

# THE EFFORT OF WASTE WATER MANAGEMENT IN NORTH SUMATRA ( JOKASHO APPROACH )

Dr. Ir. Hidayati

Environmental Protection Agency of North Sumatra Province

## **Outline of Discussion**

1. A glance of waste water condition in North Sumatera Profile
2. Jokasho is the smart installation waste water treatment
3. Lokasi Pioritas dalam penyelamatan sumber daya air di Sumatera Utara ( Danau Toba ) dan sungai Padang.
4. GHG Potential in North Sumatera Province
5. Responsibility Identification for BAU and Mitigation Action in Waste sector

## Current Condition of Waste Water Management in North Sumatera Province

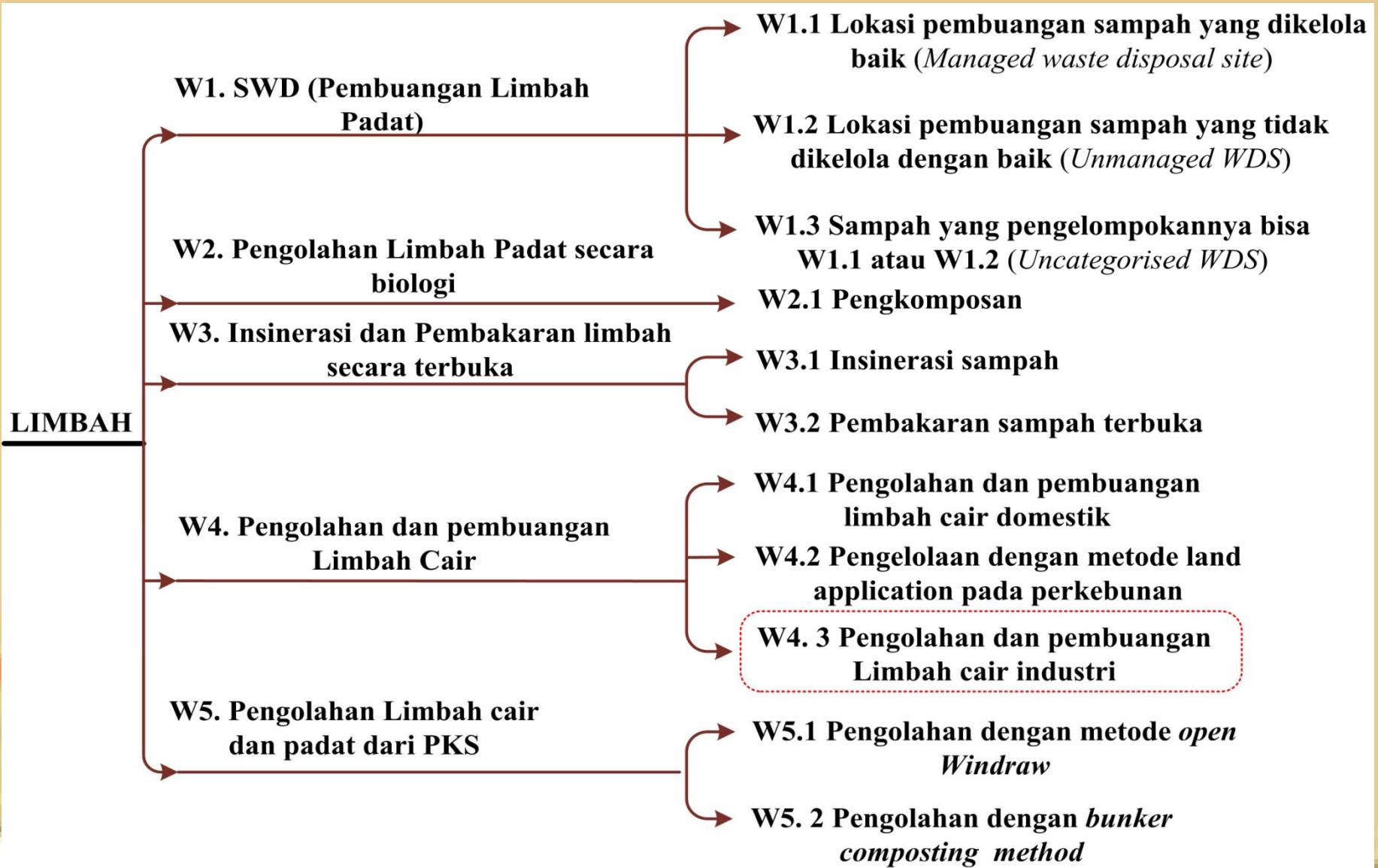


# PROFILE OF NORTH SUMATRA PROVINCE



Population	: 12.985.075
Population growth	: 1,32 %
Area	: 71,680 Km2 (3,7 % x Indonesia)
GDP	: Rp. 126,45 Trilyun
Export	: US\$. 761,34 Juta
Import	: US\$. 450,60 Juta
economic growth	: 2,04 % (Tri. I 2013)
Temperature	: 18 - 32 C (Average rain fall per year 2000 mm)

# Waste Processing in Indonesia



# Total Volume of Waste Water 2028

No.	Kecamatan	Jumlah Penduduk (jiwa)	JUMLAH VOLUME AIR LIMBAH TAHUN 2028			
			Kriteria Desain			
			Air Limbah (m <sup>3</sup> /Hari)	Timbulan Tinja (m <sup>3</sup> /Hari)	Septick Tank (unit)	MCK (Unit)
1	Medan Tuntungan	81.256	11.700,86	6,68	16.251	813
2	Medan Johor	169.592	24.421,25	13,94	33.918	1.696
3	Medan Amplas	266.374	38.357,86	21,89	53.275	2.664
4	Medan Denai	189.233	27.249,55	15,55	37.847	1.892
5	Medan Area	99.141	14.276,30	8,15	19.828	991
6	Medan Kota	77.032	11.092,61	6,33	15.406	770
7	Medan Maimun	99.087	14.268,53	8,14	19.817	991
8	Medan Polonia	81.298	11.706,91	6,68	16.260	813
9	Medan Baru	43.553	6.271,63	3,58	8.711	436
10	Medan Selayang	110.060	15.964,99	9,11	22.174	1.109
11	Medan Sunggal	127.717	18.391,25	10,50	25.543	1.277
12	Medan Helvetia	208.592	30.037,25	17,14	41.718	2.086
13	Medan Petisah	58.131	8.370,86	4,78	11.626	581
14	Medan Barat	55.497	7.991,57	4,56	11.099	555
15	Medan Timur	108.581	15.635,66	8,92	21.716	1.086
16	Medan Perjuangan	128.498	18.503,71	10,56	25.700	1.285
17	Medan Tembung	159.097	22.909,97	13,08	31.819	1.591
18	Medan Deli	228.361	32.883,98	18,77	45.672	2.284
19	Medan Labuhan	186.433	26.846,35	15,32	37.287	1.864
20	Medan Marelan	407.907	58.738,61	33,53	81.581	4.079
21	Medan Belawan	106.680	15.361,92	8,77	21.336	1.067
<b>Jumlah</b>		<b>2.992.928</b>	<b>430.981,63</b>	<b>245,99</b>	<b>598.586</b>	<b>29.929</b>

