City-to-City Cooperation for Improvement of Municipal Solid Waste Management (MSWM) In Surabaya City: Lessons Learned and Future Potential

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Outline of the Presentation

- Issue of Municipal Solid Waste Management (MSWM) in general
- Case study on establishing a city-to-city collaboration for improving MSWM in Surabaya City, Indonesia
- Discussion on lessons learned and the applicability in the participant’s own cities/countries.
Why MSWM is a matter of developing countries?
Currently, world cities generate about 1.3 billion tonnes of solid waste per year. This volume is expected to increase to 2.2 billion tonnes by 2025. “Lower income cities in Africa and Asia will double their municipal solid waste generation within next 15-20 years”

MSW generation rates vary widely within and between countries. The generation rates depend on income levels, socio-cultural patterns and climatic factors. “the richer we get, more we discharged”
MSWM is Essential Public Service

Waste Collection Rates by Income, World Bank (2012)

Controlled disposal for selected cities by income level, UNEP/ISWA (2015)
Multiple Benefits of Proper MSWM

Waste management has strong linkages to a range of other global challenges: health, climate change, poverty reduction, food and resource security, sustainable production and consumption. The political case for action can be significantly strengthened when waste management is viewed as an entry point to address a range of sustainable development issues, many of which are difficult to tackle.

**Climate change**

Potential impact of improved waste management on reducing GHG emissions across the economy: 15-20%

- Diversion from disposal of biodegradable wastes prevents emissions of methane, a powerful greenhouse gas (GHG)
- Reduction, reuse and recycling all displace virgin materials and products, and the GHG emissions in their manufacture

**A clean city**
- Where the solid waste management service works well
- A holistic approach is taken to managing all residuals

**A successful city**
- A healthy, pleasant and safe place to live
- A good place to do business and visit as a tourist
- Fosters a sense of community and belonging

**Good governance**
- The cleanliness of the city can be used as a proxy indicator of good governance

**Enterprise and creating sustainable livelihoods**

‘Waste to wealth’ projects in Africa have demonstrated that new waste services can be used as a catalyst for sustainable livelihoods and economic development in poor neighbourhoods of some of the world’s poorest cities.

- 15-20 million people working in the small-scale entrepreneurial ‘informal’ waste sector worldwide
- Estimate of worldwide potential for new jobs in the circular economy: 9 to 25 million

Global Waste Management Outlook, UNEP/ISWA (2015)
MSWM as an “entry point” to achieve sustainable development

**A GLOBAL CALL FOR ACTION**

Addressing waste management as a priority will facilitate early progress towards more than half of the Sustainable Development Goals (SDGs) within the Post-2015 Development Agenda

<table>
<thead>
<tr>
<th>Global waste management goals</th>
<th>Related SDGs</th>
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<tbody>
<tr>
<td><strong>W.1</strong> Access for all to adequate, safe and affordable solid waste collection services</td>
<td>3 – Health for all</td>
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<tr>
<td><strong>W.2</strong> Stop uncontrolled dumping, open burning</td>
<td>3 – Health for all</td>
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<td>11 – Safe cities</td>
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<td>12 – Sustainable consumption and production (SCP)</td>
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<td><strong>W.3</strong> Achieve sustainable and environmentally sound management of all waste, particularly hazardous waste</td>
<td>12.4 – Managing all waste</td>
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<td>13 – Climate change</td>
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<td><strong>W.4</strong> Substantially reduce waste generation through prevention and the 3Rs (reduce, reuse, recycle) and thereby create green jobs</td>
<td>12.5 – The 3Rs</td>
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<td>8 – Growth &amp; employment</td>
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<td><strong>W.5</strong> Halve per capita global food waste at the retail and consumer levels and reduce food losses in the supply chain</td>
<td>12.3 – Food waste</td>
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**Global Waste Management Outlook, UNEP/ISWA (2015)**
Paradigm shift from Waste Management to Resource Management

- Production
  - Extraction Manufacturing
  - Transportation
  - Distribution

- Consumption
  - Purchasing Use
  - Preparing for Re-use
  - Re-use
  - Separate Collection
  - Recycling
  - Other treatment and recovery

- End of Life
  - Source Reduction
  - Recovery

Waste Minimization

Avoided waste flows
Diverted waste flows

Waste Prevention

Resource Management
Case study: City-to-city cooperation for improving solid waste management in Surabaya City

Kitakyushu City, Japan

Surabaya City, Indonesia
Kitakyushu, a first industrial city in Japan

Population: 977,000 (2010)
Area: 487.88 km²
GDP: 3,430 billion yen (2010)

Major companies in Kitakyushu area

Nippon Steel & Sumitomo Metal Corporation
Yaskawa Electric Corporation
TOTO Ltd.
Mitsubishi Chemical Corporation
Toyota Motor Corporation
Nissan Motor Co., Ltd.
Mitsubishi Materials Corporation

Source: Kitakyushu City, 2015
City-to-city cooperation based on Kitakyushu model

Source: Kitakyushu City, 2015
Sharing the experience with other cities

We have carried out 77 projects in close cooperation with 78 Japanese companies in 44 Asian cities.
Transition of city-to-city between Kitakyushu and Surabaya

Source: Kitakyushu City, 2015
Surabaya City, Indonesia

The city of 3 million people (2010) is the second largest city in Indonesia and serves as an important commercial and industrial capital of East Java.

