SMART PRACTICE

Talangagung Educational Tourism Final Waste Processing Site

Kepanjen District – Malang Regency
East Java Province – Indonesia

By: Knowledge Center Team of the National Development Planning Agency
This module is developed from the cooperation of the Directorate for International Development Cooperation at the Indonesian Ministry of National Development Planning/National Development Planning Agency (Kementerian PPN/Bappenas), United Cities and Local Governments Asia-Pacific (UCLG-ASPAC), Eastern Indonesia Knowledge Exchange (BaKTI) and the Knowledge Sector Initiative (KSI) funded by the Australian Government’s Department of Foreign Affairs and Trade (DFAT). The insights and findings of the authors do not reflect the insights of the institution mentioned above. The authors are not responsible for anything resulted by this module.
Talangagung Educational Tourism
Final Waste Processing Site
Kepanjen District – Malang Regency
East Java Province
Indonesia

By:
Knowledge Center Team
of the National Development Planning Agency

2016
Foreword

The processes of identifying, documenting, collecting and promoting smart practices in a structured and systematic manner are efforts that adhere to Indonesia’s national development priorities within the framework of motivating learning by regions from successes of other regions, and by prioritising innovations and offering solutions to address development challenges, as well as to benefit local communities.

Proven and successful smart practices may serve as a reference in the formulation of policies and the implementation of development plans, either at national or regional levels in Indonesia. These smart practices must be significantly impactful, easy to replicate, feasible in its technicality, simple in its institutionalisation, affordable, innovative, sustainable, participative, accountable, pro-marginalised groups and pro-gender equality.

One of the initiatives carried out by the Directorate of International Development Cooperation of the Indonesian Ministry of National Development Planning/National Development Planning Agency, is to develop Knowledge Center as a centralised repository of information, knowledge and learning of tested practices from development across Indonesia. This module is one of the outputs produced by the Knowledge Center team to provide information to interested parties on the smart practice Talangagung Educational Tourism Final Waste Processing Site, Kepanjen District, Malang Regency, East Java Province, Indonesia. With the aforementioned effort, the Knowledge Center team would like to appreciate all of its partners who have contributed to the development of this module.
We are pleased to invite other local governments to plan and budget, as well as to implement the management of Final Waste Processing Site, through various innovations in turning waste into blessings. We hope that the collected smart practices will inspire and increase the effectiveness of development planning and its implementation in Indonesia in the future.

Jakarta, April 2016

Ir. Wismana Adi Suryabrata, MA
Deputy of Development Funding
The Ministry of National Development Planning (PPN)/
The National Development Planning Agency (Bappenas)
At A Glance

THE KNOWLEDGE CENTER

The Ministry of National Development Planning/National Development Planning Agency (Kementerian PPN/Bappenas) is developing an initiative to establish a Knowledge Center, a centralised repository of data, information, knowledge, and existing development best practices at local and national levels. The establishment of the Knowledge Center aims to enhance the quality of planning at national and local levels based on proven, successful and easy to replicate development practices and knowledge. The Knowledge Center will function as provider of knowledge and solutions to development challenges, as well as a center of learning, through well-stocked inventory of lessons-learned and publications on development practices from across Indonesia.

SMART PRACTICES

Smart Practices are proven development best practices implemented successfully by a local government that is in line with development priorities stated in the national medium-term development plan (RPJMN). These smart practices may be used as part of regional development proposal to receive fundings from the Special Allocation Fund (dana alokasi khusus, or DAK) or the Village Fund (dana desa). As reference, the national development priorities include various programs of which the government pays significant attention to its implementation, such as on maritime issues, basic infrastructure, energy security, national security and health.
A local government development initiative can be identified as a smart practice if it meets the following criteria:

- Significantly impactful
- Easy to replicate
- Feasible in terms of technicality, institutionalisation and funding
- Innovative
- Sustainable
- Participative
- Accountable
- Pro-marginalised group
- Pro-gender equality

This module is expected to encourage local governments to conduct breakthroughs and innovations in development planning and its implementation of their respective areas to achieve the national development targets and objectives set out in the national medium-term development plan (RPJMN 2015-2019).

THE SMART PRACTICE MODULE

This module consists of the profile of smart practice Talangagung Educational Tourism Final Waste Processing Site, Kepanjen District, Malang Regency, East Java Province. This module is part of an effort to establish the Knowledge Center in the National Development Planning Agency (Bappenas) and in identifying, documenting, and promoting existing smart practices in a more structured and systematic manner as a part of a collection of information on smart practices in the waste sector in Indonesia.

This module is expected to aid other local governments in planning and implementing the management of a Final Waste Processing Site.

TARGET AUDIENCE

The target audience of this profile is:
- The Knowledge Center Bappenas
- Other governments interested in replicating “Smart Practice Talangagung Educational Tourism Final Waste Processing Site”, either at Regional Development Planning Agency (Bappeda) or Regional Work Unit (SKPD) levels in Indonesia.
The smart practice Talangagung Educational Tourism Final Waste Processing Site is located in Kepanjen District, Malang Regency, East Java Province, Indonesia. It is a form of regional government’s initiative proven to have addressed the challenges of managing final waste processing site through the implementation of locally resources-based smart solutions. Here is the profile of smart practice Talangagung Educational Tourism Final Waste Processing Site:

**Profile of Smart Practice**
**Talangagung Educational Tourism Final Waste Processing Site**

The smart practice Talangagung Educational Tourism Final Waste Processing Site is located in Kepanjen District, Malang Regency, East Java Province, Indonesia. It is a form of regional government’s initiative proven to have addressed the challenges of managing final waste processing site through the implementation of locally resources-based smart solutions. Here is the profile of smart practice Talangagung Educational Tourism Final Waste Processing Site:

