



# TEMESI, Gianyar Waste Recovery Facility

- A. Project Background
- B. Waste Separation
- C. Composting
- D. Clean Development Mechanism
- E. Financials
- F. Six Good Reasons for Waste Recovery

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# A. Project Background

# The Objective of TEMESI

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The objective of the TEMESI project since its conception in 2004 has been:

1. Construction of a low cost, low tech and low risk waste management facility
2. Creation of a model facility that can be replicated in Indonesia and beyond
3. Registration under the Kyoto Protocol to receive carbon credits for the reduction of greenhouse gasses

# TEMESI Background

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- ◎ TEMESI is one of the very few successful waste management projects in Indonesia
- ◎ TEMESI recycles 90 % of the waste, which extends the life span of the landfills by a factor 10
- ◎ TEMESI is a waste management facility with a capacity of 60 - 100 tons waste/day
- ◎ As 84% of the waste is organic material, the facility focuses on composting

# The 4760 m<sup>2</sup> Facility



# TEMESI Sustainability

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- ◎ While other waste facility concepts rely on government funding, TEMESI was planned to be a self-sustainable waste management facility that relieves the government financially
- ◎ TEMESI is self sustainable, if the compost is sold at 410,000 Rp/ton

# Project Recognitions

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- 2006: President of Indonesia  
ADIPURA Award
- 2006: IDRC (Canada)  
Asian Center of Excellence
- 2008 United Nation Environment Programme  
No. 1 SHOWCASE Project in the Asia-Pacific region
- 2009: SANDEC of Swiss Federal Inst. of Technology  
“a good example of a highly integrated approach”
- 2010: Japan's Ministry of Environment  
Benchmark project for Indonesia
- 2010: Clean Development Mechanisms (Kyoto)  
Co-benefit Project (social, economical , environmental)

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# B. Waste Separation

# Outsourced Separation

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The waste separation was outsourced to scavengers to reduce:

- ◎ Inefficiencies
- ◎ Fixed operating costs
- ◎ Scope of operation

The outsourcers sell the recyclables to nearby agents and the organics to the Temesi Facility for Rp 40,000/ton