Source: Ema, 2011
Waste management in Surabaya City

Fig. 5-1  The Structure of Solid Waste Treatment in the City of Surabaya

Source: Kitakyushu City, 2003
Solid waste composition

Total waste generation: 678,900 tonnes/year (Average 1,860 tonnes/day) in 2012
Waste collection: Approximately 75-80%
Final landfill: 467,565 tonnes/year (1,281 tonnes/day)

Source: Kitakyushu City, 2003

Fig. 5.2 Solid Waste Composition\(^3\) in the City of Surabaya (in comparison with the City of Kitakyushu) Source: Kitakyushu City, 2003
Development of Model Community in Kampong Rungkut Lor

- Educated residents to separate waste at source and use of compost bin
- Collected H/H waste separately
- Organic waste treated at composting center
- Model community for community based SWM (200 H/H)

- Educated women to start H/H business from recycling materials
- Educated residents to start organic farming at H/H and community
- Rest sell in Market
Up-scaling the model project by the Surabaya City Government

Successful model

Pusdakota’s community-based SWM and composting method

Appreciation and up-scaling by the City Government

Surabaya City in collaboration with the PKK (women’s group), other NGOs, private company and the media

Strategic actions

Recruit environmental cadres for awareness rising

Distribution of Takakura baskets

Establish compost facility

Surabaya Green and Clean programme

Other communities

Community groups

Community groups

Community groups

Community groups

Other communities

Community groups

Community groups

Community groups
Expansion to other communities through public awareness campaign

**Counseling activities**

- Counseling to student
- Counseling to Businessman
- Counseling to community
- Counseling to officer

**Environmental campaign**

**Socialization in school**

Source: Ema, 2011
Training of Environmental Leaders (Cadres) for community mobilisation

- Community Facilitators
- Environmental Leaders (Cadres)

Developed training materials for awareness raising

Number of Community Facilitators:
- Year 2005: 0
- Year 2006: 10
- Year 2007: 100
- Year 2008: 150
- Year 2009: 200
- Year 2010: 300

Number of Environmental Leaders (Cadres):
- Year 2005: 50
- Year 2006: 100
- Year 2007: 150
- Year 2008: 250
- Year 2009: 2000
- Year 2010: 3000

Source: Ema, 2011

Organic-unorganic waste sorting
Waste segregation training
Explaining how to use compost baskets
Manufacturing bags from waste
Recycling trainings
Turn waste into blessing

Environmental Event

Pemberdayaan Masyarakat Lewat Kader
Program: Waste Segregation & Treatment = Reduce 96%

- Organic: 70%
- Inorganic: 26%

- 1-2 barrel of composter
- 10-20 basket of composter
- Transformed to TDS and processed with communal composter

Source: Rismaharini, 2011
Support for starting composting programmes

Distribution of compost bins to attended to training and willing to do residents (Over 20,000 H/H)

Provide necessary support for starting community composting centres: cleansing tools, composting tools, lands and capital cost for building, and buying composting products for city greening

Source: Rismaharini, 2011
Establish Composting Centres in the City

(16 composting centers operate to treat 110 tonnes of organic waste in the city)

Source: Ema, 2011
Establish Waste bank system

WASTE BANK IN SURABAYA

RW X Kel. Gundih

RW II Kel. Dukuh Setro
Establish both rewarding and enforcements for motivating community to participate

- Rewards are given to the communities willing to participate through Surabaya Green and Clean Programme
- Rewards are given to Outstanding Environmental Leaders at the National Day Awarding Ceremony

Number of communities willing to contest to Surabaya Green and Clean Award has been increased

<table>
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<tr>
<th>Year</th>
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<td>2005</td>
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<td>2010</td>
<td>2000</td>
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Source: Ema, 2011

Strict in law enforcement to the communities not properly handle the SWM
Motivation of Staff and Local Politicians

Capacity building (locally and internationally) for staff and local politicians

Recognition of its efforts at national and international level

Source: ema, 2011
Achievement: Reduction of waste to be final dumped

30% waste reduction to be land filled by 5 years

Enhanced recycling by removing organic matters from the waste stream (78% of waste reduction from recycling materials)