## **Problem faced of Domestic Wastewater in North Sumatera**

- 1. Domestic Wastewater in North Sumatera not managed well because on a few have received wastewater treatment facilities ( $\pm 0,2\%$  from the population in North Sumatera.)**
- 2. Lake Toba is the largest volcanic lake in the world but now it's polluted. Have performed calculations required capacity of Lake Toba and pollutant load reduction of catchment area.**
- 3. Tebing Tinggi city is surrounded by Padang River and the status of Padang River has a Black Status (Environmental rate) now it's also polluted, this city is also located in the Northern Sumatra about 90 miles and also 60 Km from the new International Airport Kuala Namu.**
- 4. Treatment and Condition of Septic Tank has no Processing only Latrine Type in all over Indonesia**
- 5. No processing for Grey Water**
- 6. water resources which consists of 72 Watershed (DAS), 99 master streams, 783 creeks and 659 small twigs river. Largely influenced by domestic waste water**
- 7. Industrial ;  $\pm 1400$  industries, type of industry : processing industry, not all obey the regulation.**



## Facilities of Wastewater Treatment in North Sumatera

- IPAL Cemara (domestic wastewater Treatment Plan)t has the capacity to process waste 60.000 m<sup>3</sup>/day until 2012.
- That has been used 20.000 m<sup>3</sup>/day. For the west side of Medan city that has been planned up to year 2030
- not qualified to have an integrated waste water disposal system when the population under one million inhabitants
  - This relates to the need for substantial investment to build an integrated wastewater treatment systems.

No	City/ Region	% System Waste Disposal and Water Management (Domestic)				MCF City/ Region
		Discharged into the sea, rivers and lakes	Latrine / pit latrine (wet climate / use the rinse water, ground water level is higher than the latrine)	Septic system (septic tank)	Centralized aerobic wastewater	
		0,5	0,7	0,5	0	
1	Kab. Nias	32,59	56,67	10,74	0	0,61
2	Kab. Mandailing Natal	71,51	11,78	16,71	0	0,52
3	Kab. Tapanuli Selatan	75,19	5,36	19,45	0	0,51
4	Kab. Tapanuli Tengah	44,09	27,12	28,79	0	0,55
5	Kab. Tapanuli Utara	10,3	33,27	56,43	0	0,57
6	Kab. Toba Samosir	12,73	29,32	57,95	0	0,56
7	Kab. Labuhan Batu	7,15	29,87	62,98	0	0,56
8	Kab. Asahan	3,95	30,65	65,4	0	0,56
9	Kab. Simalungun	8,89	28,61	62,5	0	0,56
10	Kab. Dairi	7,12	37,16	55,72	0	0,57
11	Kab. Karo	17,92	11,11	70,97	0	0,52
12	Kab. Deli Serdang	35,56	11,15	53,29	0	0,52
13	Kab. Langkat	8,32	35,78	55,9	0	0,57
14	Kab. Nias Selatan	18,56	78,25	3,19	0	0,66
15	Kab. Humbang Hasundutan	8,6	34,82	56,58	0	0,57
16	Kab. Pakpak Barat	18,26	31,36	50,38	0	0,56