# Separation Area

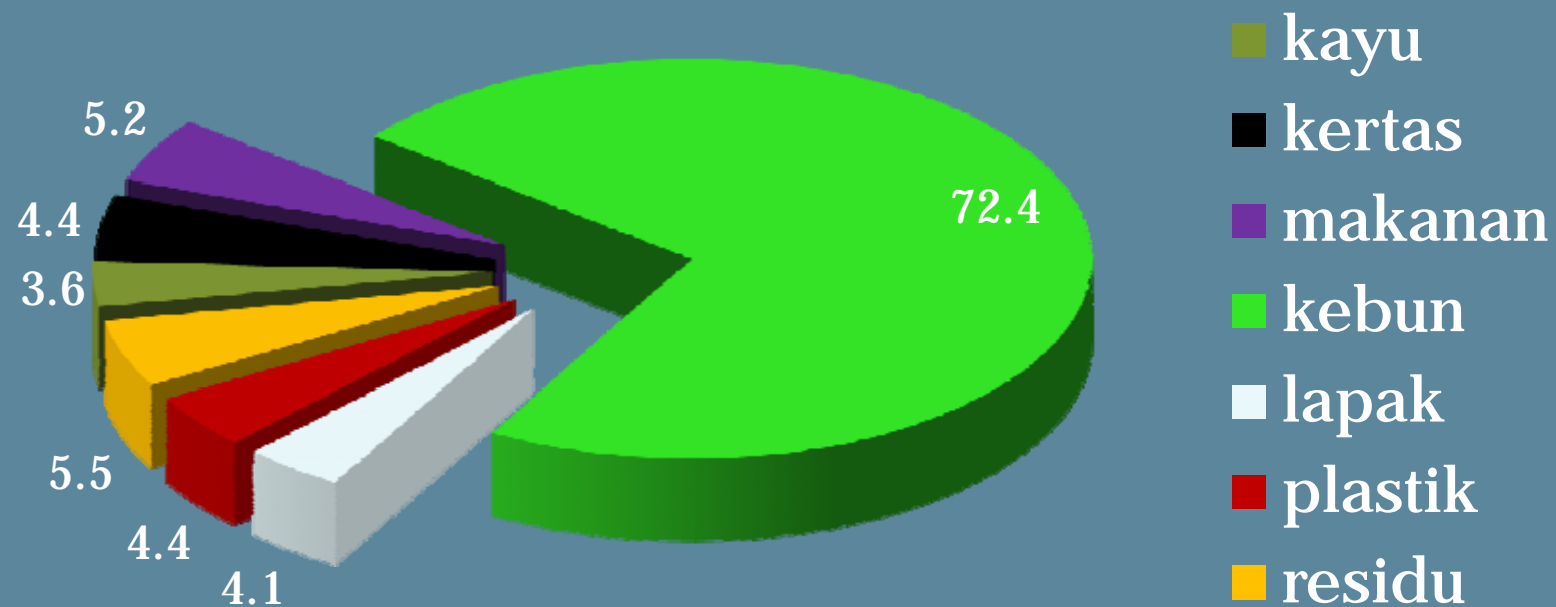


# TEMESI Incoming Waste

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- ◎ TEMESI's focus lies on the organic waste (84%), which is processed into high quality compost
- ◎ Recyclables (6%) are sold directly by the waste separators to agents at the facility
- ◎ Residues (10%) are deposited at the old landfill next to the facility, which will last 10 times longer due to the reduced volume