Source: Ema, 2011
Improvement of transfer stations for more waste reduction (about 160 locations in the city)

Source: Nishihara, 2014
Development of pilot project for transfer facilities

Source: Nishihara, 2014
Development of Nishihara Model Material Recovery Facility (MRF)

Source: Nishihara, 2014
Establishment of Super Depo

- Nishihara constructed “Super Depo” on March 2013.
- With support from DKP, Nishihara dispatched a stuff to operate “Super Depo”.
- “Super Depo” was handed over to Surabaya City on September 1, 2014.
- In clean and efficiently equipped facility, workers sort valuables (plastics/papers) from MSW, and organic waste to be composted is collected.
- Super Depo hire ex-waste pickers as workers.

Source: Nishihara, 2014
Current operation

Source: Nishihara, 2015
Future expansion

- After the operation of “Super Depo (Intermediate treatment facility)” and “Compost center”, we would like to develop the new business “Nishihara model”.
- “Nishihara model” aims to integrate the function of “Super Depo” and “Compost center” into one large facility. The facility will accept 150 tons/day of MSW (Municipal Solid Waste).

### Tipping fee  Rp100/kg

Households / Offices → MSW → “Nishihara” (150 tons/day) → Sorting

- Organic waste → Composting
- Valuables (10~15%) → Sorting
- Others (25~30%)

Sell

- Organic waste: 1 kg = Rp300
- Valuables: 1 kg = Rp500

TPA Benowo

Waste sent to the final disposal site will be 30% (70% reduction),

*Amount of MSW will be the excess of the waste treated by PT Sumber Organik.

### Profit

- Surabaya can reduce the amount of waste sent to TPA by tipping fee and land offer.
- Other profits are “GHG emission reduction”, “hiring Scavengers” and “contribution to agriculture by providing compost”.

Source: Nishihara, 2014
Design of future expansion

- This ARCHITECTURAL PERSPECTIVE DRAWINGS shows the image of Large facility with Separation and Composting (150tons/day of MSW).
- The site will be at Wonorejo.

Source: Nishihara, 2015
Design for final treatment (w2E)
Hitachi Zosen (2015)

- Plant Scale: Energy-from-MSW (600t/day)
- Function as a power plant: 8.8MW, 70,000MWh/year
Lesson 1: Integrated Thinking

Integrated Sustainable Waste Management Framework

**Stakeholders:** include individuals or groups that have an interest or roles. All stakeholders should be identified and where practical involved in creating a SWM program.

**Elements (Process):** include the technical aspects of solid waste management. All stakeholders impact one or more of the elements. The elements need to be considered simultaneously when creating an SWM program in order to have an efficient and effective system.

**Aspects (Policies and Impacts):** encompass the regulatory, environmental and financial realities in which the waste management system operates. Specific aspects can be changeable, e.g. a community increases influence or environmental regulations are tightened. Measures and priorities are created based on these various local, national and global aspects.

Adapted from van de Klundert and Anschütz 2001.
Lesson 2: Technologies adopted to local needs/condition

<table>
<thead>
<tr>
<th>Waste Management Component</th>
<th>Technology Options</th>
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<tbody>
<tr>
<td>Waste Reduction</td>
<td>Design of longer-lasting and reusable products; reduced consumption.</td>
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<tr>
<td>Waste Collection</td>
<td>Use of alternative, non-fossil fuels (bio-fuel, natural gas).</td>
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<tr>
<td>Recycling/Materials Recovery</td>
<td>Materials recovery facility (MRF) to process source separated materials or mixed waste, although source separated is the preferred option as the materials would have less contamination from other discards. MRFs use a combination of manual and mechanical sorting options. Waste pickers could be used as a source of labor for manual sorting stages.</td>
</tr>
<tr>
<td>Composting/Anaerobic Digestion</td>
<td>Institute composting programs ideally with source separated organics. As with recyclables source separated materials reduce the contamination associated with recovery from mixed waste. Compost the organic material after digestion to produce a useful soil conditioner and avoid landfill disposal. Finished compost applied to soils is also an important method to reduce GHG emissions by reducing nitrogen requirements and associated GHG emissions.</td>
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<tr>
<td>Incineration/Waste-to-energy/Refuse-Derived Fuel (RDF)</td>
<td>Use the combustible fraction of waste as a fuel either in a dedicated combustion facility (incineration) with or without energy recovery or as RDF in a solid fuel boiler.</td>
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<tr>
<td>Landfill</td>
<td>Capture the methane generated in disposal sites and flare or use as a renewable energy resource.</td>
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</table>

Source: WB, 2012
Thank you