SOLID WASTE DISPOSAL on LAND in INDONESIA

The 4th Workshop on Greenhouse Gas (GHG) Inventories in ASIA

by

HB Henky Sutanto – BPPT – Indonesia

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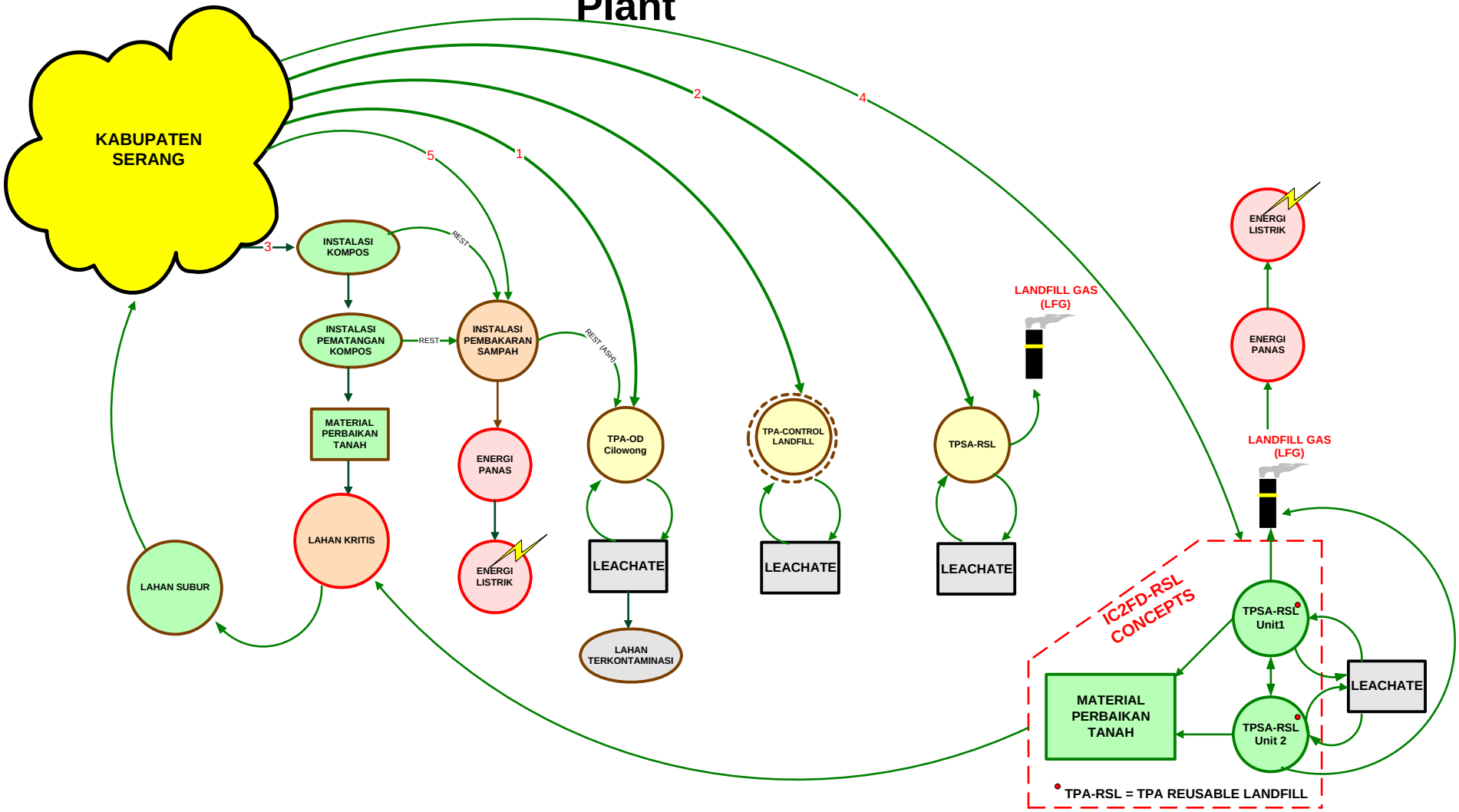
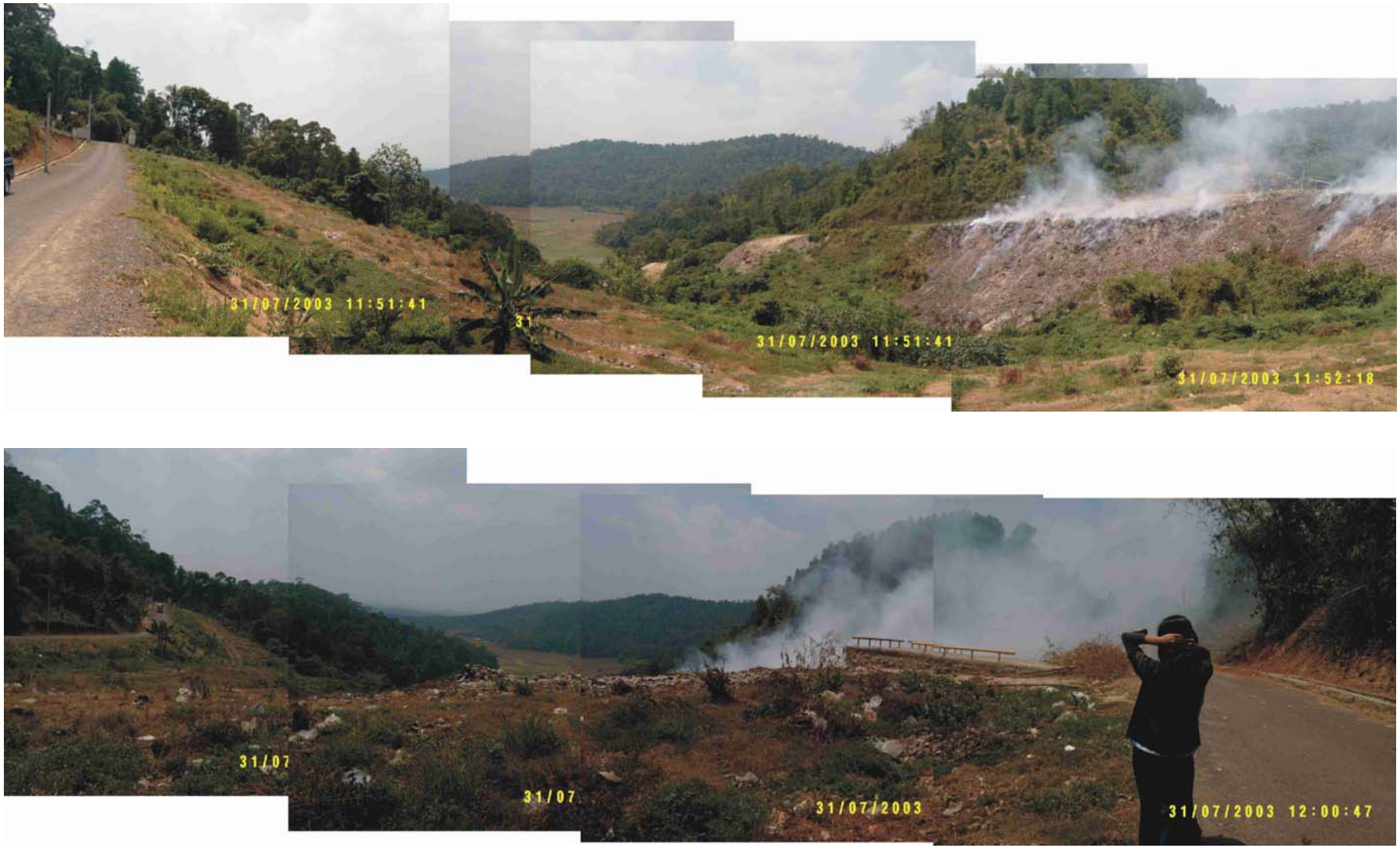
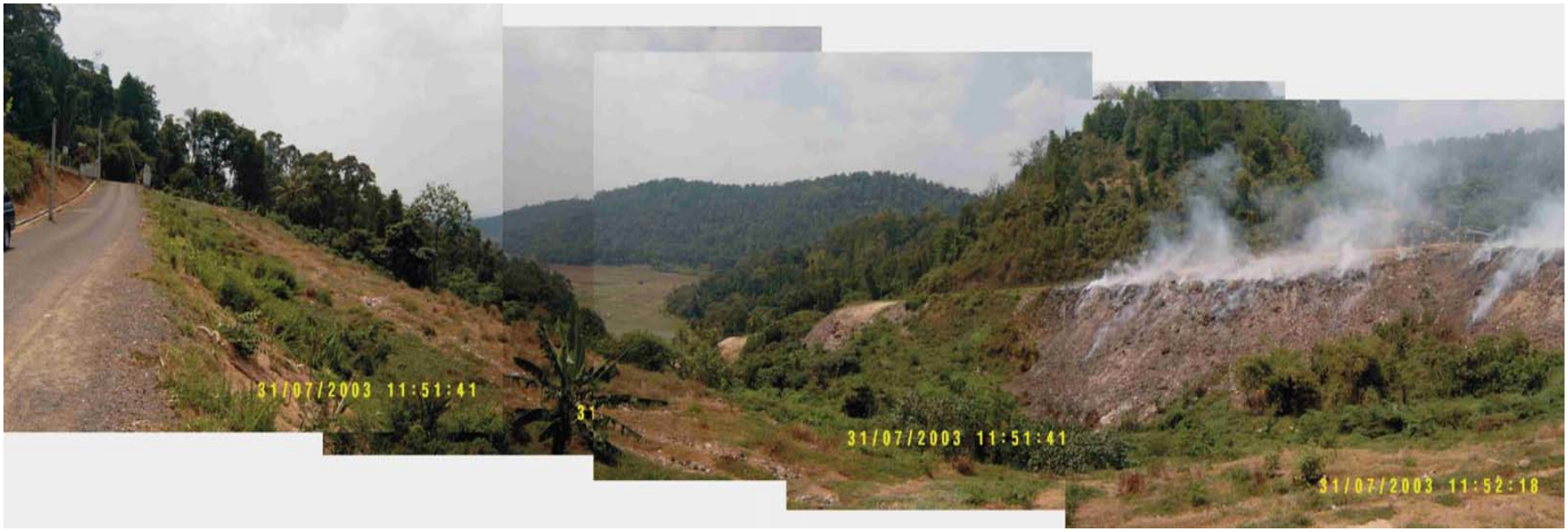
2FD.Reusable Sanitary Landfill means 2 place of LandfillGas to Energy Plant & Means also 2 Anaerobic Composting Plant