# TEMESI incoming waste fraction

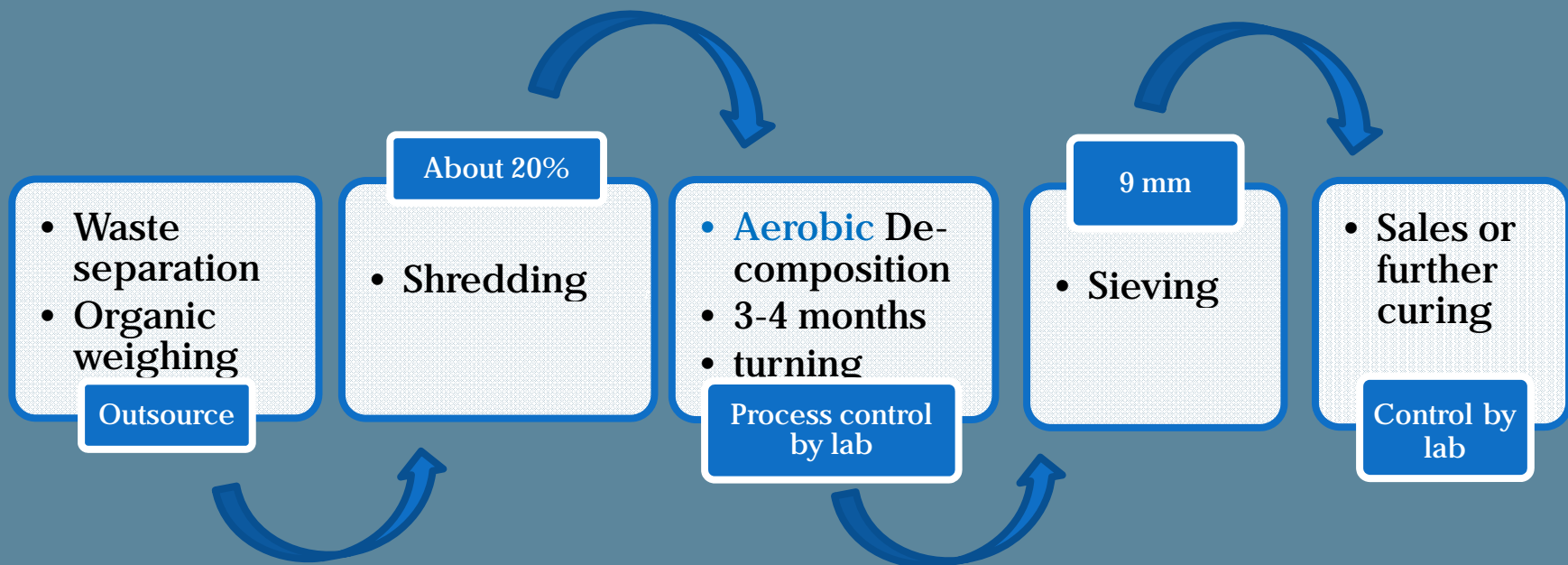


Data from January 2009 to July 2010

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# C. Compost

# Production Process



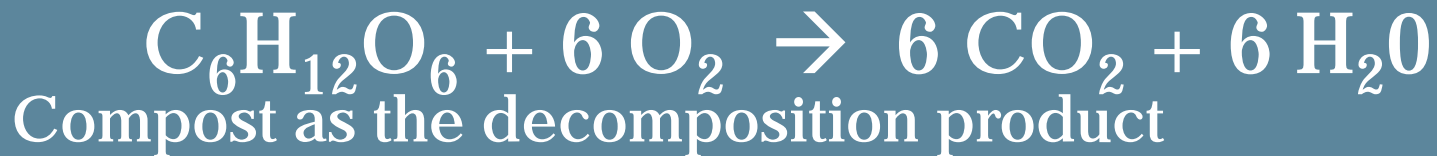
# Forced Aeration Process



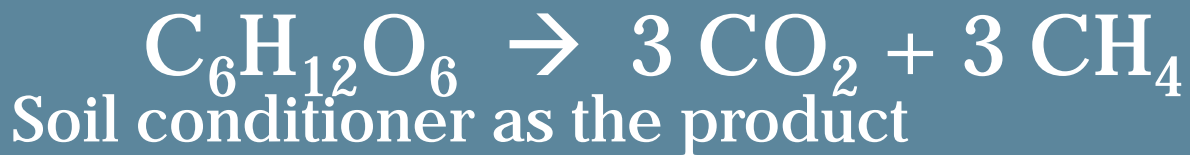
# Organic decomposition

◉ Organic decomposition of the microorganism can occur in two ways:

◉ Aerobic



◉ Anaerobic



Methane is a 21 stronger green house gas than  $\text{CO}_2$

# Compost Sieving (9 mm)



# Quality System

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- ◉ Since August 2009, TEMESI operates under an ISO 9000 type Quality System that assures product quality, work discipline and customer satisfaction
- ◉ The Quality System has 3 levels:
  - Quality Manual
  - Operating Procedure
  - Work Instruction

# Compost Analysis

- Electric Conductivity (= Salt Content)
- pH
- Content of:
  - Water
  - Organic Carbon
  - Ammonium
  - Nitrite
  - Nitrate
  - Phosphate
- For NPK, organic pollutants, heavy metal content, samples are sent to an accredited compost laboratory in Switzerland for further analysis