**CHALLENGES**
- Ban on open dumping
- Environmental pollution (malodorous, ground water, air)
- Community rejecting the presence of a landfill
- Maintaining the image as capital of a regency
- Using renewable source of energy
- Reducing the volume of waste (3R)
- Utilising the economic potentials of waste

**INITIATOR**

**SOLUTIONS**
1. Final Waste Processing Site Management using controlled landfill method (including the control of leachate and methane gas)
2. Reduction of waste volume - TPS 3R
3. Utilisation of methane gas
4. Afforestation and educational facilities for visitors

**RESULTS**
- Legislation on waste management
- Utilisation of waste as energy and economic potentials
- Reduction of pollution
- Establishment of TPS3R (integrated waste management system)
- Establishment of Educational Tourism facilities at Final Waste Processing Site
- Issuance of regional regulations on waste management
- Feasible mechanism for managing the Site
- Simple organisational/institutional structure for the management of Final Waste Processing Site and becoming part of a Regional Work Unit (SKPD)
- Regional Budget (APBD) as a part of Regional Work Unit’s operational funds

**Notes:**
- Criteria for an initiative to be identified as a smart practice according to the Knowledge Center of the National Development Planning Agency cover the following aspects:
  - Output is significantly impactful, easy to replicate, feasible in its technicality, simple in its institutionalisation and affordable, innovative, and sustainable.
  - Process is participative, accountable, pro-marginalised groups and pro-gender equality.
- For definitions of criteria and indicators of a smart practice, see Annex C of this profile.
- For guideline for replicating the smart practice Talangagung Educational Tourism Final Waste Processing Site, see the following document “Replication Guideline Smart Practice Educational Tourism Final Waste Processing Site.”
Executive Summary

To be significantly impactful, easy to replicate, feasible in its technicality, simple in its institutionalisation, affordable, innovative, sustainable, participative, accountable, pro-marginalised groups and pro-gender equality are the criteria of a smart practice that serve as reference in selecting the best development practices across Indonesia that will contribute to the formulation of Indonesia’s national development planning and budgeting policies.

To address challenges faced by waste management in Final Waste Processing Site mandated by the law is the background that triggered the birth of an initiative to develop Talangagung Educational Tourism Final Waste Processing Site. Prior to 2009, Talangagung Final Waste Processing Site in Malang Regency was operating with open dumping method, of which waste was disposed into a final waste processing site without any further treatment. This had caused environmental pollution around the Final Waste Processing Site, causing surrounding sites to be dirty, malodorous and full of flies. Meanwhile, the methane gas (CH4) produced from anaerobic decomposition and fermentation of waste was processed only through flaring. Methane gas has a contribution on Greenhouse Gasses 21 to 25 times as powerful as carbon dioxide or CO2.

Changing the landfill’s operation from open dumping to controlled landfill method was a result of formal and informal reflections and discussions in 2009 between the Head of Sanitation Section, the Head of Residential Environmental Health Section and a staff, three of which came from the Office of Human Settlements and Spatial Planning of Malang Regency. They endeavoured so that the Final Waste Processing Site complied with Law no. 18/2008 on Waste Management and that surrounding communities may enjoy economic benefits of waste management. In addition to the development of Final Waste
Executive Summary

Processing Site using controlled landfills operating system, prototypes of methane gas use were developed in 2010 to address environmental issues occurring at Final Waste Processing Sites. This effort was resumed in 2011, by engaging academics i.e., undergraduate students, graduate students, alumni and lecturers from the Faculty of Environmental Engineering of Institute for Technology Sepuluh Nopember Surabaya (ITS), to acquire inputs and recommendations on controlled landfill and development of prototypes for methane gas use.

Starting with social approach, various innovations and experiments were created to safeguard waste management for humans and the environment, as well as to provide economic benefits for surrounding communities. Strategies employed to address the waste issues are implementation of controlled landfill method, development of support facilities, afforestation around the Final Waste Processing Site, and utilisation of waste potentials as resource to improve local economy. These strategies are derived from four integrated developmental components: (i) the area and operation of Final Waste Processing Site using controlled landfill method, including control of leachate and methane gas; (ii) the reduction of waste volume; (iii) the utilisation of methane gas as a new alternative renewable source of energy; (iv) afforestation, environmental management and use of space as areas for educational tourism. These components are implemented through social approaches and cooperation between environmental cadres and regional government, as well as through innovative efforts and experiments (trial and error) supported by technical assistance from academics, community’s participation, and financial support from regional government, the private sector through corporate social responsibility (CSR) and environmental cadres.

Several deeply committed parties support the operation of Talangagung Educational Tourism Final Waste Processing Site, including Regional Work Units and relevant community groups. The roles and functions of the managers of Final Waste Processing Site include supervision of environmental quality, supervision of safety in using methane gas as fuel, providing free health examinations for workers of Final Waste Processing Sites, dissemination and educational activities by environmental cadres and methane gas users’ community groups, and other activities.
The Regional Budget of Malang Regency finances the operation of Final Waste Processing Site, as well as contributions from community groups around the Final Waste Processing Site, and grants. For example, the 2016 budget allocation for operating Educational Tourism Final Waste Processing Site totals Rp 560,000,000.00, allocated for salaries, operational cost, procurement of goods/services, maintenance of equipments, and other costs.

The presence of Talangagung Educational Tourism Final Waste Processing Site provides economic benefits, such as availability of new employment, reduced community’s energy expenses from using methane gas produced on site, and increased income of those processing waste for reuse and recycle.

Social and environmental impacts of Talangagung Educational Tourism Final Waste Processing Site include a decrease in waste entering Final Waste Processing Site due to reuse or recycle, an increase in the community’s knowledge on properly managed waste, as well as the establishment of new community groups. Other impacts of the same importance as the aforementioned impacts are an increase in the roles of women using methane gas as an alternative source of energy and growing collaborations of different parties in relation to waste management and utilisation.

