Economic Analysis of Composting, Through Surabaya’s case: Application in Bangkok

Bangkok Palace Hotel
6 November 2008
Toshizo Maeda
Researcher, IGES Kitakyushu Office

Contents:
1. Introduction of IGES
2. Introduction of Kitakyushu City
3. Introduction of Kitakyushu Initiative (KI) Programme
4. Surabaya’s community-based waste management
5. Application in Bangkok

1. Introduction of IGES

- Institute for Global Environmental Strategies
- Since 1998 (~ 10 year anniversary)
- Offices: HQ (Kanagawa), Kansai, Kitakyushu, Tokyo, Bangkok, Beijing
- Staff: Total 140 (researchers and supporting staff: 80)
- Objective: International environmental policy development
- Geographical area: Asia and the Pacific

Economic analyses of composting, through Surabaya’s case: Application in Bangkok

2. Introduction of Kitakyushu City

- Population: 1 million
- Industrial city: Heavy pollution in the 60s
- Recovery in 70s-90s: Cleaner production, recycling park
- Cost for recovery: USD8 billion (Bht280 billion) (1972-1991)
- International environmental cooperation:
  - KITA (Kitakyushu Internatl’l Techno-cooperative Association)
  - More than 5,000 trainees since 1980
- Environmental Model City in Japan
  - 150% of city’s GHG emission reduction in Asian cities
  - No. 1 in Environmental Capital Contest in Japan (2007, 2008)

3. Introduction of Kitakyushu Initiative (KI) Programme

- Adopted at the Ministerial Conference on Environment and Development in Asia and the Pacific (MCED) in 2000
- Under UNESCAP
- Inter-city environmental cooperation network
- Objective: urban environmental improvement, through capacity building of local governments
  → Collection and replication of good practices
- Scope: Urban environment
- Area: Asia-Pacific
- Member cities: Over 60 cities from 18 countries

3. Introduction of Kitakyushu Initiative Programme-2

Targeted themes:
- Community-based waste management (composting)
- Improvement of final disposal site
  - Banning open dumping (Philippines, Indonesia)
  - Demand for low-cost methods
- Decentralised wastewater treatment
  - Sewerage system requires huge capital cost
  - Many good practices (BORDA-Indonesia, USAID-Philippines, Eco-San, Jokaso, bio-fertiliser plant in Nonthaburi)
- Linking CSR activities with environmental management
  - Easy to replicate
  - Public parks, river bank protection, waste reduction campaign, biodiesel from used cooking oil, etc.
Economic analyses of composting, through Surabaya’s case: Application in Bangkok

1. Introduction

2. Achievements

3. Main stakeholders

4. Background

5. Waste management system in Surabaya

6. Composting methods

7. Economic analysis

8. Social and environmental impacts

9. Remaining challenges

10. Replication in other cities

11. National policy

Basic info. of Surabaya

Analysis

How to expand more?

Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(2) Achievements-2

Location of composting centres

Surabaya’s Introduction

Main cities

Kitakyushu

Oct-04

Training

and

Kitakyushu Initiative for a Clean Environment

IGES | http://www.iges.or.jp

Surabaya’s

Introduction

Main

cities

Jombang

Jombang

2007

Fig. 12. Economic impacts of 500kg/day waste reduction.

Fig. 11. Amount of waste reduced by each measure.

Fig. 12. Surabaya’s community-based waste management

(1) Introduction of Surabaya City

(2) Achievements

(3) Main stakeholders

(4) Background

(5) Waste management system in Surabaya

(6) Composting methods

(7) Economic analysis

(8) Social and environmental impacts

(9) Remaining challenges

(10) Replication in other cities

(11) National policy

Population: 3 million

2nd largest in Indonesian Centre of East Indonesia

Leading environmental city

Replication in 39 cities

Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(2) Achievements-3

10% waste reduction in 3 years

(1,500/day → 1,300/day)

200/day waste reduction

= US$15,000/year cost saving

(B=12 million/year)

Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(2) Achievements-4

1 ton of composting reduces waste by 2.5 tons.

Recycling of other dry waste

Composting at each household:

17,000 units sold by PUSDAKOTA

20,000 units copied by communities (assumption)

600 units of a communal type distributed by Cleansing Department,

which caters for about 5 households each (1,000 households)

40,000 households × 1kg/day/household → 40/day

Composting at 13 composting centres:

Cleansing Department: 12 composting centres, 390/d (≈1ton/24h)

PUSDAKOTA: 1 composting centre, 140/d

400/d reduction at composting centres, → 800/d waste reduction

Remaining 120/d comes from Reuse and Recycling.
Economic analysis of composting, through Surabaya’s case: Application in Bangkok

(3) Main stakeholders (Green & Clean Campaign)
- Award-winning community
- Green street
- Products made from waste
- Entrance to a community

(4) Background
- Final disposal site was closed in 2001 due to opposition by residents. Waste filled the streets and drains.
- (uncompleted) Benowo Landfill started operation.
- Baseline survey on SWM by Kitakyushu in 2002.
- Cooperation between KITA and PUSDADOTA in 2004.
- Development of composting methods.