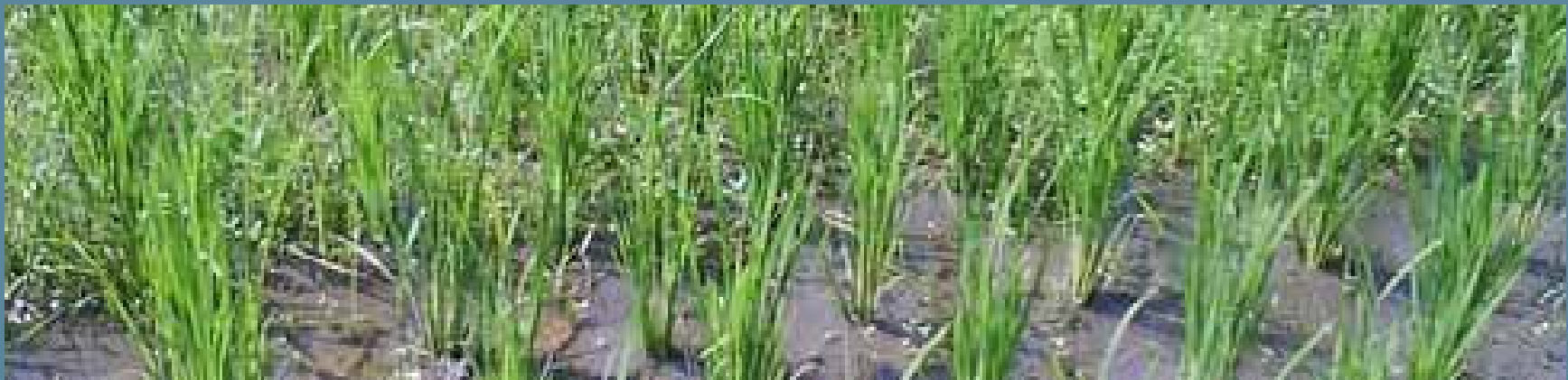
# TEMESI Compost

## Aerobic decomposition

- Compost as product
- Perfectly sanitized (no plant seeds and pathogen)
- Free of any phytotoxins
- No methane produced

## Anaerobic decomposition

- Soil conditioner as product
- Contains pathogens, plant and weed seeds
- Phytotoxins as byproduct
- Produces methane



# Agricultural Threats

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Indonesia faces a potential food crisis.

Two factors contribute:

1. Depleted and acidified soil due to excessive use of fertilizers and pesticides (the pesticide use increased 30-fold from 1998 to 2008)
2. The Brown Planthopper (wereng coklat) spreads Stunt Viruses due to excessive pesticide use. Both feed on rice (Brown planthoppers became pesticide resistant while their natural predators were killed with pesticides)

# Brown Planthoppers



Planthoppers  
(4 mm)

- ◎ Brown planthoppers and the stunt viruses they carry destroy the rice crops
- ◎ In China and Thailand millions of hectares were affected
- ◎ The pest is also spreading in Indonesia's 10 million hectares of rice paddies

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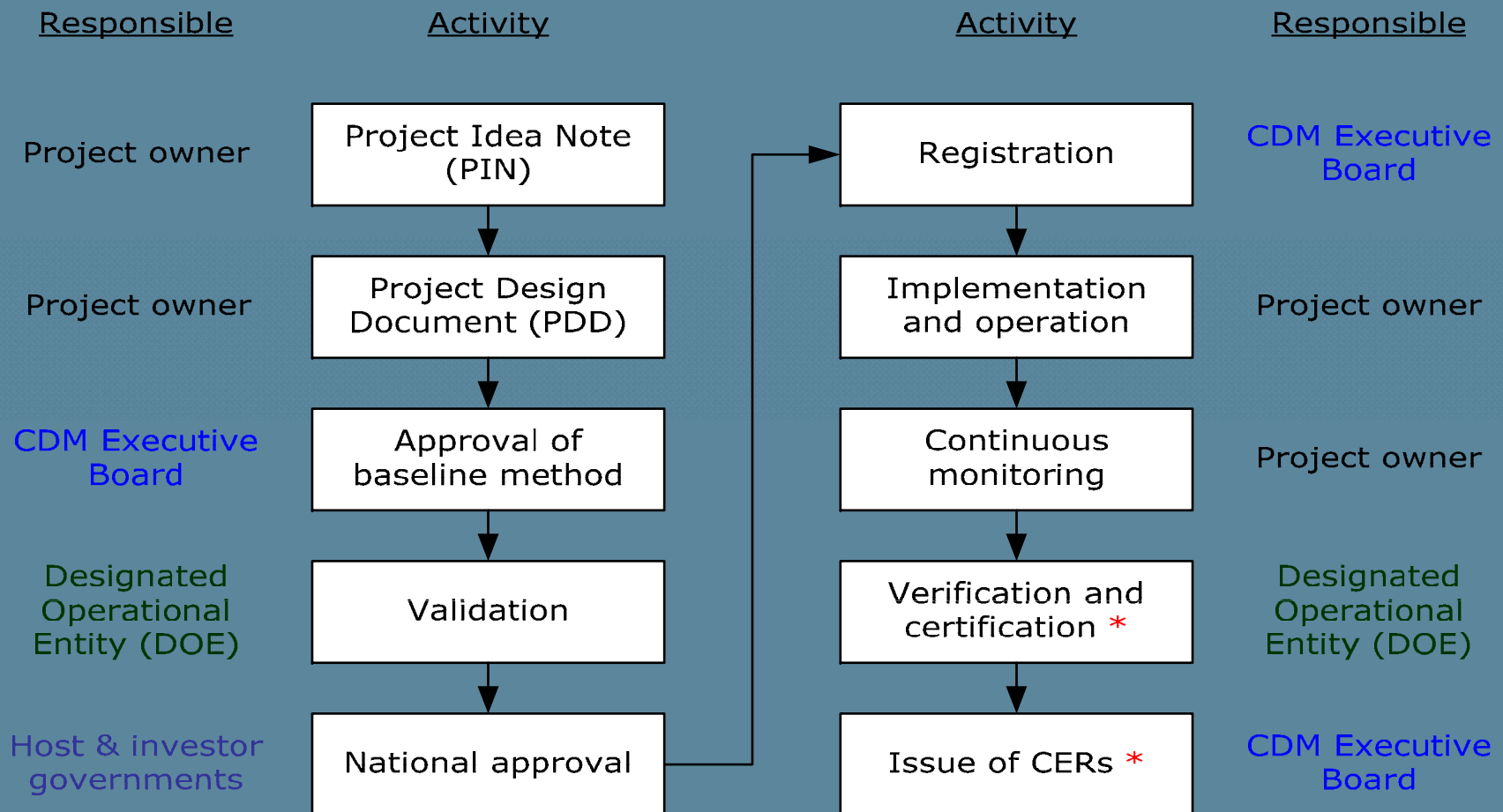
# D. Clean Development Mechanisms (CDM)