From a series of innovations and experiments in waste management, Talangagung Final Waste Processing Site became a place for learning that provides motivation for students and other stakeholders in developing their love for the environment founded on waste management.

Malang Regency has issued local regulations governing waste management to guarantee sustainable implementation of smart practice Talangagung Educational Tourism Final Waste Processing Site.

This profile on smart practice Educational Tourism Final Waste Processing Site management is expected to be the source of guiding principles for learning and information for other local governments on waste management practices that can be replicated in accordance to respective local conditions.
Contents

Foreword.................................................................................................................................iii
At A Glance....................................................................................................................................v
Executive Summary.........................................................................................................................ix
Contents........................................................................................................................................xii
List of Figures.................................................................................................................................xiv
Abbreviations.................................................................................................................................xv

Part 1. Challenges and Solutions...............................................................................................1
  1.1 Challenges Faced.................................................................................................................1
  1.2 Finding Solutions.................................................................................................................3

Part 2. Talangagung Educational Tourism Final Waste Processing Site...............................7
  2.1 About Educational Tourism at Final Waste Processing....................................................7
  2.2 Actionable Strategy and Plan..............................................................................................8
  2.3 Components of Smart Practice Talangagung Educational Tourism Final Waste Processing Site ............................................................9

Part 3. Institutionalisation ........................................................................................................19
  3.1 Organisational Structure....................................................................................................19
  3.2 Main Duties and Functions.................................................................................................20

Part 4. Funding...............................................................................................................................23
  4.1 Operational Funding............................................................................................................24
  4.2 Funding for Methane Gas Utilization..................................................................................25
  4.3 Funding for Use of Additional Facilities and Development...............................................26
Part 5. Community’s Participation .................................................................27
   Dissemination to Local Communities .........................................................30

Part 6. Impacts ..................................................................................................31

Part 7. Closing ..................................................................................................33

Annex A. Definition and List of Smart Practice Indicator
   Operational Terms ......................................................................................37
Annex B. Definition of Operational Terms ......................................................42
Annex C. Waste Management Rules .................................................................46
Annex D. Regions Replicating Smart Practice Talangagung
   Educational Tourism Final Waste Processing Site ..................................49
List of Figures

Figure 1.1 Development Sequence of Talangagung Educational Tourism Final Waste Processing Site ........................................5
Figure 1.2 Waste Challenges in Indonesia .............................................6
Figure 2.1 Accumulating/Compacting of Waste ....................................11
Figure 2.2 Leachate Treatment .................................................................12
Figure 2.3 Compost Shelter .................................................................13
Figure 2.4 Organic and Non-organic Waste Sorting Machine ............14
Figure 2.5 Methane Gas Purification Reactor ........................................16
Figure 2.6 Methane Gas Utilisation .......................................................17
Figure 2.7 Gazebo and Playground at Final Waste Processing Site ......18
Figure 3.1 Organisational Structure of Talangagung Educational Tourism Final Waste Processing Site .........................20
Figure 3.2 Managing Educational Tourism Final Waste Processing Site .................................................................22
Figure 4.1 Source of Funding for Talangagung Educational Tourism Final Waste Processing Site ...................................................23
Figure 4.2 Distribution Pipes for Methane Gas and Community Gas Stove .................................................................25
Figure 4.3 Field Visit by Representatives of Wakatobi Regency ........26
Figure 5.1 Gas Meter and Sticker in Surrounding Community ..........28
Figure 5.2 3R Temporary Shelter Workers in Action .........................29
Figure 5.3 Dissemination to Local Community .....................................30
Figure 6.1 An Impact of Methane Gas Use ...........................................32
Figure 7.1 Support from Various Parties ..............................................35
Figure 7.2 Benefits of Smart Practice Talangagung Educational Tourism Final Waste Processing Site .................................36
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3R</td>
<td>Reduce, Recycle, Reuse</td>
</tr>
<tr>
<td>AMeG</td>
<td>Accumulator of Methane Gas</td>
</tr>
<tr>
<td>AMPL</td>
<td><em>Air Minum dan Penyehatan Lingkungan</em> (Drinking Water and Sanitation)</td>
</tr>
<tr>
<td>APBD</td>
<td><em>Anggaran Pendapatan dan Belanja Daerah</em> (local government budget)</td>
</tr>
<tr>
<td>APBN</td>
<td><em>Anggaran Pendapatan dan Belanja Nasional</em> (state budget)</td>
</tr>
<tr>
<td>BAKTI</td>
<td>Bursa Pengetahuan Kawasan Timur Indonesia (Eastern Indonesia Knowledge Exchange)</td>
</tr>
<tr>
<td>BAPPEDA</td>
<td>Badan Perencanaan Pembangunan Daerah (Regional Development Planning Agency)</td>
</tr>
<tr>
<td>BAPPENAS</td>
<td>Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)</td>
</tr>
<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
</tr>
<tr>
<td>DAK</td>
<td><em>Dana Alokasi Khusus</em> (special allocation fund)</td>
</tr>
<tr>
<td>DED</td>
<td>Detailed Engineering Design</td>
</tr>
<tr>
<td>DELGOSEA</td>
<td>Democratic Local Governance in South-East Asia</td>
</tr>
<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
</tr>
<tr>
<td>IPAL</td>
<td><em>Instalasi Pengolahan Air Limbah</em> (wastewater treatment plant)</td>
</tr>
<tr>
<td>ITS</td>
<td>Institut Teknologi Sepuluh Nopember</td>
</tr>
<tr>
<td>KC</td>
<td>Knowledge Center</td>
</tr>
<tr>
<td>KK</td>
<td><em>Kepala Keluarga</em> (head of household)</td>
</tr>
<tr>
<td>KP3A</td>
<td>Kantor Pemberdayaan Perempuan dan Perlindungan Anak (Office of Women Empowerment and Child Protection)</td>
</tr>
<tr>
<td>KPI</td>
<td>Kerjasama Pembangunan Internasional (International Development Cooperation)</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>KSI</td>
<td>Knowledge Sector Initiative</td>
</tr>
<tr>
<td>KSM</td>
<td>Kelompok Swadaya Masyarakat (community groups)</td>
</tr>
<tr>
<td>KTI</td>
<td>Kawasan Timur Indonesia (Eastern Indonesia region)</td>
</tr>
<tr>
<td>MBR</td>
<td>Masyarakat Berpenghasilan Rendah (low-income society)</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Government Organisation</td>
</tr>
<tr>
<td>PNPM</td>
<td>Program Nasional Pemberdayaan Masyarakat (National Program for Community Empowerment)</td>
</tr>
<tr>
<td>PNS</td>
<td>Pegawai Negeri Sipil (civil servant)</td>
</tr>
<tr>
<td>RPJMN</td>
<td>Rencana Pembangunan Jangka Menengah Nasional (National Medium Term Development Plan)</td>
</tr>
<tr>
<td>SKPD</td>
<td>Satuan Kerja Perangkat Daerah (regional working unit)</td>
</tr>
<tr>
<td>ToR</td>
<td>Term of Reference</td>
</tr>
<tr>
<td>TPA</td>
<td>before the issuance of Law no. 18/2008 means Final Waste Disposal Site</td>
</tr>
<tr>
<td></td>
<td>after the issuance of Law no.18/2008 means Final Waste Processing Site</td>
</tr>
<tr>
<td>TPS</td>
<td>Tempat Penampungan Sementara (temporary shelter)</td>
</tr>
<tr>
<td>TPS 3R</td>
<td>Tempat Pengolahan Sampah 3R (3R waste processing site)</td>
</tr>
<tr>
<td>TPST</td>
<td>Tempat Pengolahan Sampah Terpadu (integrated waste processing site)</td>
</tr>
<tr>
<td>UCLG ASPAC</td>
<td>United Cities and Local Governments Asia-Pacific</td>
</tr>
<tr>
<td>UKL/UPL</td>
<td>Upaya Pengelolaan Lingkungan/Upaya Pemantauan Lingkungan (environmental management/environmental monitoring)</td>
</tr>
</tbody>
</table>
PART 1