(5) Waste management system in Surabaya-1
- Only 1 landfill in a 3 million pop city
- Area: 27ha (already 17ha is filled)
- Started operation in 2003 (7 year old)
- Life span: 5 years more??
- Construction cost: USD8.5 million (IDR120 million)

- Cleansing & Landscaping Department is in charge of waste management.
- More than 1,000 staff. Waste management and park management.
- Total amount of waste: 2,300/day??

Economic analysis of composting, through Surabaya’s case: Application in Bangkok

(3) Main stakeholders (UI Peduli)
- Number of Environmental Cadres under UI Peduli
- Number of KPs participated in Green & Clean Campaign

(5) Waste management system in Surabaya-2
- Cost reduction by waste reduction.
- Only 2% for waste reduction campaign
- Organic waste is more than 50%
Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(6) Composting methods-1

(1) Mixing seed compost with organic waste and shredding
(2) Production of seed compost
(3) Fermenting for 1-2 weeks
(4) Collection of Native Microorganisms (NM)

- Seeding local fermented foods
- Fixing water for 3 days
- Seeding vegetables and fruits seeds in salted water for 3 days

Features:
- Fast production cycle (1-2 weeks) and less space requirement
- No foul smell (no rotting)
- Active microorganisms in compost makes no rich smell
- Low-cost, easy-hort and labour intensive
- Using only local materials

(1a) Compost is ready for use (mixing compost with soil for 2 weeks before planting)

Source: IGES | http://www.iges.or.jp

(6) Composting methods-2

Organic waste from households
Organic waste from fresh produce markets

Means of composting
- Home compost baskets
- (17,000 baskets distributed)
- Community composting center (PUDUSMEGA’s case)

Composting methods
- Takakura Home Method (THM)
- Takakura Basin Method (THB)
- New Windrow Method

Figure 31 Types of composting methods in Surabaya

Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(6) Composting methods-3

Northhuburi (Thailand)-1

Pelabuhan Chon- Northhuburi Composting Plant

- Compost production: 14.3 t/month
- Income: BTH20,000/month (USD260/month)
- Selling price: BTH20,000/ton (USD260/t)

Construction cost: BTH120,000 (USD1,500)
6m³/day of waste
30 days for processing

(6) Composting methods-4

Nonthaburi (Thailand)-2

- Windrow composting
- 3 months for processing

Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(6) Composting methods-5

Bago (Philippines)

- Changing to Takakura Method (2 weeks for fermenting)
- Vermi composting
- 3 months for processing

Economic analysis-1

- Waste management cost in Surabaya (collection and landfill mgmt)
  USD2.3 million (BTH80 million, 2007)
  Divided by 1,100x/d @ 365 days
  USD2.3 million (BTH80 million)

- Landfill construction cost
  USD0.5 million (BTH20 million)
  Divided by 1,100x/d @ 365 days @20 years
  USD2.3 million (BTH80 million)

- Waste management cost:
  USD0.2/t (BTH22/t)
(7) Economic analysis-1

In Bangkok,
- Waste collection cost: Bht1.6 billion (USD46 million)
- Total waste: 9,000t/day
- Unit waste collection cost: Bht1.6 billion / (9,000t/d x 365days) = Bht500/t (USD14)

(7) Economic analysis-4

Economic analysis of PUSDAKOTA’s composting centre: (1.4t/day)
- Without land: USD20,000 (100m²)
- With land: USD70,000 (100m²)

(7) Economic analysis-2

PUSDAKOTA’s composting centre: 1.4t/day collection
- 40t/month collection
- 8.5t/month of compost production
- Selling at USD150/t (Bht5,100/t)
- Income USD510,000 (Bht19,300,000)

(7) Economic analysis-5

Cleansing Dept’s composting centre: 5t/day of waste input
- 150t/month of waste
- Without land: USD55,000 (100m²)
- With land: USD255,000 (100m²)

(7) Economic analysis-3

Converting to 30t/day operation:
- 30t/month of compost production
- Selling at USD300/t (Bht10,500/t)
- Income USD9,000,000 (Bht315,000,000)