FD-OD Cilowong, Serang 2004



THE MAIN PROBLEMS

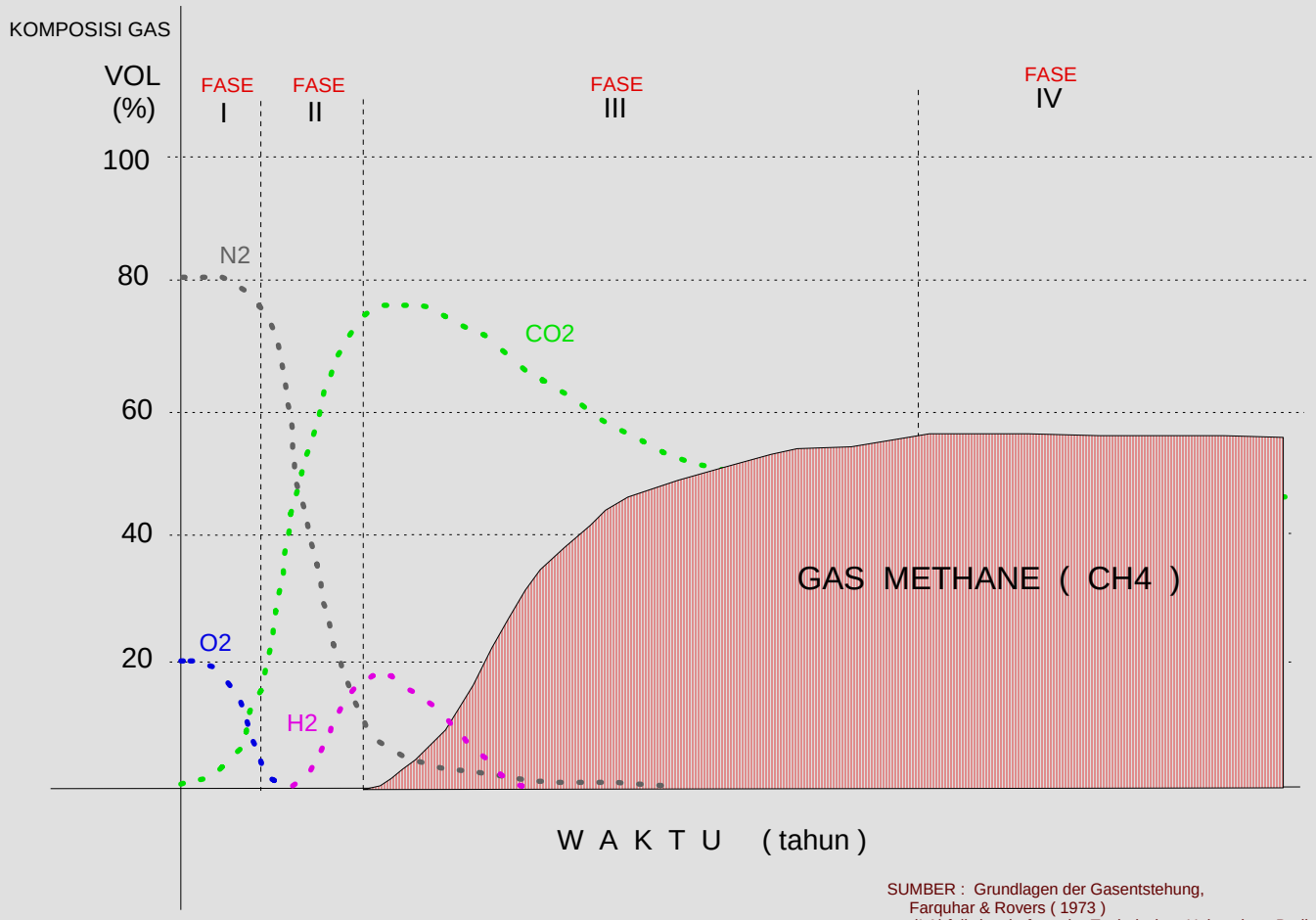


460 Location of Final Disposal-Open Dumping in Indonesia

460 unit Emitter of Green House Gas (CH4 & CO2)