Challenges and Solutions

1.1 Challenges Faced

Talangagung Educational Tourism Final Waste Processing Site (TPA) is one of four Final Waste Processing Sites in Malang Regency and it is located in Talangagung Village, Kepanjen District, Malang Regency, East Java Province, Indonesia. Talangagung landfill is in operation since 1997 on a piece of land covering an area of three hectares. Currently, Talangagung landfill serves waste collection from residential areas and markets in eight districts. Talangagung Final Waste Processing Site was developed to address occurring problems, as well as to respond to development challenges in Malang Regency. Challenges and issues principal to the birth of the concept for Talangagung Educational Tourism Final Waste Processing Site are:

- Challenge in changing the operational system of Talangagung landfill from open dumping to controlled landfill method, in accordance with Law no. 18/2008 on Waste Management, which regulates:

  • The changing definition from Final Waste Disposal Site to Final Waste Processing Site, done to guarantee that waste and/or waste residue returned to the environment will not cause any pollution (Article 22 Clause 1 Letter e).

---

1 Final processing is the place for processing and returning waste to the environment in a safe way for humans and the environment.

2 Malang Regency has four active Final Processing sites, namely: Talangagung Educational Tourism, Randu Agung, Paras Poncokusumo and Rejosari Bantur. Additionally, there are three backup Final Processing sites: Pagak, Kasri Bululawang and Madiredo Pujon.

3 Article 22 Clause 1 letter e: Final waste processing is to return waste and/or waste residue of the previous processing to the environment in a safe manner.
The ban on open dumping method as the operating system of a Final Waste Processing Site (Article 29 and 44)\(^\text{4}\), and the requirement of the operating system for Final Waste Processing Site of at least using controlled landfill method.

- **Negative impacts caused by open dumping**

Operating a Final Waste Processing Site using open dumping method has caused several negative impacts for the environment:

- **Open dumping is the best source of different kinds of diseases vectors.** Various kinds of rodents and insects i.e., mice, flies, cockroaches and mosquitoes are frequently found in landfill with open dumping method.
- **Methane gas\(^\text{5}\) is produced from anaerobic waste decomposition and fermentation of waste.** As a result, microorganism-producing methane was initially controlled through flaring and was not optimally use to address local communities’s need for energy.
- **Leachate\(^\text{6}\) is produced from infiltration of rainwater into waste dumps/ piles in the landfill and from liquids in the waste itself that can seep into and pollute the soil and ground water.**
- **Aesthetic nuisance and malodour of waste become the reason why local communities objected to the presence of a landfill and mounted protests toward the Regional Government of Malang Regency.**

- **The need to make the Final Waste Processing Site greener and more beautiful as it is located in the center of Malang Regency capital.**

The Government Regulation no. 18/2008 on the Relocation of the Capital of Malang Regency from Malang City to Kepanjen District turned Kepanjen District into the heart of Malang Regency, as well as the center of government. This regulation changed the location of Talangagung Final

---

\(^\text{4}\) Article 29 Clause 1 letter f: It is forbidden to treat waste using open dumping method in final waste processing site. Article 44 Clause 2: The regional government must shut down waste final processing site that uses open dumping method no more than five years after the enactment of this law.

\(^\text{5}\) Methane must not be exposed to the air as if there is a contact with the air at the concentration above five percent, an explosion will occur, thus requiring control and monitoring. The general control of gas can be done by combustion or utilisation of the gas as a source of energy. Methane is one of the gasses contributing toward the Greenhouse Gasses 21 times as strong as carbon dioxide or CO2.