(7) Economic analysis-6

Construction cost of Cleansing Dept’s composting centre (30t/day of waste input): Without land: USD3,000,000 (Bht10.5 million)
- * Land is free (300m²)
Economic analyses of composting, through Surabaya’s case: Application in Bangkok

(7) Economic analysis-7

- Cost of waste reduction campaign (3 years): USD680,000 (Bht2 million)
- Compost baskets: USD180,000 (Bht5.9 million)
- Composting centres: USD500,000 (Bht17.8 million)

Returning period of capital cost: 1.1 years

(8) Social and environmental impacts-1

Better household environment. Greener and cleaner streets. Environmental education through composting. Composting and handcraft production from waste by students →

(7) Economic analysis-8

- Household economic analysis: 1kg of organic waste/day/household → 30kg/month
- Purchasing price: USD0.07/kg (Bht2.5)
- Income: USD42/month (Bht1,300)
- Not by economic incentive:

Because of household sanitary improvement

(8) Social and environmental impacts-2

Employment
Production of herbs and vegetables by compost

Waste segregation and promotion of recycling
Selling compost

(7) Economic analysis-9

- Distribution of household compost baskets:
  - 15,000 units distributed by Cleansing Dept in 3 years
  - Distribution cost: USD110 (Bht380)/unit × 15,000 = USD150,000 (Bht5.2 million)
  - Campaign cost: USD30,000 × 3 years = USD90,000 (Bht3.2 million)
  - Total cost: USD240,000 (Bht8.4 million)
- Benefit:
  - Waste reduction: 40t/day
  - Cost saved from waste reduction: 40t/day × 365 days × USD6.2/t
    = USD90,000/year (Bht3.2 million)
  - USD180,000/3years (Bht6.3 million)
  - USD270,000/3years (Bht9.5 million)
  - Suppose waste reduction impact was 100t/day (2.5 times),
    → USD230,000/year (Bht8.8 million)

(9) Remaining challenges

- Cleansing Department has setup 12 composting centres.
- But, there is only one community composting centre yet. NGOs and CBOs require financial supports to setup a composting centre. Local government can support financially utilising the cost saved from waste reduction.
- Guarantee of minimum price of compost.
- Promotion of usage of organic compost by farmers.
  (Compost purchasing scheme and market expansion)
- 17,000 units of compost baskets were disseminated. 40,000 units including copied ones. 7% of total number of households (600,000). Further expansion?
- Further waste reduction is possible. 20% reduction?
5. Application in Bangkok

- Model Districts: Din Daeng, Nongjok, Don Muang??
- Model communities: Amornpun & Ruamjaipatana (Don Muang), Utairat (Phayatai), Suan Prik (Bang Phlat)??
- Other NGOs??
- “Green & Clean Campaign” by a private company??
- Composting centres?? At On Nuch? (13 centres in Surabaya)
- Household compost baskets?? (17,000 units in Surabaya)
- Waste collection: 9,000t/day → … (10% reduction in Surabaya)
- Waste collection cost: Bht1.8 billion (USD51 million) → …
- Distance to landfill: 100km (disposal cost Bht500/t)

→ Seminar in Bangkok in March 2009?

---

(10) Replication in other cities

- 39 cities in Indonesia.
- 24,000 units of household compost baskets.
- Dissemination through NGO networks.
- Limited involvement of local governments.
  - How to promote more?
  - Economic analysis. Impact assessment. More seminars?
  - Involvement of the central government.

---

(11) National policy in Indonesia

- Municipal Solid Waste Management Act (May 2008)
- National 3R Strategy (being developed by MOE)
- 3R Projects (implemented by Min. of Public Works)
- Solid Waste Management Task Force (SWM-TF, under National Development Planning Agency (BAPPENAS))

- Apr-Aug 2008: Research in Surabaya and other cities
- Aug 2008: National Workshop in Surabaya
- Nov 2008: Development of a National Programme with Min. of Public Works, BAPPENAS, MOE and JICA

---

5. Application in Bangkok

What can be done in Bangkok?

- Model Districts: Din Daeng, Nongjok, Don Muang??
- Model communities: Amornpun & Ruamjaipatana (Don Muang), Utairat (Phayatai), Suan Prik (Bang Phlat)??
- Other NGOs??
- “Green & Clean Campaign” by a private company??
- Composting centres?? At On Nuch? (13 centres in Surabaya)
- Household compost baskets?? (17,000 units in Surabaya)
- Waste collection: 9,000t/day → … (10% reduction in Surabaya)
- Waste collection cost: Bht1.8 billion (USD51 million) → …
- Distance to landfill: 100km (disposal cost Bht500/t)

→ Seminar in Bangkok in March 2009?