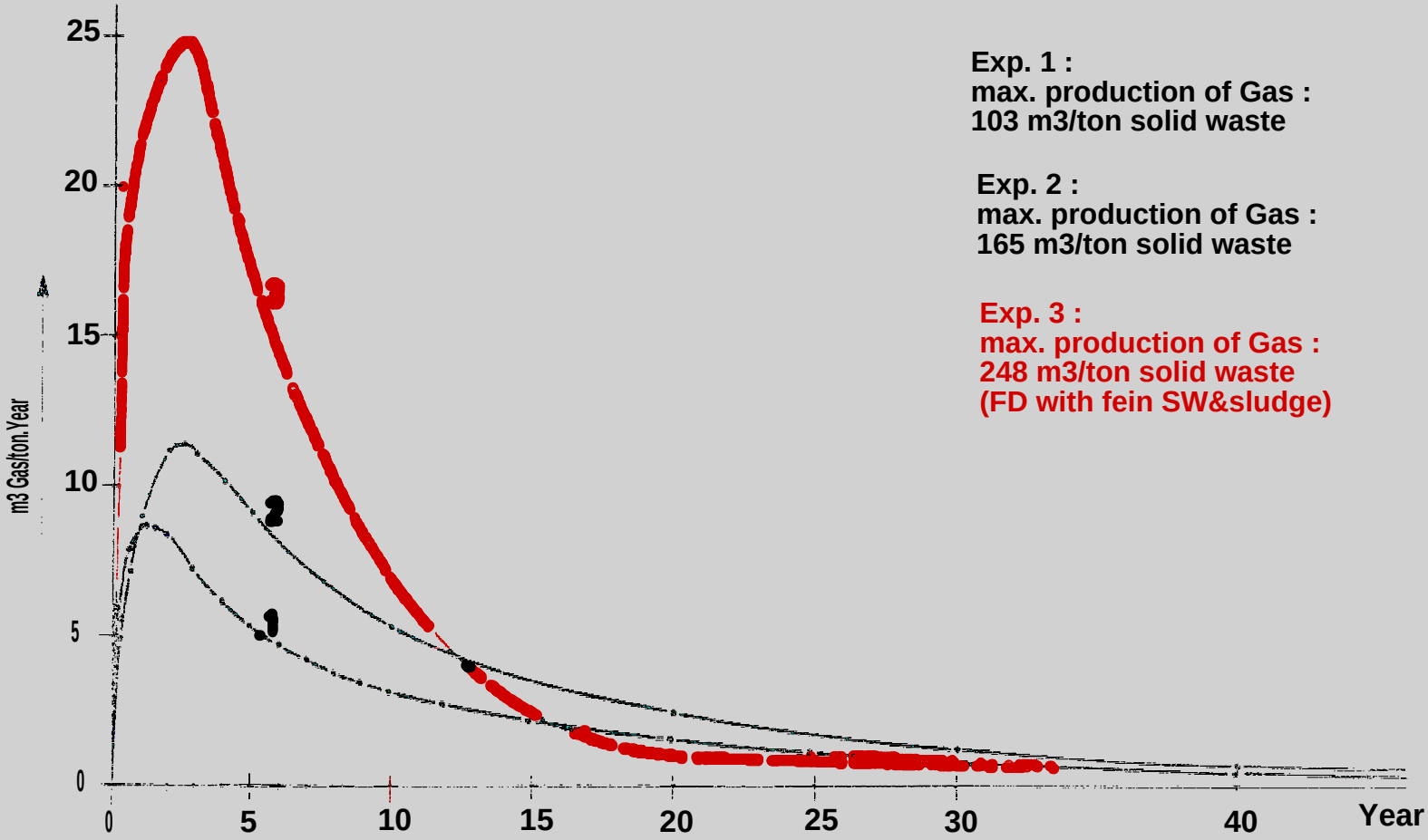
21 x CO2 = CH4 (Landfill Gas & GreenHouseGas)

Time Frame of Production of CH4-Gas in SW-Landfill-Sites



SUMBER : Grundlagen der Gasentstehung,
Farquhar & Rovers (1973)
dI Abfallwirtschaft an der Technischen Universitaet Berlin, Band 5, s. 139-169
TU BerlIn, 1980