\(^\text{6}\) If leachate is uncontrollable, it may pollute groundwater and surface water. In general, leachate is brown in color, containing high organic contents (BOD, COD), usually containing high contents of heavy metals, and septic-smelling. The existence of leachate that is not well-managed will eventually become a source of diseases for nearby communities.
Waste Processing Site that was initially at the edge of Malang Regency to become at the center of this Regency. Therefore, there is increased need to beautify the management pattern of Final Waste Processing Site.

- Community's negative behaviour in managing waste.

To handle waste, communities rely on nature’s ability to reduce and absorb it, which can worsen the condition of waste management. This should change as types and quantity of waste produced is changing. The change in community’s behaviors depends heavily on their will to participate actively and consistently in managing waste.

1.2 Finding Solutions

Based on these challenges mentioned above, an idea arose of developing a Final Waste Processing Site that functions as reference to an educational tourism site in Malang Regency.

This idea emerged from two initiators from the Office of Human Settlements and Spatial Planning of Malang Regency, Ir. Koderi and Ir. Renung Rubiyatadji7. The objective is to adhere to the provision of existing legislations, as well as to benefit local communities. Later, Ir. Santoso joined the initiating team to support innovation in one of the components of the Final Waste Processing Site.

The three initiators have different educational backgrounds i.e., mechanical engineering, environmental engineering and electrical engineering, their skills complement each other when developing various innovations for waste management at the Final Waste Processing Site.

To address these challenges, the Government of Malang Regency as the manager of the Final Waste Processing Site together with the three initiators attempted to:

- Improve the management of Final Waste Processing Site using controlled landfill method.
- Utilise methane production from waste at Final Waste Processing Site as a renewable source of energy benefitting those living in surrounding areas.

7 Ir refers to engineering title.
Challenges and Solutions

- Reduce the volume of waste coming into Final Waste Processing Site by providing facilities to apply 3R (Reduce, Reuse, Recycle) concept8 and change the community’s mindset on managing waste that encourages reduction of waste volume from its source.
- Organise and make use of the area of Final Waste Processing Site through the provision of facilities for use by nearby communities/visitors.

In developing the Final Waste Processing Site, local communities and academics were actively engaged to ensure that the Site become a center of education and laboratory in Malang Regency for the development and implementation of waste technology and the use of methane gas as renewable source of energy. The Final Waste Processing Site also becomes a place for learning and motivation for school students, college students, and other stakeholders in developing their love for the environment. This is the reason of why the Final Waste Processing Site was transformed into and subsequently known as Smart Practice Talangagung Educational Tourism Final Waste Processing Site.

The development sequence of Talangagung Educational Tourism Final Waste Processing Site (see Figure 1.1).

---

8 To reduce means to decrease the use of all things causing waste. To reuse means to use again waste that can be of use for the same function or different functions. To recycle means to reprocess waste into a new useful thing or product.
FIGURE 1.1 Development Sequence of Talangagung Educational Tourism Final Waste Processing Site

1997

Talangagung Landfill of Kepanjen District was established.

Landfill operation using open-dumping method:
- Environmental pollution (air, ground water)
- Malodorous and causing aesthetical nuance
- Complaints from nearby communities

2008

Law no. 18 /2008 on Waste Management:
- TPA-Final Waste Processing Site
- Ban on Open Dumping
- TPS (temporary processing shelters) 3R Requirement

2009

Government Regulation no.18/2008 on the relocation of Malang Regency capital from Malang City to Kepanjen District.

Government Regulation no.18/2008 on the relocation of Malang Regency capital from Malang City to Kepanjen District.

The initiators endeavored so that:
- Final Waste Processing Site Talangagung adheres to Law no. 18 /2008 and methane gas can be managed.
- The image of Malang Regency capital can be maintained.

2010

TPA Talangagung was using controlled landfill method.
- Leachate and methane gas were controlled.

2011

Development of prototypes for use of methane gas.

Introducing and asking for inputs from Faculty of Environmental Engineering of ITS

Source: Knowledge Center team of the National Development Planning Agency – interview with initiators, December 2015.
The creative and innovative approaches in developing the smart practice Talangagung Educational Tourism Final Waste Processing Site include:

a. Inviting students and lecturers from Faculty of Environmental Engineering of Institute of Technology Sepuluh Nopember, for inputs and recommendation on the application of technology in waste management.

b. Approaching local communities and gathering their aspirations regarding the use of methane gas.

c. Involving community groups and environmental cadres in the management and use of methane gas, so partnership is established between regional government and local communities.

d. Sharing information by managers and initiators of Final Waste Processing Site as they open for every study or research visit.

e. Utilising Final Waste Processing Site as a laboratory for the development, implementation of studies on technological application in waste management.

The Final Waste Processing Site met all the criteria for innovation based on various efforts and innovative practices in addressing existing challenges, adaptation from other smart practices, as well as originality of ideas from the initiators, either as officials of the regency or as non-officials.

FIGURE 1.2 Waste Challenges in Indonesia

Source: processed by Knowledge Center team of the National Development Planning Agency
2.1 About Educational Tourism at Final Waste Processing

Talangagung Educational Tourism at Final Waste Processing Site is a Final Waste Processing Site that serves as a facility for sanitation services to local communities in accordance to Law no. 18/2008 on Waste Management. It is also a place for learning for the community related to the management and use of methane gas as a renewable source of energy.

The objective of Talangagung Educational Tourism at Final Waste Processing Site is to focus on downstream waste management that is safe for humans and the environment and on the use of waste as potential resources with economic value for the community.