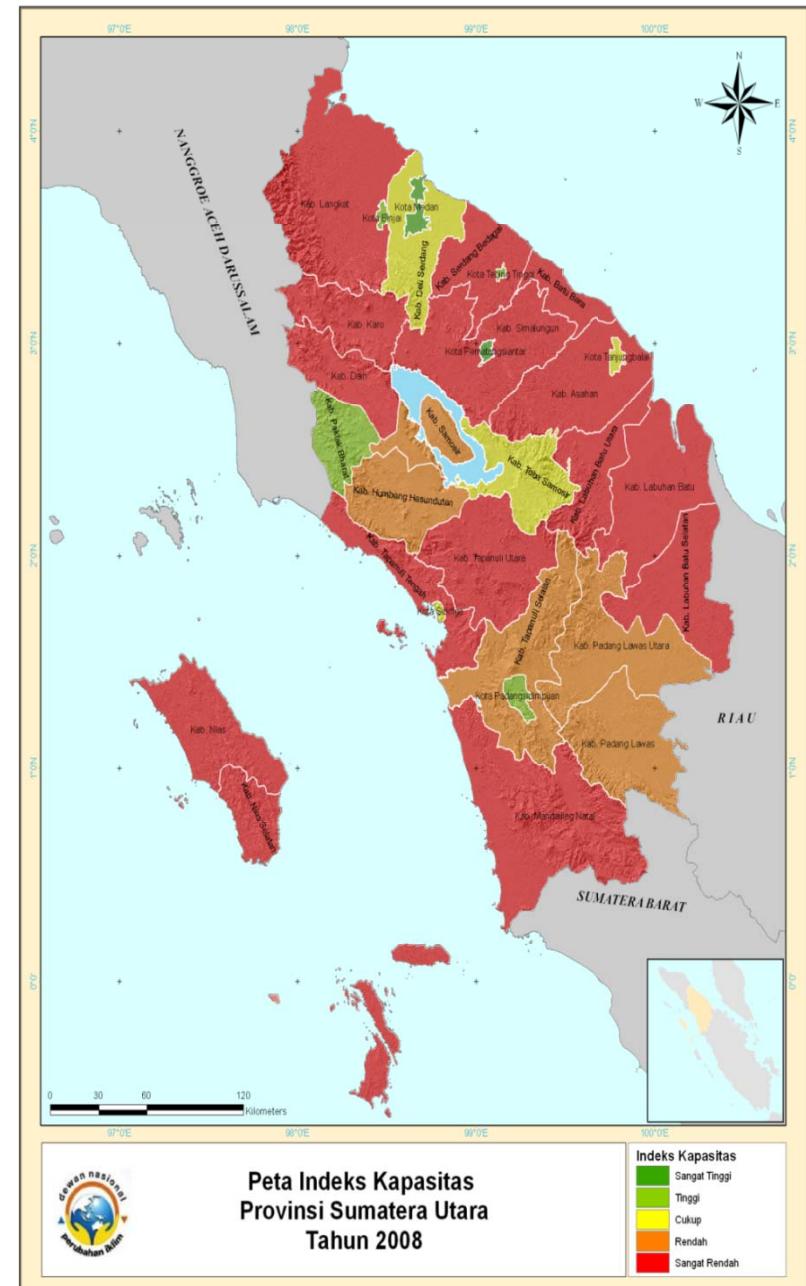
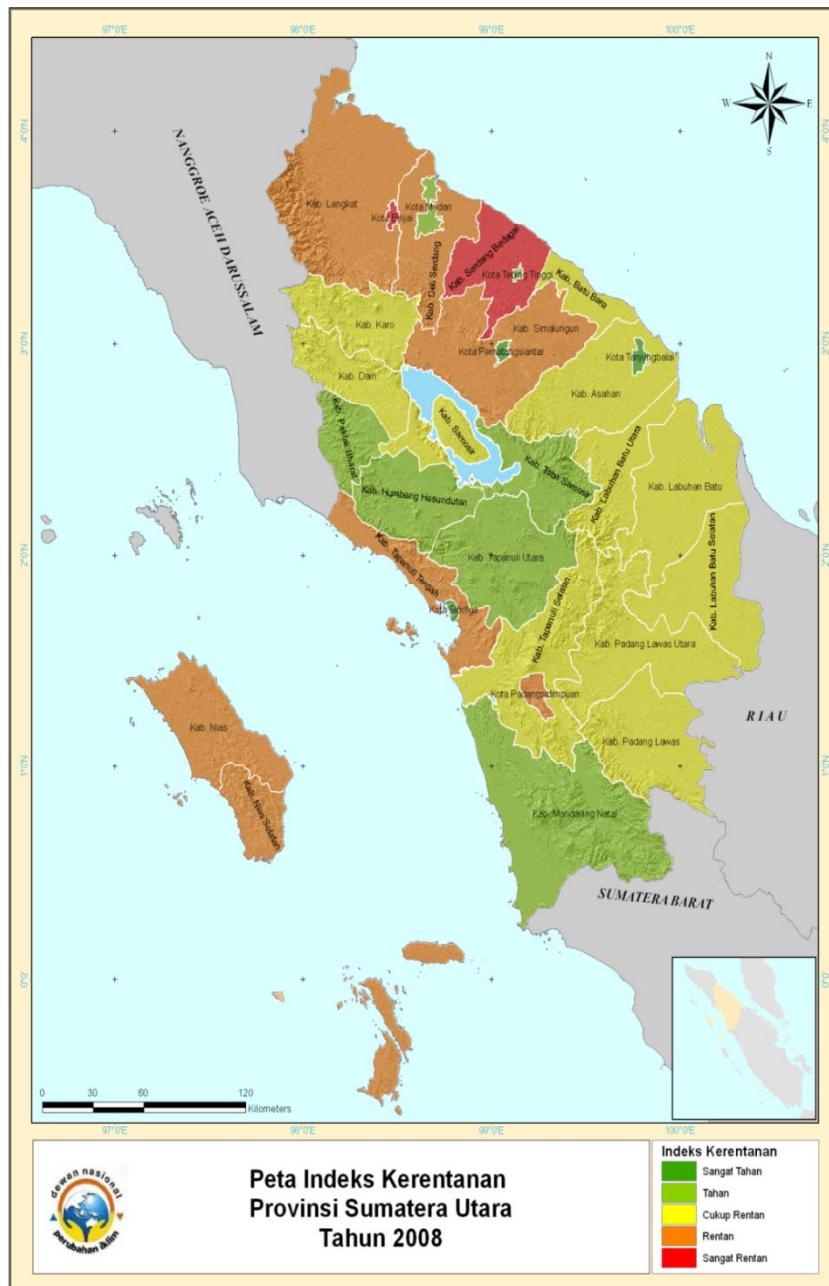
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		Discharged into the sea, rivers and lakes	Latrine / pit latrine (wet climate / use the rinse water, ground water level is higher than the latrine)	Septic system (septic tank)	Centralized aerobic wastewater	
17	Kab. Samosir	4,72	51,36	43,92	0	0,60

18	Kab. Serdang Berdagai	4,75	21,49	73,76	0	0,54
19	Kab. Batu Bara	11,87	25,44	62,69	0	0,55
20	Kab. Padang Lawas Utara	46,18	19,64	34,18	0	0,54
21	Kab. Padang Lawas	52,46	28,23	19,31	0	0,56
22	Kab. Labuhanbatu Selatan	12,65	26,34	61,01	0	0,55
23	Kab. Labuhanbatu Utara	12,56	38,84	48,6	0	0,58
24	Kab. Nias Utara	17,46	61,89	20,65	0	0,62
25	Kab. Nias Barat	12,95	66,28	20,77	0	0,63
26	Kota Sibolga	54,74	4,75	40,51	0	0,51
27	Kota Tanjung Balai	14,43	5,27	80,3	0	0,51
28	Kota Pematang Siantar	8,21	4,27	87,52	0	0,51
29	Kota Tebing Tinggi	2,03	3,38	94,59	0	0,51
30	Kota Medan	9	4,42	65*	21,58	0,40
31	Kota Binjai	6,79	4,95	88,26	0	0,51
32	Kota Padang Sidempuan	35,11	5,7	59,19	0	0,51
33	Kota Gunung Sitoli	39,75	29,71	30,54	0	0,56