Timeframe & Amount of LFG-Production from SW-Landfill

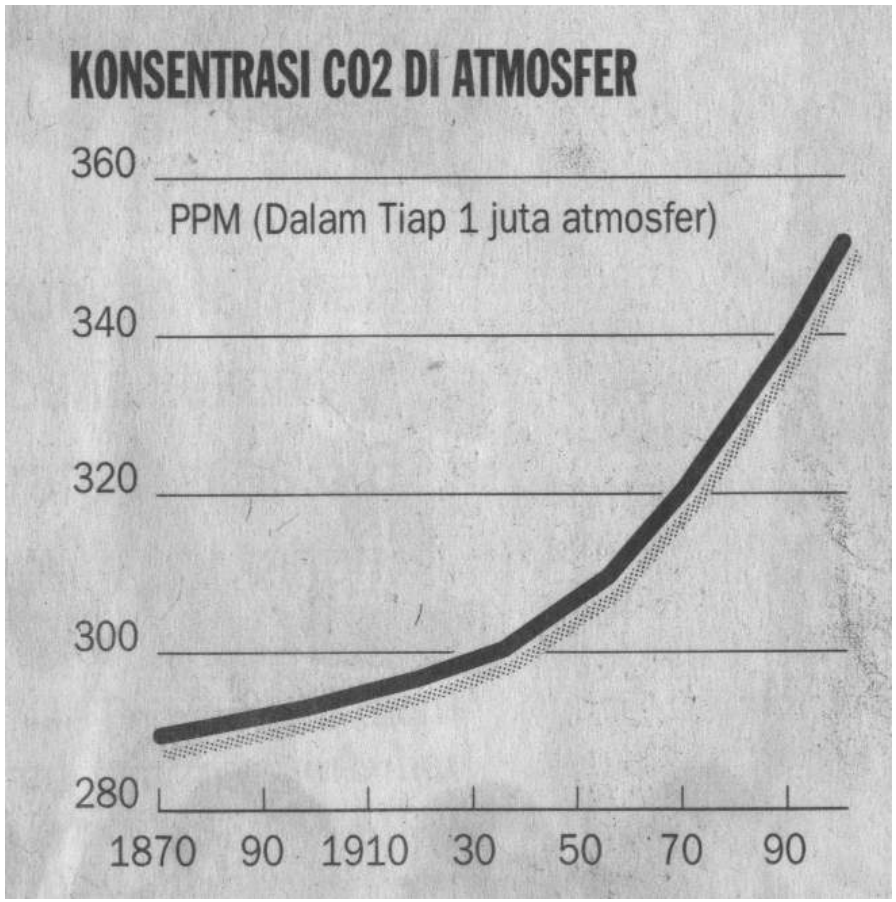


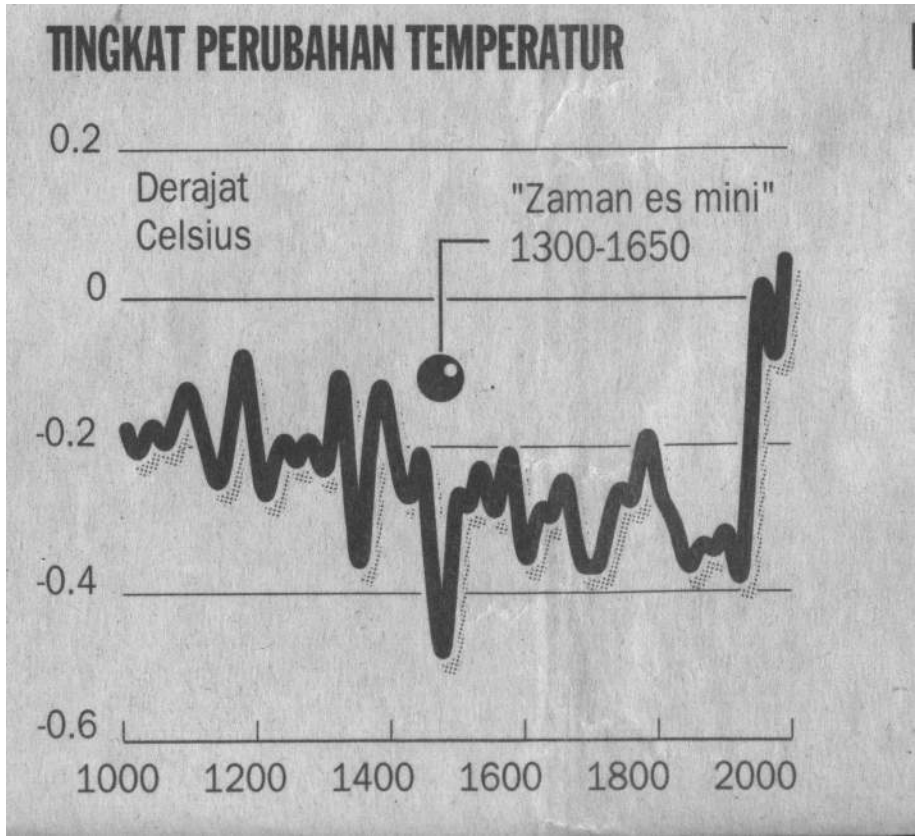
Exp. 1 :
max. production of Gas :
103 m3/ton solid waste

Exp. 2 :
max. production of Gas :
165 m3/ton solid waste

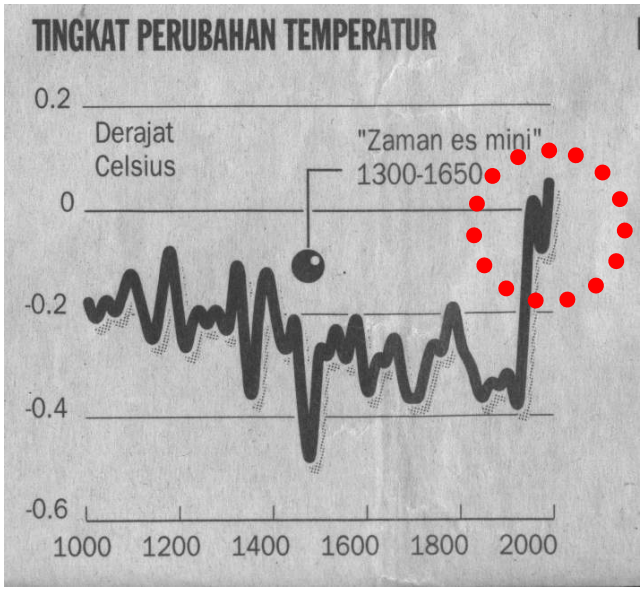
Exp. 3 :
max. production of Gas :
248 m3/ton solid waste
(FD with fein SW&sludge)

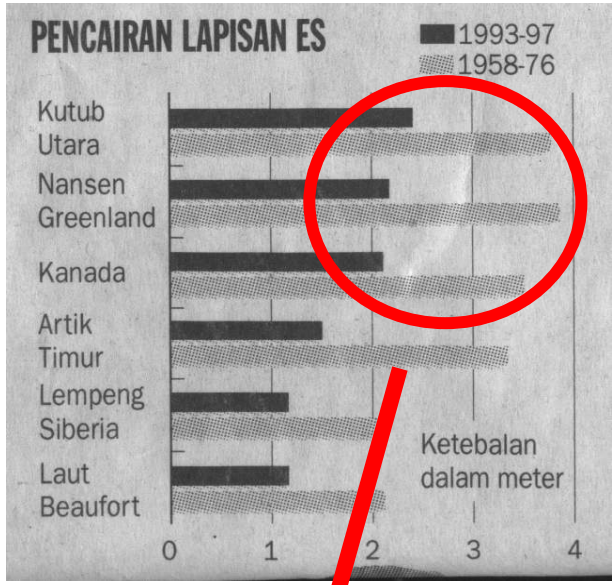
Global Warming as an effect of Green House Gas (CO2,CH4) Emission

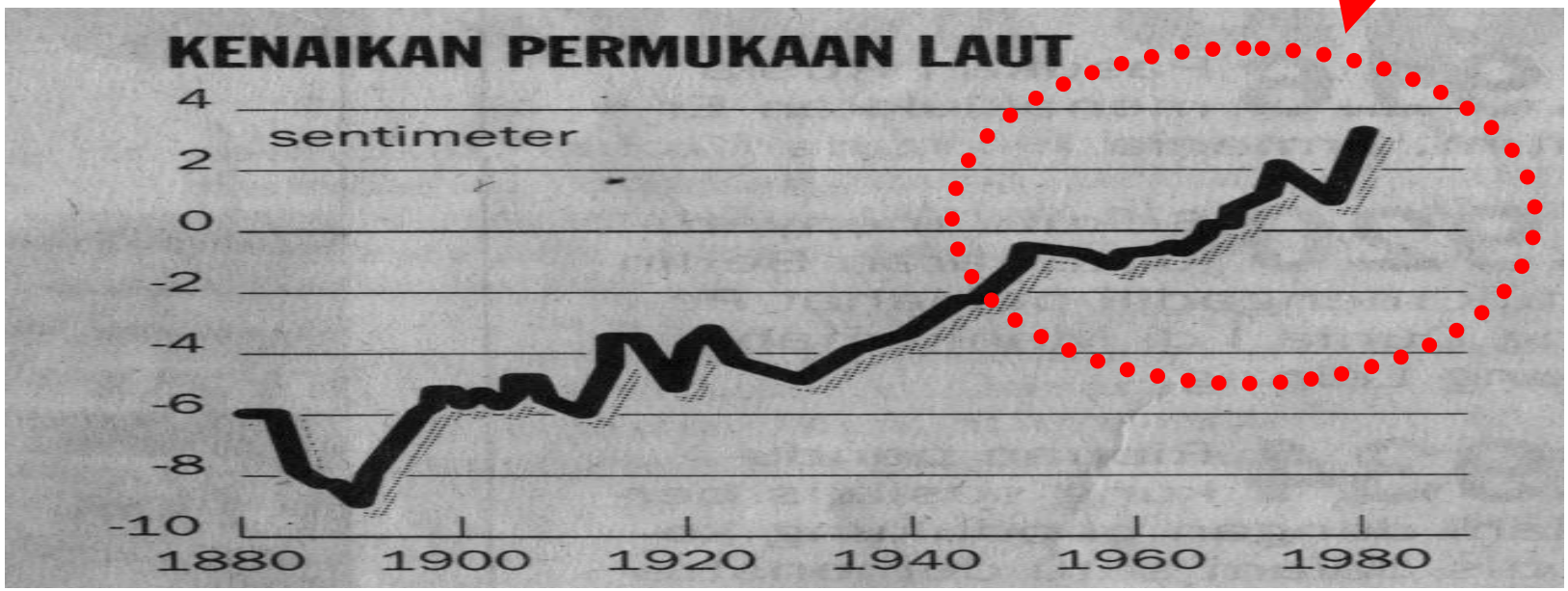




Global Warming & Possible Future Disasters







ANOTHER PROBLEMS

- **How to fulfill the MDG-Targets & to eradicate :**
  - Poverty
  - Illiteracy
  - Hunger
  - Unsafe & unsustainable water supply
  - Disease
  - Urban & environmental degradation