The targets Talangagung Educational Tourism Final Waste Processing Site activities are:

a. Community groups living nearby Talangagung Final Waste Processing Site, those particularly with low income can:
   • Make use of waste as a source of extra income through the mechanism of Waste Bank.9

---

9 Waste Bank is a concept of managing sorted and selected dry waste like a bank, instead of money saved, waste is saved. Those who save are called customers and have savings book. The saved waste is scaled and priced, which later can be sold to factories/businesses in collaboration with the Waste Bank.
• Maintain the environmental conditions of Final Waste Processing Site through operation using controlled landfill method, complete with leachate and methane gas control.
• Benefit from methane gas as a fuel, directly use by 205 households, free of charge.

b. Residents of Malang Regency who want to learn about the use of methane gas as efficient technology.
c. Communities and other local governments who want to develop and establish educational tourism at Final Waste Processing Site.
d. Academics, college students and school students who want to apply their knowledge in creating innovations and conducting researches related to the management of a Final Waste Processing Site, leachate and methane gas.

2.2 Actionable Strategy and Plan

The development of Talangagung Educational Tourism Final Waste Processing Site is a chosen solution to address challenges in managing a landfill in Malang Regency. In its implementation, the following strategies are used:

1) Changing the operation of landfill from open dumping to controlled landfill method.
2) Reducing waste from the main source\textsuperscript{10} by applying 3R.
3) Gaining local support by ensuring use of methane gas as renewable energy can improve local economy.
4) Greening and beautifying areas of Final Waste Processing Site along with providing various facilities for visitors to discuss waste management or simply to relax.

To implement these strategies for smart practice Talangagung Educational Tourism Final Waste Processing Site, the following action plan may help:

1) Carry out planning by developing a detailed engineering design (DED) on Final Waste Processing Site, with support of environmental assessments e.g., environmental management effort/environmental monitoring effort (UKL/UPL) and by developing a standard operating procedures (SOP) on the management of a Final Waste Processing Site.

\textsuperscript{10} \text{The main sources of waste are housings, commercial places, public places, and social facilities.}
2) Apply TPS 3R11 to reduce the volume of waste coming into the Final Waste Processing Site.

3) Manage leachate by channeling it through perforated pipes installed horizontally to the Waste Water Treatment Plant (IPAL) to be neutralised and re-circulated to the designated Final Waste Processing Site cells to maintain the dampness of waste during anaerobic fermentation.

4) Design methane-capturing network system by using ventilation pipes installed vertically and then connecting those pipes in one network.

5) Construct a gas purification system and record volume of methane gas used.

6) Develop various prototypes of efficient technology in using methane gas as a renewable source of energy.

7) Construct transmission and distribution network system for channeling methane to nearby communities at Final Waste Processing Site as a renewable source of energy.

8) Train local residents on the security and safety of using methane gas.

9) Facilitate the establishment of community groups (kelompok swadaya masyarakat or KSM) that functions as a forum for methane gas users.

2.3 Components of Smart Practice Talangagung Educational Tourism Final Waste Processing Site

The smart practice on waste management at Talangagung Educational Tourism Final Waste Processing Site operates an integrated manner to reduce the volume of waste and waste impact from its handling.

Integrated waste management includes collecting, sorting, reusing, recycling, treating and final-processing waste. Therefore, the components of smart practice of Talangagung Educational Tourism of Final Waste Processing Site, include: 1) the operation of Final Waste Processing Site using controlled landfill method; 2) the reduction of waste volume coming into Final Waste Processing Site by applying TPS 3R; 3) the use of methane gas; and 4) the management and use of Final Waste Processing Site area as an educational tourism facility.

All components of smart practice are to be implemented gradually starting from mapping of issues with waste, development of detailed technical and non-technical plans, and implementation of component from the smart practice. Detailed information on each component from smart practice

TPS 3R refers to temporary processing shelters for 3R activities of reduce, reuse and recycle.
Talangagung Educational Tourism Final Waste Processing Site is available in “Replication Guideline of Smart Practice Talangagung Final Waste Processing Site” documented by the Knowledge Center team of the National Development Plan Agency.

The following sections contain detailed information on components of smart practice Talangagung Educational Tourism Final Waste Processing Site.

### 2.3.1 Component 1: Operation of Final Waste Processing Site Using Controlled Landfill

The management of Final Waste Processing Site adheres to Law no. 18/2008 on Waste Management and changed the operating pattern from open dumping to controlled landfill. This is done by considering the topographic location and geological structure of Final Waste Processing Site, as well as the availability of land or other covering materials to ease and accelerate waste decomposition.

In addition, in the Regulation of the Minister of Public Works no. 3/2013 on the Organisation of Waste Infrastructures and Facilities in Handling Domestic Waste and the Likes, final wastes processing in controlled landfill include accumulating/compacting waste, covering waste dumps/piles, treating leachate and controlling gases.

Talangagung Final Waste Processing Site is located in an area of varying land contour that it allows the implementation of cut and fill method. The basin for final waste processing site is covered with waterproof layer of geomembrane and geotextile, either at the bottom or on walls. This waterproof layer prevents seepage of leachate into groundwater.

a. Accumulating/compacting waste

Waste from trucks is dumped into the basin, leveled up, and compacted using heavy equipment. The waste compacting should make the waste dumps/piles strong enough to receive the next layer of waste.
b. Covering the waste with soil or other covering materials

Early in the operation of Talangagung Educational Tourism Final Waste Processing Site, the overlay of compacted waste was covered with a layer of soil every 5-7 days at the thickness of around 15-20 cm. As time passes, the management of Educational Tourism Final Waste Processing Site had a hard time procuring soil for covering purposes, so they innovate by putting on and taking off tarpaulins to cover the overlay of compacted waste. Such that waste anaerobic decomposition and fermentation progressed better and an excessive amount of rainwater was prevented from seeping into waste dumps.

Periodical waste covering allows anaerobic fermentation to take place. To dampen waste and accelerate anaerobic fermentation, leachate is re-circulated from the processing pond into waste dumps. This final waste processing method called semi-anaerobic landfill.