# TEMESI and Climate Change

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- ◎ The project reduces greenhouse gasses and is registered under Kyoto Protocol's Clean Development Mechanisms (CDM)
- ◎ During the 10-year CDM Crediting Period, the project reduces 150,000 tons of the greenhouse gas CO<sub>2</sub>
- ◎ 77,000 tons CO<sub>2</sub> of these greenhouse gas reductions are eligible for Carbon Credits, which will amount to USD 1.5 million (the plant investment was USD 0.6 million)

# The CDM Application Process



\* periodically throughout CDM lifetime



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# E. Financials

# Expenses and Income

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- ◎ We currently process about 1,200 tons/month organics, which yield 300 tons of compost
- ◎ The monthly operational cost are about 123,000,000 IDR, or 410,000 IDR/ton compost.
- ◎ A minimum selling price of 410,000 IDR/ton compost is required to break even
- ◎ Temesi is a non-profit organization, thus our financial goal is only to break even

# Monthly Income & Expenses

<b>1. Monthly Processing Volume</b>	<b>100 tons Waste/Day</b>		
Waste processed, tons	tons	3,000	per month
Organics separated (85 % of total waste)	tons	2,400	per month
Compost produced (25 % yield)	tons	600	per month
<b>2. Monthly Expenses</b>			
Organic purchased	tons	2,400	per month
Price of outsourcers per ton	Rupiah	40,000	
Cost of organics	Rupiah	96,000,000	39.0%
Personnel cost	Rupiah	93,000,000	37.8%
Diesel fuel cost	Rupiah	20,000,000	8.1%
Electricity	Rupiah	8,000,000	3.3%
Material & Service	Rupiah	17,000,000	6.9%
Sales & Administration	Rupiah	12,000,000	4.9%
<b>Total Expenses</b>	<b>Rupiah</b>	<b>246,000,000</b>	<b>100.0%</b>
<b>3. Monthly Income</b>			
Sales of compost	tons	600	
Minimum sales price per ton	Rupiah	410,000	
<b>Total Income</b>	<b>Rupiah</b>	<b>246,000,000</b>	

# What Strategy to Pursue

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We are currently pursuing three viable strategies to sell our final product:

- ◎ Rice Paddies

- ◎ Other Agricultural Sectors

- ◎ Landscaping

The strategy to sell a lot of compost needs to be planned very early to avoid subsidies

# Building Time Schedule

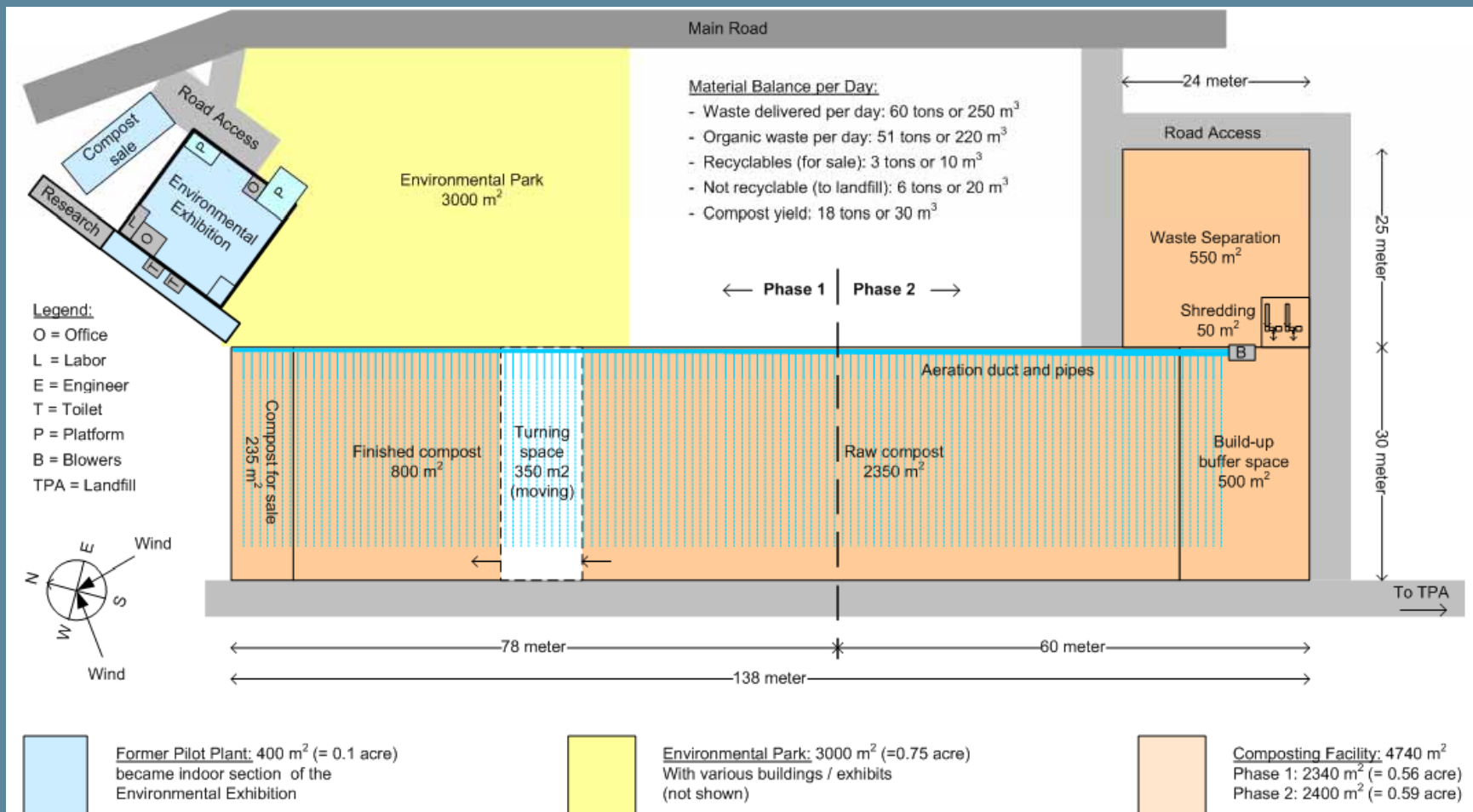
Year	2007				2008				2009				2010				Approx. Investment	
	Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3		4
Project Phases and Investments:																	Mio.IDR	
Phase 1 (= 2400 m <sup>2</sup> )																		1,800
Phase 2 (+ 2360 = 4760 m <sup>2</sup> )																		2,000
Wheel loader																		1,200
Total Facility																		5,000