- **Energy supply shortages**

- **Sustainability of available Airspace for the Solid Waste -Temporary & -Final Disposal.**

SOLID WASTE STREAM, FROM GENERATION TO DISPOSAL

The Growth of Solid Waste Generation/person/year (tpy)

			Y	1971	1980	1990	2000	2010	2020
	Prog-CODE			Tpy/capita	Tpy/capita	Tpy/capita	Tpy/capita	Tpy/capita	Tpy/capita
Sumatra	HMSMPC			0,026	0,191	0,189	0,225	0,209	0,182
Java	**HMJVPC**			**0,029**	**0,199**	**0,240**	**0,338**	**0,361**	**0,358**
Kalimantan	HMKLPC			0,031	0,224	0,271	0,381	0,407	0,403
Sulawesi	HMSLPC			0,031	0,224	0,271	0,381	0,407	0,403
Nusa Tenggara	HMNTPC			0,053	0,372	0,496	0,780	0,945	1,079
Maluku-Irian	HMMIPC			0,039	0,230	0,326	0,555	0,750	1,009
INDONESIA	HMPCRI			0,031	0,195	0,236	0,332	0,354	0,350

Source: Sutanto, HBHenky – AbfallWirtschafts Indonesia SDS-Model/AWINA-Systems Dynamic SimulationModell version G,, TUBerlin 1993

SOLID WASTE STREAM, FROM GENERATION TO DISPOSAL

ThePrediction of Growth of Urban Population in Indonesia

			Y	1971	1980	1990	2000	2010	2020
	Prog-CODE			Million person	Million person	Million person	Million person	Million person	Million person
Sumatra	EWSM			3,6	5,5	7,5	9,6	11,7	13,8
Java	**EWJV**			**16,6**	**22,9**	**30,0**	**37,0**	**44,1**	**51,1**
Kalimantan	EWKL			0,9	1,4	2,1	2,7	3,4	4,0
Sulawesi	EWSL			1,0	1,7	2,2	2,8	3,4	3,9
Nusa Tenggara	EWNT			0,6	1,0	1,3	1,7	2,0	2,3
Maluku-Irian	EWMI			0,3	0,4	0,5	0,7	0,8	1,0
INDONESIA	EWRI			23,1	32,8	43,7	54,5	65,3	76,2

Source: Sutanto, HBHenky – AbfallWirtschafts Indonesia SDS-Model/AWINA-Systems Dynamic SimulationModell version G,, DissertationTUBerlin 1993

SOLID WASTE STREAM, FROM GENERATION TO DISPOSAL
ThePrediction of Growth of Household in Indonesia

			Y	1971	1980	1990	2000	2010	2020
	Prog-CODE			X1.000 unit	X1.000 unit	X1.000 unit	X1.000 unit	X1.000 unit	X1.000 unit
Sumatra	HAHASM			684	1.054	1.541	2.091	2.717	3.354
Java	**HAHAJV**			**3.344**	**4.984**	**6.969**	**9.027**	**11.010**	**12.770**
Kalimantan	HAHAKL			166	283	444	636	845	1.007
Sulawesi	HAHASL			207	306	455	637	844	987
Nusa Tenggara	HAHANT			114	176	271	393	488	587
Maluku-Irian	HAHAMI			42	68	106	154	202	250
INDONESIA	HAHARI			4.558	6.872	9.786	12.938	16.105	18.954

Source: Sutanto, HBHenky – AbfallWirtschafts Indonesia SDS-Model/AWINA-Systems Dynamic SimulationModell version G,, DissertationTUBerlin 1993

SOLID WASTE STREAM, FROM GENERATION TO DISPOSAL

ThePrediction of Solid Waste Production Growth in Indonesia

			Y	1971	1980	1990	2000	2010	2020
	Prog-CODE			Million Ton/year	Million Ton/year	Million Ton/year	Million Ton/year	Million Ton/year	Million Ton/year
Sumatra	HMULLSM			0,10	1,05	1,43	2,17	2,44	2,51
Java	**HMULLJV**			**0,48**	**4,57**	**7,20**	**12,53**	**15,92**	**18,29**
Kalimantan	HMULLKL			0,03	0,32	0,57	1,04	1,38	1,62
Sulawesi	HMULLSL			0,03	0,37	0,60	1,07	1,37	1,59
Nusa Tenggara	HMULLNT			0,03	0,35	0,65	1,29	1,89	2,53
Maluku-Irian	HMULLMI			0,01	0,09	0,18	0,39	0,63	1,01
INDONESIA	HMULLRI (tpy)			0,70	1,80	3,80	7,00	10,80	14,80
INDONESIA	HMULLRI (cumpy)			1,70	5,30	19,00	36,40	56,30	76,70

Source: Sutanto, HBHenky – AbfallWirtschafts Indonesia SDS-Model/AWINA-Systems Dynamic SimulationModell version G,, DissertationTUBerlin 1993

Sources of Solid Wastes & Volume (m3/day) in Bandung – West Java Province

Nr.	Source	Volume(m3)	
1	**Housing Area**	**3.978**	
2	Market	613	
3	Street	449	
4	Industry	787	
5	Commercial	312	
6	Public Facility	561	

Source: KLH-Asdep Urusan Limbah Domestik, maret 2005

Composition of Solid Wastes & Volume (m3/day) in Magetan – East Java Province

Nr.	Art of Waste	Volume(m3)	(%)
1	**Organic Materials**	**93,18**	
2	Paper	3,87	
3	Plastics	3,97	
4	Metal	1,54	
5	Glass/Porcelain	0,52	
6	Natural Rubber	0,63	
7	Textile	1,72	
8	Others	1,84	

Source: KLH-Asdep Urusan Limbah Domestik, maret 2005

POSSIBLE SOLUTIONS

- CH4-Recovery from existing SW-Final Disposal.Open Dumping

- Landfill-Mining after CH4-Recovery activity

- Use of LM-Compost for erosion control activity
- Plantation of Jatropha-Curcas in terraced area
- Use the Jatropha-Tree as a hedge in the rural area

- Jatropha-Seed processing for Non-Edible BioDiesel Oil (Liquid)

- Conversion of SWFD, from existing FD.Open Dumping to FD.RSL I
- Development of 2nd. FD.RSL in New Locations

- Integrate two FD Locations in the 1C-2FD.RSL spatial concept.