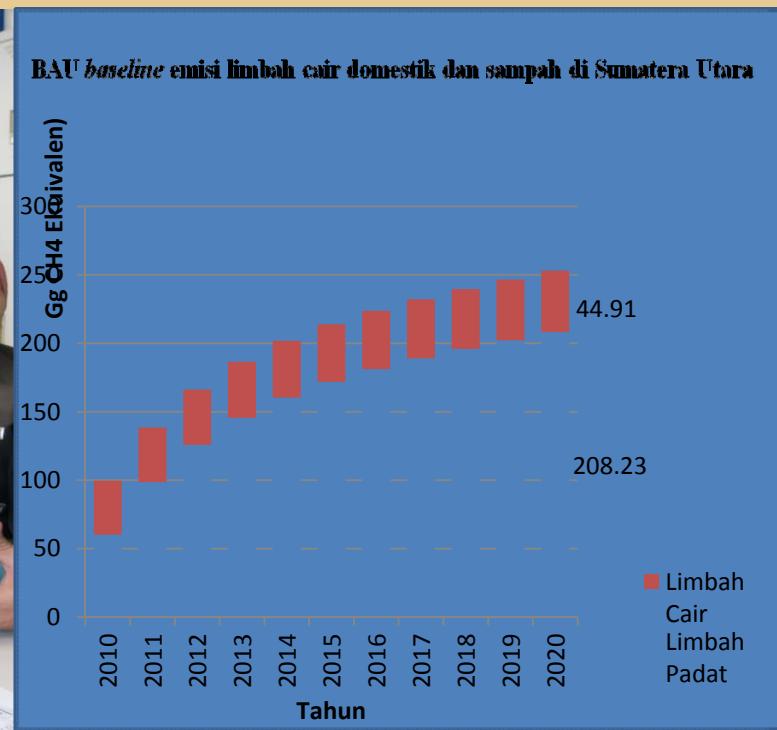
Sumber: Survei Sosial Ekonomi Nasional (Susenas), 2010

Keterangan: \*) RIPJM 2011-2015 Kota Medan

# Capacity Index map of North Sumatera Province



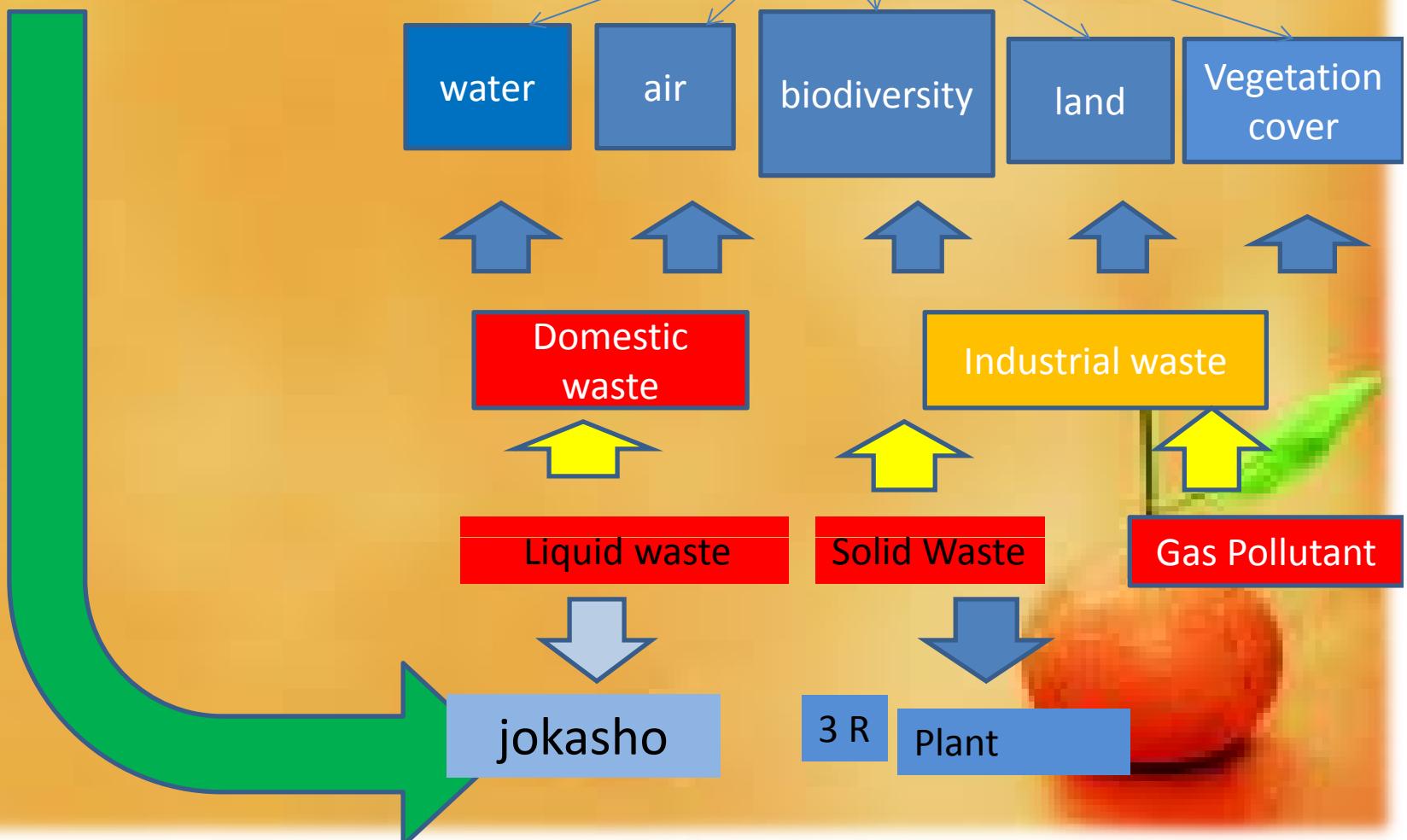
# Jokasho is the smart installation waste water treatment