- With start-up subsidies for 50 tons/day. Increase by 1,000,000,000 for 100 tons/day.
- Without concrete 4,760 m<sup>2</sup> working surface with air ducts for aeration (cost about 1,200 mio.IDR)

# Investments for 100 Tons/Day

Item	Units	Investment	Invested
<b><u>1. Facility Investment</u></b>			
Building	4,760 m2	1,611,967,000	2007/2009
Shredders	2	290,000,000	2008/2010
Aeration Ducts and Blowers	2	463,815,000	2008/2011
Compost Sieves	2	60,500,000	2005/2008
Weight Bridges (balances)	3	15,700,000	2008
Wheel Loader	1	1,200,000,000	2011
Trucks (second hand)	2	144,826,000	2005
Office	1	41,190,000	2008
Laboratory	1	71,111,600	2008
Subtotal Facility		3,899,109,600	
<b><u>2. Subsidies and Reserve</u></b>			
Start-up subsidies (1 year)		1,800,000,000	
Contingency & various		300,890,400	
Subtotal Subsidies & Reserve		2,100,890,400	
<b><u>3. Total Investment</u></b>			
<b>Gran Total</b>		<b>6,000,000,000</b>	
<b><u>Optional:</u></b>			
Concrete slab with aeratiopn ducts	4760 m2	1,200,000,000	

# Layout of the TEMESI Facility



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# F. Six Good Reasons for Waste Recovery

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1. Low Cost Option to Extend the Life Span of Landfills
  2. Economical - No Tipping Fee Required
  3. Low Cost, Low Tech, Low Risk
  4. No Public Opposition
  5. Restores a Healthy Ecosystem
  6. Environmentally Friendly

# 1. Low Cost Option to Extend the Life Span of Landfills

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- ◎ The investment for matching Waste Recovery Facilities is about 20 % of the investment for a Sanitary Landfill
  - ◎ Because Waste Recovery Facilities reduce waste to about 10 %, Sanitary Landfills will last about 10 times longer
- = A small investment with huge economy

## 2. Economical - No Tipping Fee

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- ◎ Self-sustainable without tipping fees, if the compost is sold for 400 to 500 Rp / kg
- ◎ A decentralization of Waste Recovery Facilities is recommended to reduce logistic costs
- ◎ Decentralized Waste Recovery Facilities reduce waste by 90 %. The 10 % residue can then be sent to more centralized Sanitary Landfills with low logistic costs

### 3. Low Cost, Low Tech, Low Risk

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- ◎ Far lower investment per ton processed than incineration or gasification
- ◎ All equipment is made Indonesian:
  - No difficult imports
  - No maintenance problems
  - No spare part problems
  - Easy to modify

## 4. No Public Opposition

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- ◎ Facilities can be built on restored existing unmanaged landfills, eliminating problematic emissions
- ◎ Therefore population will welcome rather than oppose recycling facilities
- ◎ Aerobic composting generates no stench like anaerobic landfills

# The population welcomed the project on the old landfill

Before



The old landfill with problematic emissions was restored.



The facility and a environment park was built on the old landfill

After

## 5. Restores a Healthy Ecosystem

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- ◉ Compost brings back beneficial microorganisms
- ◉ Compost supports good rice yields
- ◉ Compost is free of pathogens and weeds
- ◉ Compost helps to control pests

Planthoppers (wereng coklat) and other pests developed, because its predators were killed by the 30-fold increase in imports of pesticides from 1998 to 2008

## 6. Environmentally Friendly

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- ◎ Very little emissions
- ◎ Recycling of non-renewable resources
- ◎ Organic waste decomposes into compost, an organic fertilizer

### A final word of caution:

If “Waste to Energy” is promised, ask for the energy balance and net income: They are often negative!