- CH4 Gas Recovery in every FD.REUSABLE SANITARY LANDFILL (Gas)

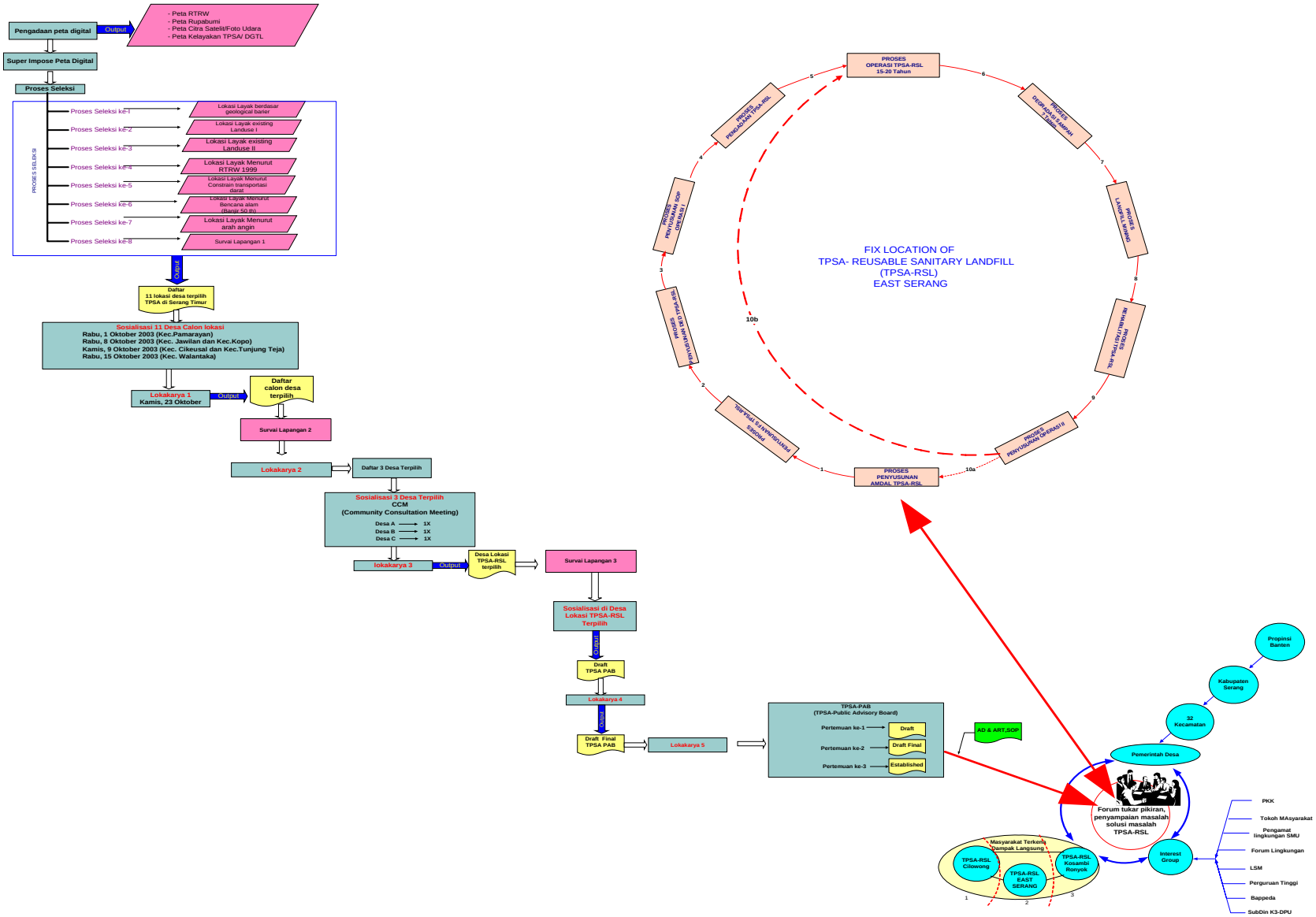
- Landfill-Mining in FD.RSL after CH4-Recovery activity, preparation works before the next filling cycle (Reuse of FD.Reusable Sanitary Landfill)

SW-Final Disposal, a spatial problems

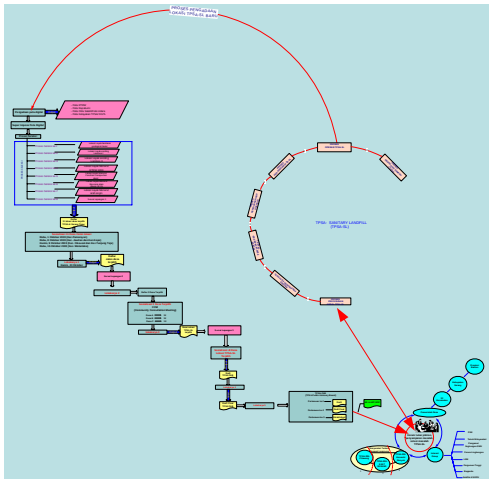
		SCENARIO I	SCENARIO II	SCENARIO III
Heavy Equipment		Cat-D8	Cat-D9 / Cat-LC 816C	Cat-LC 826B
Standard Space/ FD-RSL Module BPPT	Ha.	23,61	18,85	13,51
INDONESIA 2000	Ha	5.360	4.280	3.070
INDONESIA 2010	Ha	6.470	5.170	3.705
INDONESIA 2020	Ha	7.560	6.032	4.325

Sumber: Sutanto, HB Henky, 1C2FD-SL+. An alternative concept toward sustainable Healthy Tropical City of Indonesia. Jakarta, 8 Juni 2000

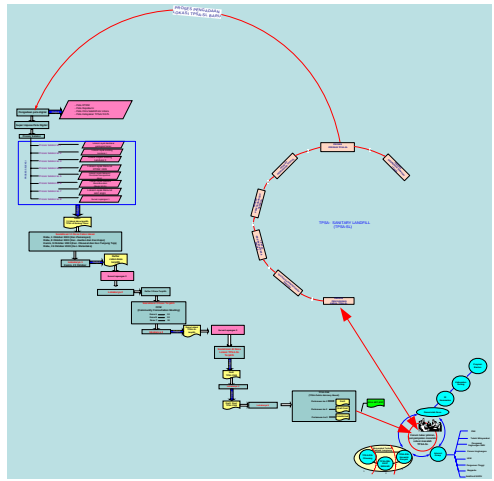
METHODOLOGY OF SITE_SELECTION FOR SWFD-REUSABLE SANITARY LAND
DEVELOPED DURING THE WORLD-BANK PROJECT
WJEMP-SERANG 3-1, Kabupaten Serang, Provinsi Banten 2003
“ ONE TIME SITE SELECTION, USE IT FOREVER”



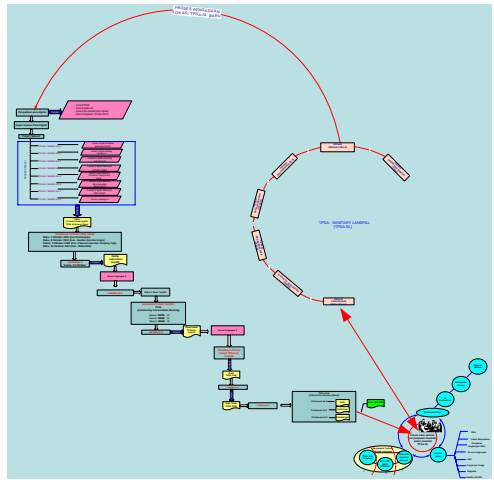
FD.SL ?...or... FD.RSL ?