## Environmental management and protection



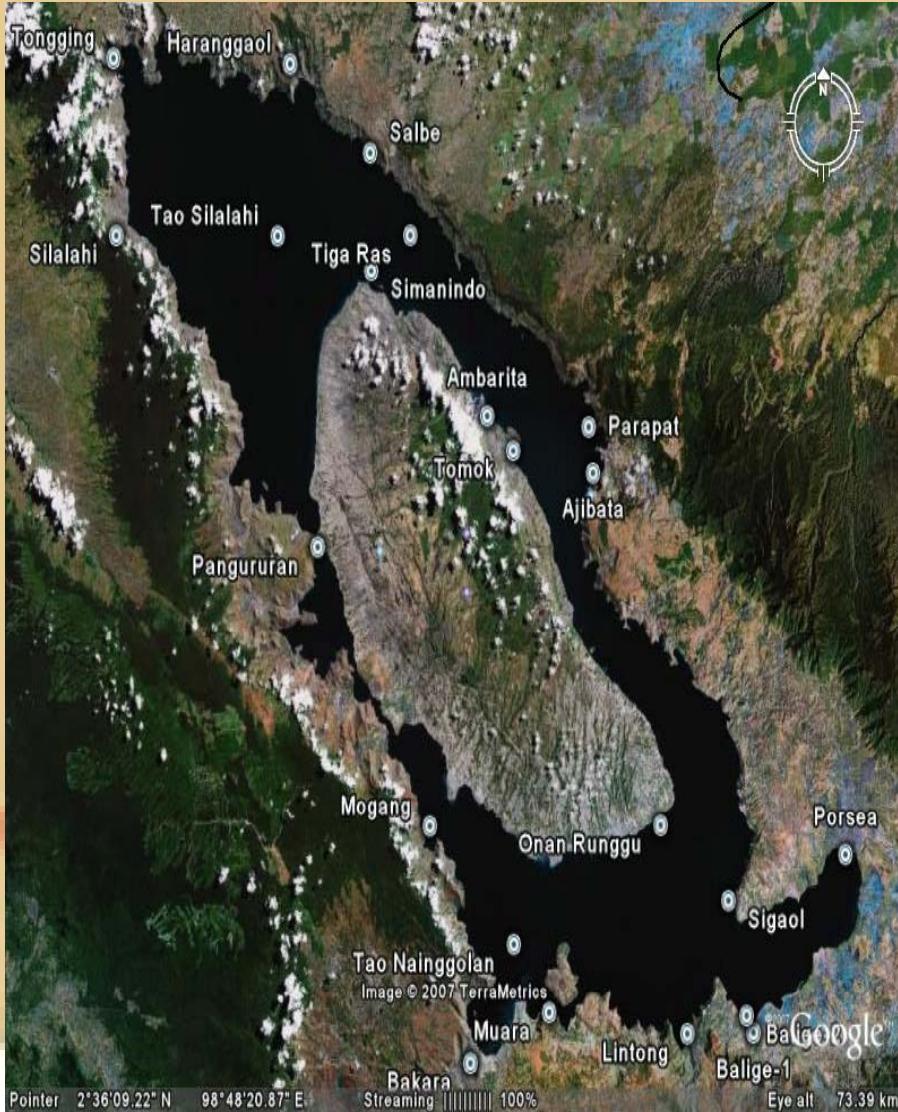
### The components of environment



## Why do we need Jockashou ?

1. Have technology that can reduce pollution domestic waste
2. Housing conditions in North Sumatra is very difficult to rebuild the channel.
3. Easy monitoring and operation. (Can be done with periodic maintenace)
4. Save water resources from pollution in North Sumatra
5. In Lake Toba has happened eutrophication may also reduce the burden organic pollutants that can reduce the growth spurt water hyacinth (algae).

# General Description of Lake Toba



- Width : 110.260 Ha
- Height : ± 900 m dpl
- Rainfall : 1.700 – 2.400 mm/year
- Sub DAS on DTA : 19 Sub DAS
- Include 9 (nine) regencies:
  - Karo regency
  - Dairi regency
  - Simalungun regency
  - Toba Samosir regency
  - Humbang Hasundutan regency
  - Samosir regency
  - North Tapanuli regency
  - Asahan regency
  - Tanjung Balai city

## Activity Near Lake Toba

Disposal of wate in Lake Toba



Toilet near Balige District



Eceng gondok di Kelurahan Tiga Raja Kecamatan Girsang S. Bolon



Washin thier clothes near lake Toba



Lwaste/ Polluted

# Domestic Waste Water

## LIMBAH DOMESTIK



SALURAN LIMBAH RUMAH  
TANGGA KE DANAU TOBA





# Source

1. As the source of drinking water 82% of the communities around Lake Toba using lake water as a raw water source of drinking water



**2. As Hydro Power Station:**

- Asahan hydropower has 450 MW Capacity
- Lae Renun hydropower has 82 MW Capacity



**3. Asahan hydropower, which uses the water of Lake Toba as the turbines, where the electricity generated is used by PT. Inalum for aluminum smelting**



**4. PT. Toba Pulp Lestari that use water as the water of Lake Toba River production through Asahan**

**5. As tourism destination such as:**

**Parapat, Tomok, Tuk-tuk Siadong, Tongging, Sipisopiso waterfall, Tao Silalahi, Muara-Pulau Sibandang, Haranggaol, Tao Sidihoni, Tele, Hot Spring Pangururan, etc.**



# Pig Farm in Near Lake Toba

## -PT. Allegrindo

- Capacity of Product that is permitted : 25.000 ekor/semester
- Total Livestock : 25.000 ekor/semester
- Type of Waste that is Produced: Liquid waste, Solid, Gas
- Solid Waste can be used for composting and also for Fertilizer
- Liquid waste can be process to be water that can be consumed for livestock.
- Regulation Number : 15.07/P2KLB3-2012 parameter Environmental that has been qualified.

## Capacity of polluted Area (DTBP) Parameter for Danau Toba T-P

Method of Measurement :

- Permenlh No. 28 Tahun 2009 Load capacity Water Pollution and Reservoir.

Status trofik Danau Toba :

- Oligotrofik ( $T-P < 10 \mu\text{g/l}$ )

Monitoring Result 2012 :  $T-P = 110 \mu\text{g/l}$

Kadar T-P Danau Toba qualified of oligotrofik



## II. Lake Toba Ecosystem Pollution Load

### 1. Domestic Pollution Load

No.	Regency	Domestic Pollution Load (kg/day)				
		BOD5	COD	Suspended Solid	Total Nitrogen	T- Phosphorus
1	Karo	109,92	192,36	2.387,17	19,99	5,66
2	H. Hasundutan	1.303,30	2.280,77	2.830,39	236,96	67,14
3	Tapanuli Utara	586,59	1.026,53	1.273,90	106,65	30,22
4	Samosir	3.094,16	5.414,77	6.719,63	562,57	159,40
5	Toba Samosir	3.770,61	6.598,56	8.188,69	685,57	194,24
6	Dairi	63,17	110,55	137,19	11,49	3,25
7	Simalungun	584,34	1.022,59	1.269,01	106,24	30,10
Total		9.512,07	16.646,13	22.805,98	1.729,47	490,02

### 2. Pollution load from others

Polutan	COD		T-N		T-P	
	Sumber	(ton/thn)				T-P
Curah Hujan		-	-	-	2,05	
Pertanian		986,30	18,57	6,19		
Padang Rumput		704,13	28,17	6,19		
Hutan		198,56	80,79	2,79		
Sawah		154,92	47,74	1,89		
Total		2.043,91	175,27	19,10		



Sumber : 1. Pen Tropiget, skala 1:100.000  
BAGIAN KORDILAI PELESTARIAN EKOSISTEM  
KAWASAN DANAU TOBA  
(BKPEKT)

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7	Simalungun	584,34	1.022,59	1.269,01	106,24	30,10
Total		9.512,07	16.646,13	22.805,98	1.729,47	490,02