When cells at the basin are full, final covering is placed with a layer of soil at the thickness of 50-100 cm. Afterwards, various kinds of plants and trees that are resistant to acidic conditions are planted over the basin.
c. Treating Leachate

Leachate is channeled through perforated pipes placed horizontally on waterproof layers at the bottom of Final Waste Processing Site’s basins. Then leachate flows by gravitation into the Waste Water Treatment Plant (IPAL) to be neutralised and re-circulated to the Final Waste Processing Site cells.

d. Managing methane gas

Methane gas is captured through ventilation pipes installed vertically in waste dumps, which is later used as a renewable source of energy.

### 2.3.2 Component 2: Reduction in Waste Volume Coming into Final Waste Processing Site

The facilities for waste volume reduction using 3R principles available at Talangagung Educational Tourism Final Waste Processing Site are: 1) basic infrastructure for processing organic waste into compost (composting); 2) facilities for sorting non-organic waste (TPS 3R); and 3) prototypes of organic and non-organic waste sorting machine.
Composting facilities consist of a container to filter and for making compost. Fertiliser produced from the composting process is used for green areas at Final Waste Processing Site.

In the Educational Tourism Final Processing Site area, a basic TPS 3R shelter is provided to sort non-organic waste with economic values. The TPS 3R workers come from low-income communities residing around the Final Waste Processing Site.

The manager of Talangagung Educational Tourism Final Waste Processing Site is currently developing an organic and nonorganic waste separating machine called “Air and Hydro Waste Separation”. In this machine, organic waste is crushed and pumped into the sludge drying bed to be processed into compost. Meanwhile, non-organic waste already washed using water sprayer is sold to “collectors.” The trials of this instrument will be evaluated for advanced operation and further development.

The reduction of waste volume coming into Talangagung Educational Tourism Final Waste Processing Site is done outside Final Waste Processing Site, through dissemination of 3R principles at household level and improvement of the functions of temporary shelter (TPS) into integrated waste processing site (TPST).
The integrated waste processing site, has intensive, well-managed, and structured 3R activities. The Site also provides additional benefits to local communities, particularly in improving their economy and preventing environmental pollution.

The reduction of waste volume coming into Final Waste Processing Site through 3R principles:
- A real form of communities participation because of the behavior the 3Rs community can extend the life of landfill.
- Pro marginalised because Improving economic benefits particularly for low income communities.
- Easy to replicate for principles and simple requirement on the equipment of work.

FIGURE 2.4 Organic and Non-organic Waste Sorting Machine

Source: Documentation by Knowledge Center team of the National Development Planning Agency, December 2015
2.3.3 Component 3: Using Methane Gas as an Alternative Source of Energy

There is a methane gas utilisation program called Kampung Mandiri Energi Pro Iklim (Pro-Climate Autonomous Energy Village) with the following activities:


b. Purification of gas using tried and tested equipments developed by initiators.

c. Use of methane gas by 205 households through channeling of gas to transmission and distribution pipes.

d. Continuous innovations in using methane gas through development of technological instruments for household purposes. In developing use of methane gas, initiators of smart practice conducted trial and error to improve the processes and procedures in gas usage to meet targeted conditions. Such conditions are written in the SOP as guideline to the management of methane has as alternative source of energy from waste. The Office of Human Settlements and Spatial Planning also took part in the implementation of this smart practice through regular monitoring activities.

e. Manage the use of methane gas as a source of energy. Local communities established community groups in Ardirejo sub-district and in Talangagung Village, Kepanjeng District, Malang Regency. Local community learns how to organise and manage their contributions (financial) towards of independent methane gas use. These community groups collects and manages the money received from community contribution for methane gas usage.
Prototypes of efficient technology developed for the use of methane gas as a renewable fuel:
- Purification of methane gas and gas meter
- Brajasaluki (name of an instrument for transforming energy from methane gas into electrical energy) using the engine of Toyota Land cruiser 78 and generator at 22.5 kVA
- AMeG (Accumulator of Methane Gas) using raw materials from used Air Conditioners
- Nonaku stove from used cans
- Kerosene pressure lantern from used materials
- Baking oven
- Generator 5000 watt
- Waste count tool
- Pumping machine
- Flaring used for heating water

Initiators of smart practice engage local communities to develop different kinds of prototypes for methane gas use as a new renewable source of energy. This participation and active engagement made Talangagung Educational Tourism Final Waste Processing Site fits the criteria of being participative and innovative in its approach.
Assuming one family comprised of four (4) people with average monthly use of three (3) kg LPG cylinders /month:
- 3 KG LPG Price = Rp13.500 /cylinder
- Expense/month = 3 x Rp13.500 = Rp40.500/family
- Expense/year = 12 x Rp40.500 = Rp486.000/HH
- Cost-saving after methane gas usage
  - Expense/month = Rp6.000
  - Expense/year = 12 x Rp6.000 = Rp72.000
  - Cost saving = Rp486.000 - Rp72.000 = Rp414.000/year

In 2015, there are 205 families using methane gas from piping network free of charge. Later, the community groups who manages and use methane gas in their households planned to charge Rp 6,000 per month for maintenance and repair (hiring of technicians) of piping network.

In general, beneficiaries of methane gas production and distribution are low-income families and small entrepreneurs, including food vendors, etc.
2.3.4 Component 4: Organisation and Use of Space at Final Waste Processing Site as Educational Tourism Facility

Talangagung Educational Tourism Final Waste Processing Site is utilised as a laboratory for the development, implementation and center for technological studies on waste management. Visitors can see props and materials explaining various processes taking place at the Final Waste Processing Site. Attractive and easily read signages are used. Visitors can also see wastewater treatment plant, leachate pools, methane-gas distribution network, and prototypes of efficient technology for methane gas usage.