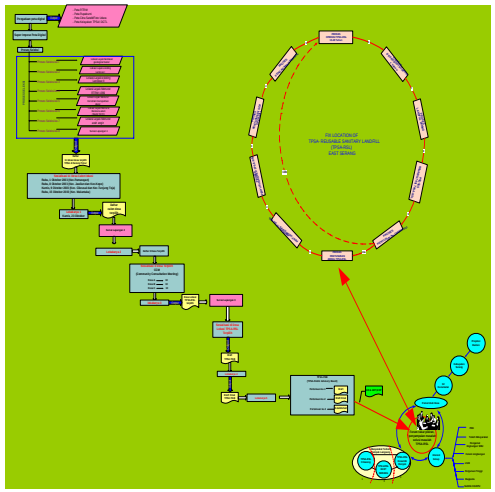
SL 1 - 2005 >> 2025



SL 2 - 2025 >> 2045



SL 3 - 2045 >> 2065



TPSA.RSL 1 - 2005 >> 20xx

REUSABLE SANITARY LANDFILL, LANDFILL MINING COMPOST, SOIL CONSERVATION AND JATROPHA CURCAS L. PLANTATION

An

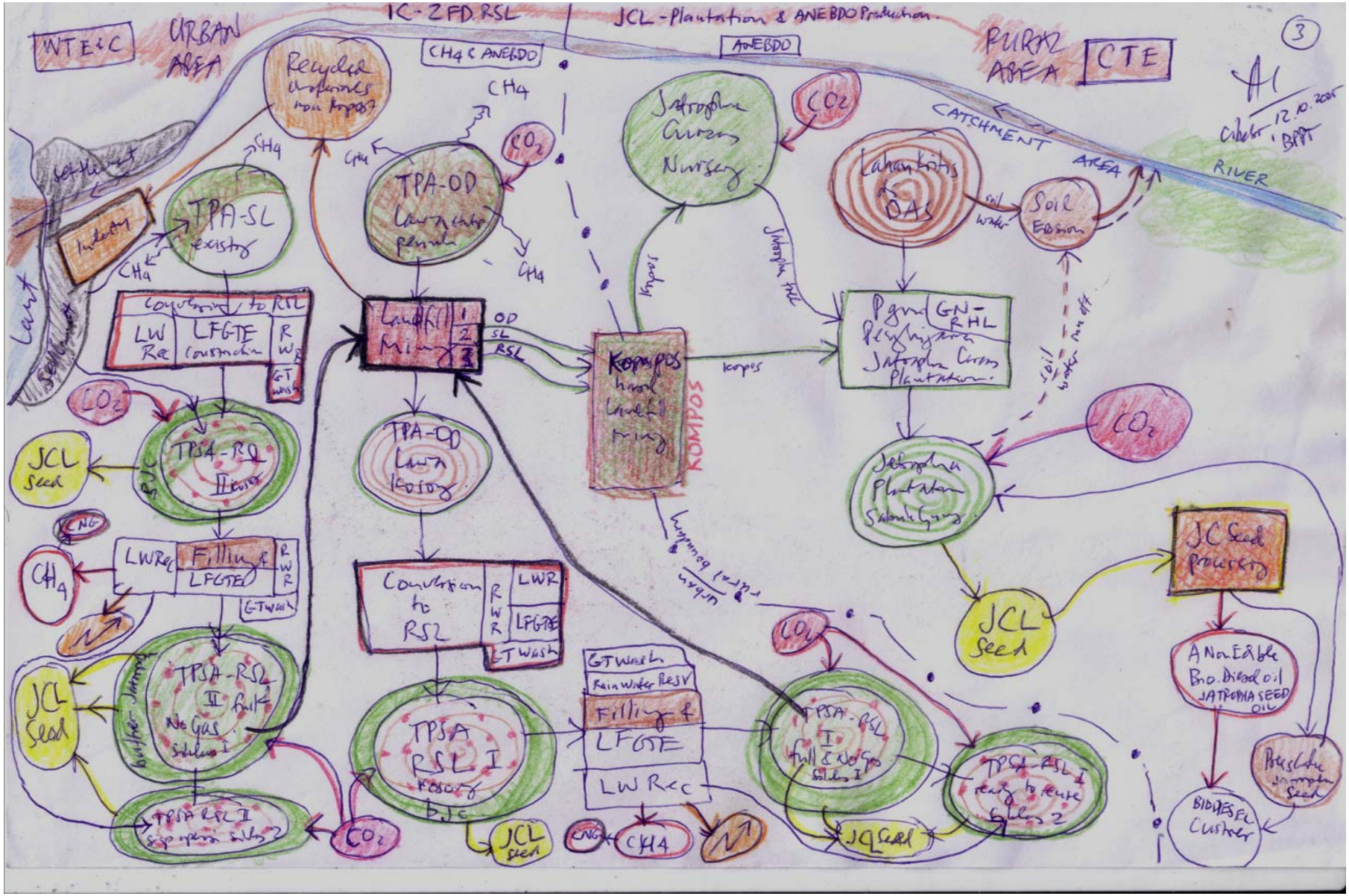
Automotive Non Edible Bio-Diesel Oil

(ANE-BDO)