### 2. Pollution load from others

Polutan	COD		T-N	T-P
	Sourcess	(ton/thn)		
Rainfall	-	-		2,05
Agriculture	986,30	18,57		6,19
Grass Land	704,13	28,17		6,19
Forest	198,56	80,79		2,79
Paddy Field	154,92	47,74		1,89
<b>Total</b>	<b>2.043,91</b>	<b>175,27</b>		<b>19,10</b>



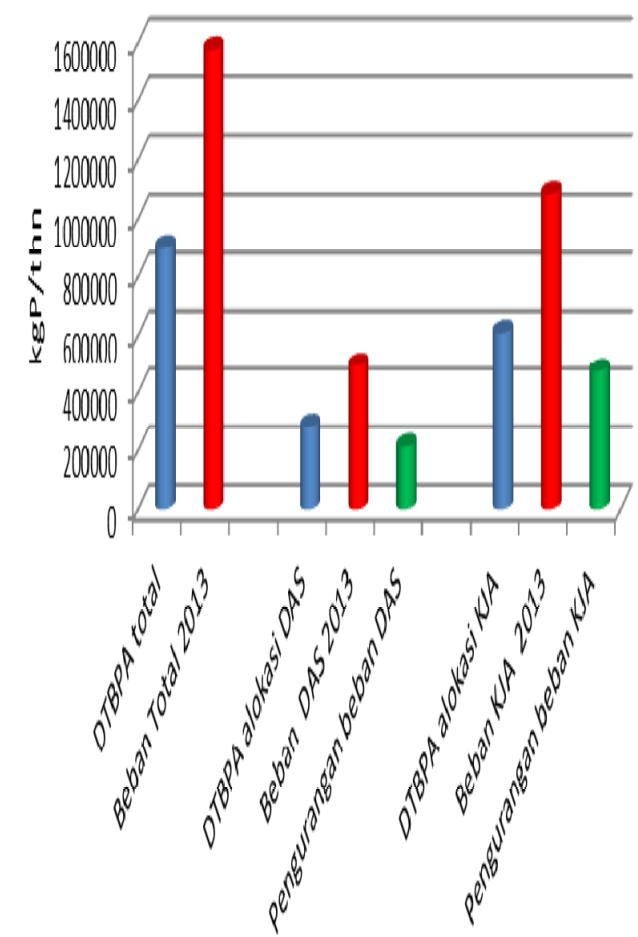
### 3. Livestock Pollution Load

Pollutant	Total Solid	BOD	COD	T-N	T-P
Kabupaten	ton/tahun				
Karo	51,48	10,86	43,52	3,74	0,52
Humbang	1.561,31	367,13	1.320,48	118,24	17,62
Taput	625,55	156,58	537,64	48,91	7,85
Samosir	6.622,14	1.370,82	5.522,18	476,51	63,46
Tobasa	18.035,68	3.676,45	14.949,01	1.211,77	199,22
Dairi	121,25	34,10	107,38	10,14	1,79
Simalungun	186,04	51,95	167,17	15,72	2,26
<b>Total</b>	<b>27.203,45</b>	<b>5.667,90</b>	<b>22.647,37</b>	<b>1.885,03</b>	<b>292,72</b>

### 4. Fishery Pollution Load

Pemilik KJA	Jumlah	Rata-rata		Total		Unit Limbah		Total Limbah		
		Produksi	Pakan	Produksi	Pakan	Nitrogen	Phospor	BOD	Nitrogen	
		unit	(ton/tahun/unit KJA)	(ton/tahun)		(Kg/Kg Pakan)			Phospor	
Masyarakat	848	2,84	4,3	23.935,5	36.240,4	0,0321	0,0113	0	1.163,3	409,5
PT. Aquafarm	484			31.000,0	59.520,0				1.910,6	672,6
<b>Total</b>				<b>54.935,5</b>	<b>95.760,4</b>				<b>3.073,9</b>	<b>1.082,1</b>

Grafik 6.1 DTBPA Danau Toba untuk T-P



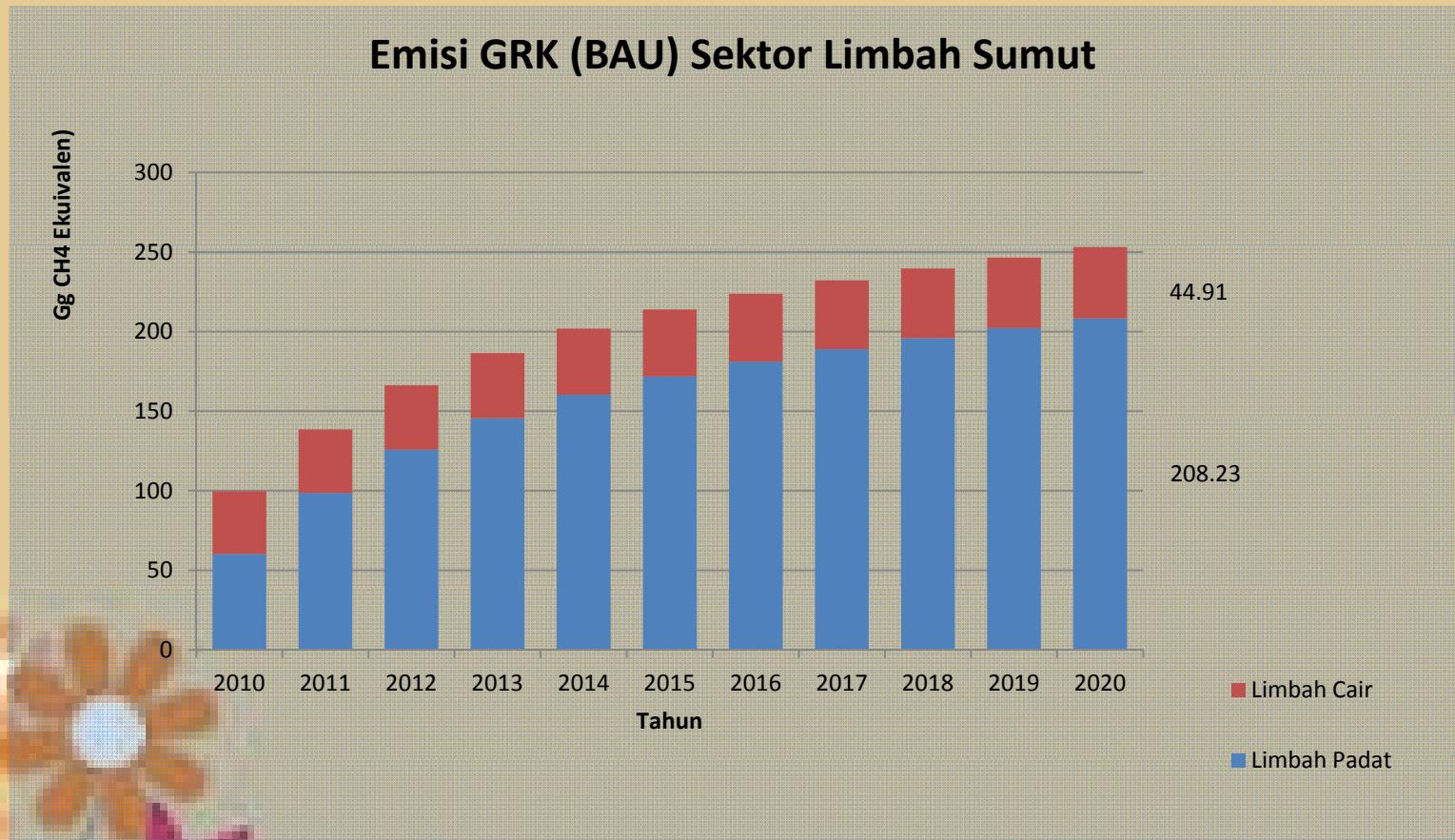
Water Quality for  
Danau toba  
(parameter: TSS, M&L, BOD,  
COD,NO3,NH3,DO, pH)