& CH4-Landfillgas

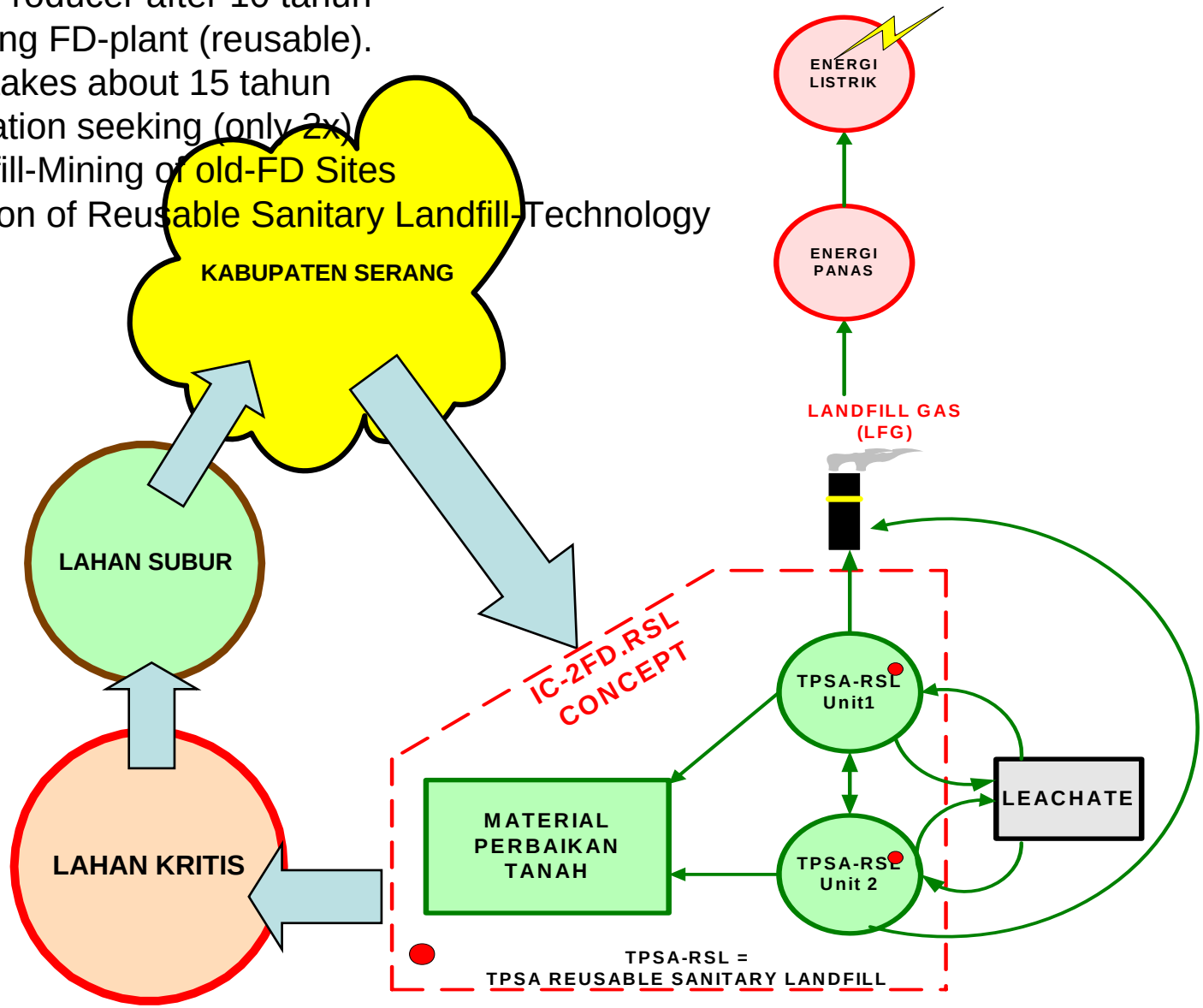
sustainable producer

Integrated System of
Solid Waste Management to Dual Renewable Energy Generation
& Catchment Area Land Conservation & Poverty Alleviation

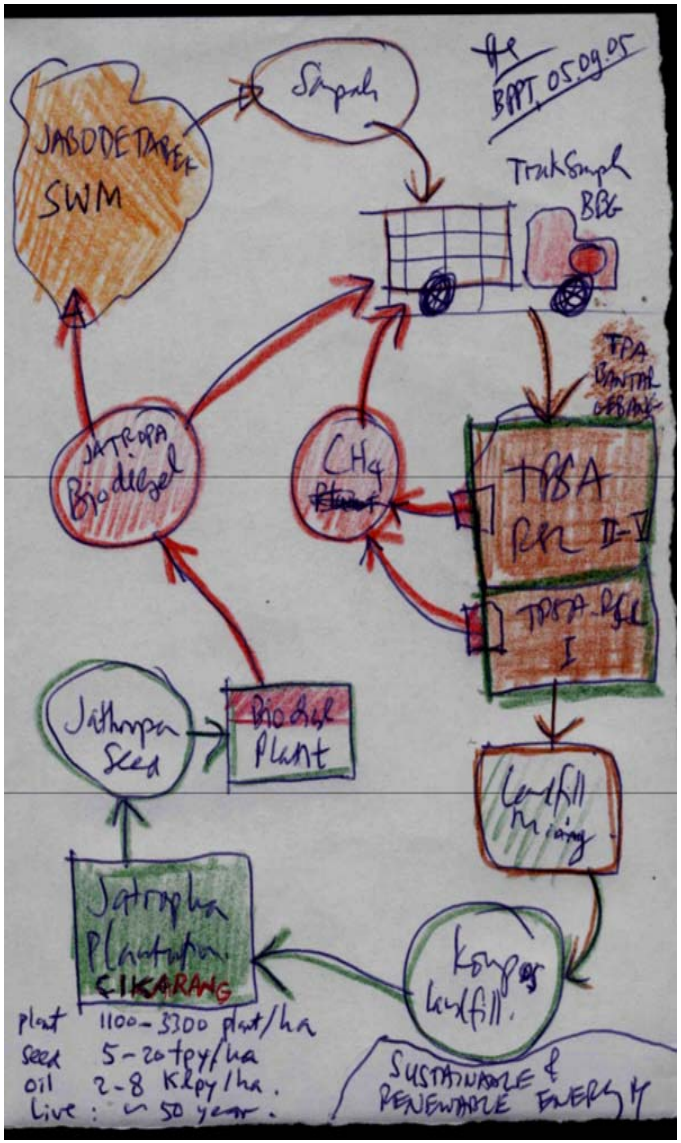


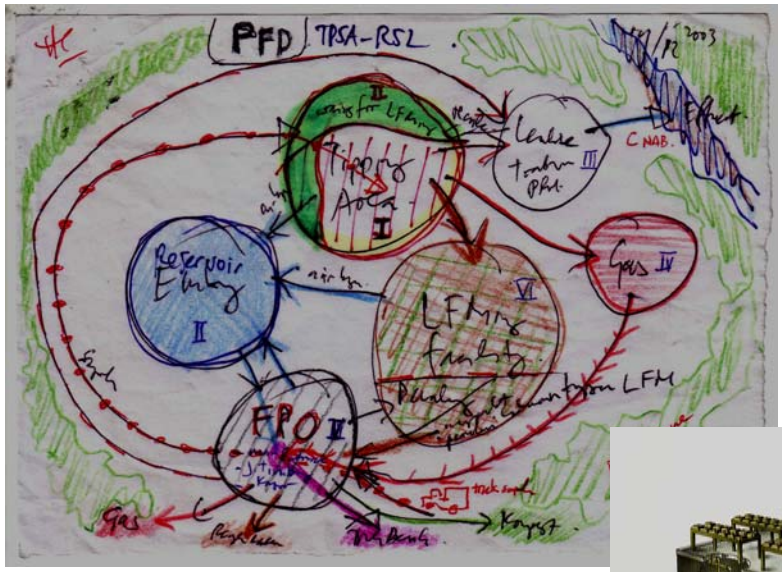
REUSABLE SANITARY LANDFILL TECHNOLOGY

Investment Rp. 3 Milyard/Hektar
CH4-Power Plant, Recycling Plant
Anaerobic Compost Producer after 10 tahun
Fix location, everlasting FD-plant (reusable).
1 Operational-Cycle takes about 15 tahun
No need new FD location seeking (only 2x)
First Start from Landfill-Mining of old-FD Sites
Followed by application of Reusable Sanitary Landfill-Technology



Integrated System of Solid Waste Management to Dual Renewable Energy Generation, Catchment Area Land Conservation & Poverty Alleviation





Renewable
CH4-LFGas

Non Edible Jatropha
BioDiesel Oil

PILOT PLANT OF
REUSABLE SANITARY LANDFILL
TPSA-RSL Bojong Menteng –
Kec.Tunjung Teja-Kabupaten Serang
Provinsi Banten
Areal : 119,5 Hektar
Carrying Capacity for 1st.Cycle: 100 jt.M3
LFGTE max: 25 MWel.
Treatment Capacity max 3.000 Ton/day
Investment : USD 45 juta
(Exchange Rate 1USD=Rp 9.000,00)
REUSABLE – n-Cycles