STATUS MUTU AIR DANAU TOBA (PEMANTAUAN 2005 s/d 2010)			
No	Desa	Nilai Stored	Kesimpulan
1	TONGGING	-12	Cemar Sedang
2	HARANGGAOL	-15	Cemar Sedang
3	SALBE	-12	Cemar Sedang
4	TIGARAS	-20	Cemar Sedang
5	PARAPAT	-20	Cemar Sedang
6	SIMANINDO	-18	Cemar Sedang
7	AJIBATA	-20	Cemar Sedang
8	TENGAH SILALAHI	-18	Cemar Sedang
9	AMBARITA	-12	Cemar Sedang
10	TOMOK	-18	Cemar Sedang
11	ONAN RUNGU	-20	Cemar Sedang
12	TENGAH TAO SILALAHI	-10	Cemar Ringan
13	SIREGAR AEK NALAS/SIGAOL	-20	Cemar Sedang
14	PORSEA	-26	Cemar Sedang
15	BALIGE I	-12	Cemar Sedang
16	BALIGE II	-12	Cemar Sedang
17	LINTONG	-8	Cemar Ringan
18	MUARA	-16	Cemar Sedang
19	BAKARA	-20	Cemar Sedang
20	PALIPI/MOGANG	-26	Cemar Sedang
21	PANGURURAN	-18	Cemar Sedang
22	SILALAHI	-18	Cemar Sedang

# ENVIRONMENTAL PERFORMANCE IN BUSINESS / ACTIVITIES IN THE LAKE TOBA

	<b>Hotel</b>  <b>Total: 23 hotel</b>	<b>Hospital/ clinic</b>  <b>Total : 6</b>	<b>Petro Stasion</b>  <b>Total: 4</b>	<b>Fishery</b>  <b>Total : 4</b>	<b>Farming</b>  <b>Total : 4</b>	<b>PLTA/PLT M</b>  <b>Total : 13</b>	<b>Ect.</b>  <b>Total : 5</b>
WWTP	83% do not have the WWTP	67% do not have the WWTP	-	100 %do not have the WWTP	50 %do not have the WWTP	-	60 % do not have the WWTP
Enviromental Document	100 %not have Enviromental Document	83 %not have Enviromental Document	100 % have an Enviromental Docume nt	25 % tidak have Envrioment document	100 5 have enviroment document	7 % do not have envirome nt document	40 % do not have enviroment document
Wastewater discharge permit	100% have a wastewater discharge permit	100% have a wastewater discharge permit	-	100 % wastewater discharged into the lake	67 % permit to throw wastewater	-	80 % do not have permit to discharge wastewater

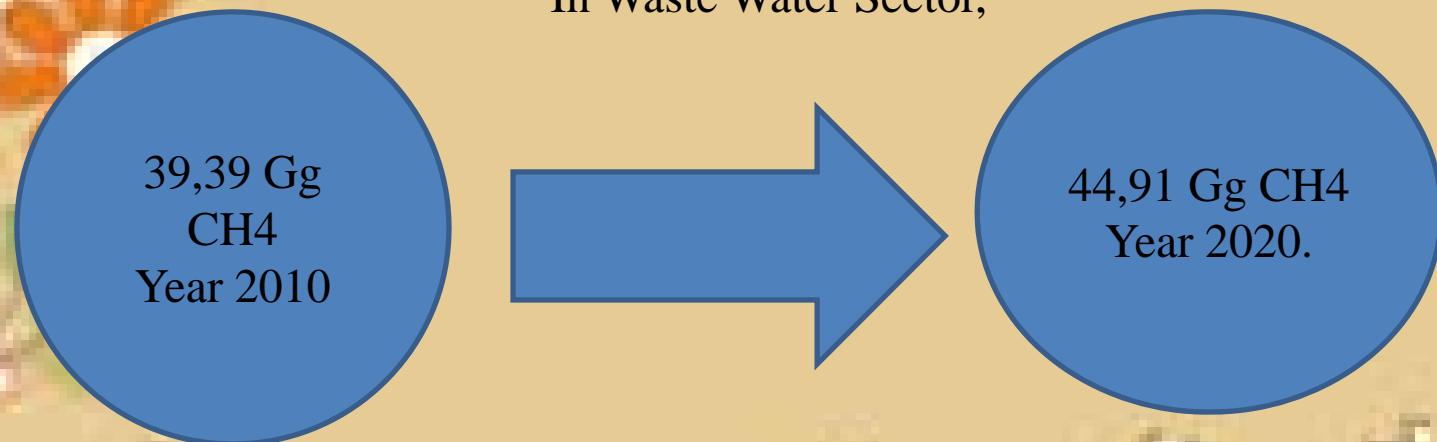
# GHG Potential in North Sumatera Province



## **BAU baseline** domestic wastewater in North Sumatra

No.	Year	Domestic Wastewater	
		Emisi GRK (Gg CH <sub>4</sub> )	Emisi GRK (tCO <sub>2</sub> eq)
1	2010	39,39	827.275
2	2011	39,91	838.180
3	2012	40,44	849.228
4	2013	40,97	860.423
5	2014	41,51	871.765
6	2015	42,06	883.256
7	2016	42,61	894.899
8	2017	43,18	906.696
9	2018	43,75	918.648
10	2019	44,32	930.757
11	2020	44,91	943.026

Project baseline in Emission of GHG (Gg CH<sub>4</sub>)  
In Waste Water Sector,



# Base of Calculation

The calculations were carried out on domestic and industrial wastewater in North Sumatra as a basic reference to:

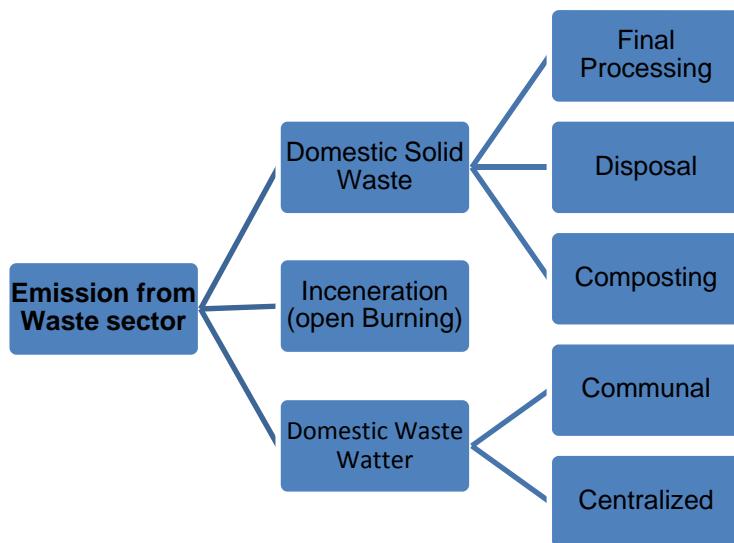
- Population
- number of industry
- Volumes of domestic and industrial wastewater  
domestic wastewater BOD Data, Data sewer and WWTP
- Data domestic wastewater on-site; septic tanks and pit-latrine, or other.

Type of Treatment and Disposal	Potential of CH4 and N2O emissions
<i>Uncollected</i>	Septic Tank Sludge dewatering regularly will reduce CH4 production.
	<i>Open pits/Latrines</i> Pits / latrine will produce CH4 when the temperature and retention time allows.
	Direct discharge to the river Pits / latrine will produce CH4 when the temperature and retention time allows.

**Estimated GHG emissions**  
**wastewater sector still use the default number of Tier I.**  
**Emissions estimated value is based on the population of North Sumatra province, assuming a value of degradable organic component of 14.6 kg BOD / capita / year and a maximum capacity result in methane gas at 0.6 kg BOD according CH4/kg 2006 IPCC Guidelines Chapter 6**

No.	Usulan Aksi Mitigasi	Penurunan Emisi GRK	Pelaksana
1.	Program Peningkatan Sarana-Prasarana Persampahan sesuai UU No 18, 2008)	751.694 tCO <sub>2</sub> eq	PU Cipta Karya Prov dan K/K, Satker PLP, BLH Prov, BLH K/K
2.	Program Minimasi Sampah dengan prinsip 3R	306.800 tCO <sub>2</sub> eq	PU Cipta Karya Prov dan K/K, Satker PLP, BLH Prov, BLH K/K
3.	Program Peningkatan Pengelolaan Gas Sampah	35.461 tCO <sub>2</sub> eq	Satker PLP, Swasta
4.	Pembangunan prasarana Waste Water Treatment Pemukiman	190.293 tCO <sub>2</sub> eq	PU Cipta Karya Prov dan K/K, Satker PLP
5.	Program Pengendalian Banjir	94.303 tCO <sub>2</sub> eq	Dinas PSDA
6.	Program Penyusunan Perencanaan Pengelolaan Persampahan	Tidak ada nilai emisi	PU Cipta Karya Prov dan K/K, Satker PLP
7.	Penyusunan Perencanaan Pengelolaan Air Limbah	Tidak ada nilai emisi	PU Cipta Karya Prov dan K/K, Satker PLP, BLH Prov, BLH K/K
8.	Program Pengelolaan Badan Air	Tidak ada nilai emisi	BLH Prov, BLH K/K
9.	Program Pemberdayaan Kesehatan Lingkungan dan Masyarakat	Tidak ada nilai emisi	Dinkes K/K, BLH Prov K/K
10.	Program Monitoring dan Evaluasi	Tidak ada nilai emisi	Bappeda Prov K/K, BLH Prov K/K, DKP K/K, Satker PLP
11.	Program Non Teknis RAD GRK	Tidak ada nilai emisi	Bappeda Prov K/K, BLH Prov K/K, Dinas Pendidikan Provsu
<b>Total kegiatan (termasuk sub kegiatan)</b>		<b>49 kegiatan</b>	
<b>Total Penurunan Emisi</b>		<b>1.368.449 tCO<sub>2</sub>eq</b>	
<b>BAU</b>		<b>5.315.858 tCO<sub>2</sub>eq</b>	
<b>Persentase Penurunan Emisi</b>		<b>25,7%</b>	
<b>Total biaya mitigasi:</b>		<b>1.841.010.00 (Rp. Juta)</b>	

# Sources of Emissions from Waste Sector by RAN-GRK



# Responsible BAU Identification and Mitigation Actions Waste Sector

## Penetapan Kewenangan Pelaksanaan Aksi Mitigasi Sektor Limbah

Sektor	Nasional (K/L Terkait)	Provinsi (SKPD Terkait)	Kabupaten/Kota (SKPD Terkait)
Limbah	<ul style="list-style-type: none"><li>• Kebijakan dan program pengelolaan limbah nasional</li><li>• Pengelolaan limbah B3</li></ul>	<ul style="list-style-type: none"><li>• Kordinasi pengelolaan limbah padat dan cair yang dihasilkan dari Industri dan Domestik</li></ul>	<ul style="list-style-type: none"><li>• Pengelolaan limbah padat dan cair yang dihasilkan dari Industri dan Domestik</li></ul>

## Conclusion

1. Is needed Jokasho as solutions to problems of wastewater domestic in North Sumatra
2. Mainly to save Lake Toba from destruction is needed jokasho around Lake Toba.
3. Domestic wastewater in North Sumatra contributed to the decline in the quality of surface water (rivers and lakes) and also groundwater.
4. Domestic Waste Management in North Sumatra is a potential toward GHG reduction

**Thank you  
Arigato  
Terima kasih**