Community development activities are done through cooperation with many stakeholders and are integrated with existing programs of various regional work units. For example, with the Office of Parks on planting green areas, with the Office of Women Empowerment and Child Protection to ensure at least 3,500 students a year benefit from educational tourism at the Final Waste Processing Site.

Initiators and managers of Final Waste Processing Site are creative and innovative in providing educational facility for visitors and local communities. As a place for conversation or simple relaxation, the community built a gazebo.

FIGURE 2.7 Gazebo and Playground at Final Waste Processing Site

Source: Documentation by Knowledge Center team of the National Development Planning Agency, December 2015
PART 3
Institutionalisation

3.1 Organisational Structure

The organisational management of Talangagung Educational Tourism Final Waste Processing Site is under the Office of Human Settlements and Spatial Planning with the Sanitary and Park Area in the Development and Waste Processing Section.

The organisational structure of Talangagung Educational Tourism Final Waste Processing Site has simple and basic duties and responsibilities required for managing a Final Waste Processing Site (see Figure 3.1). Currently, the number of personnel in Talangagung Educational Tourism Final Waste Processing Site totals 14, consisting of positions stated in the organisational structure, as well as technicians, janitors and security guards.

Personnel involved in the operation of Talangagung Educational Tourism Final Waste Processing Site are responsible for the operation and inventory of Final Waste Processing Site, including heavy equipment (1 unit of excavator), water tank truck (1 unit), equipment for making compost, plastic sorting machine, water spraying machine, conveyor for sorting waste, and some units of pump, power generator, blower, and office supplies (furniture, etc.).

In performing its duties, the management of Talangagung Educational Tourism Final Waste Processing Site collaborates with environmental cadres and community groups, both groups of methane gas users and groups conducting drinking water and environmental health assessments for Kepanjen District, Malang Regency.
3.2 Main Duties and Functions

- The institutionalisation of the Final Waste Processing Site is clearly set, leading to clarity of coordination and cooperation arrangement between the regional work units and other institutions.

- The organisational structure is deemed simple, so it is easy to replicate and is in line with the criteria of a smart practice.

The main duties and functions of each position in the organisational structure of Talangagung Educational Tourism Final Waste Processing Site management are:

1) Development and Waste Management Division
   The main duties and functions of the Development and Waste Management division are:
   a. Determine policies on the development of waste infrastructure and facilities, as well as sanitation management;
   b. Develop waste management technical master plan;
c. Organise the management of waste/sanitation from waste shelter, relocation, waste processing, transportation and final disposal.

d. Organising and funding the development of waste infrastructure and facilities.

2) Coordinator of Final Waste Processing Site
The duty of the coordinator of Final Waste Processing Site is to coordinate all activities taking place at Final Waste Processing Site through recording, allocating, organising daily activities conducted onsite, etc.

3) Innovation Division
The innovation division is responsible for designing and implementing innovative studies related to the management of a Final Waste Processing Site and further development.

4) Waste Bank Division (for scavengers at Final Waste Processing Site)
The Waste Bank and Security Guard Divisions are in charge of coordinating, monitoring and managing the mechanism of the Waste Bank, bookkeeping on scavenged waste, and responsible for the security of Final Waste Processing Site locations and local communities.

5) Operator (excavator)
The excavator operator, according to his expertise, is responsible for the operation of excavator to dig, level, relocate and organise waste dumps/piles in such a way that accrued waste will cause no harm and the final waste processing runs smoothly.

6) Composting Division
The composting division is technically responsible for processing organic waste at Final Waste Processing Site into compost.

7) Installation Maintenance Division (electricity and gas)
The installation maintenance division is responsible for installing, monitoring, maintaining and minimising any damage and risk that are likely to occur from electricity and production of methane gas at the Final Waste Processing Site.
8) Sanitation Division
The sanitation division is responsible for making sure that cleanliness and sanitary conditions in and at surrounding locations of Final Waste Processing Site are maintained.

9) Administration (recording)
The administrative division is responsible for all activities in managing the Final Waste Processing Site that is related to financial management, customer recording, organisation, public service, organisational operation and administration that guarantees transparency of administrative system onsite to relevant stakeholders. The duties of administrative division include:
- Register and check the waste entering Talangagung Educational Tourism Final Waste Processing Site, as well as to direct waste trucks/other vehicles to discharge areas, through TPS 3R and then active cells.
- Document the waste source, waste volume, vehicle number, drivers, and the date or time waste carrying vehicles enter Final Waste Processing Site, etc.

**FIGURE 3.2** Managing Educational Tourism Final Waste Processing Site

**FIGURE 3.2** Managing Educational Tourism Final Waste Processing Site

Periodic monitoring and evaluation activities implemented by the Office of Human Settlements and Spatial Planning shows that there is a clear and credible mechanism of reporting and accountability.

Source: processed by Knowledge Center team of National Development Planning Agency
PART 4

Funding

The majority of funding for smart practice Talangagung Educational Tourism Final Waste Processing Site is from the regional budget (APBD) of Malang Regency. Other sources of funding are from community groups contributions and grants from donor or the private sector through CSR as presented in Figure 4.1.

FIGURE 4.1 Source of Funding for Talangagung Educational Tourism Final Waste Processing Site

Available funding is allocated to the following components: (1) studies (development of detailed engineering design, environmental assessments); (2) construction of Final Waste Processing Site; (3) procurement of equipments; (4) operation and maintenance of Final Waste Processing Site; (5) control and use of methane gas; and (6) further development.
4.1 Operational Funding

The operational funding of Talangagung Final Waste Processing Site covers:

1) Salaries
2) Operating cost
3) Item purchasing cost
4) Equipment maintenance cost
5) Others

The operational funding includes funding for preparing the land for Final Waste Processing Site of ground cutting using excavator, which later covered with geomembrane as a part of Final Waste Processing Site’s operation. The waste dumps/piles was periodically covered before a final covering is placed. The land preparation also includes the installation of pipelines that channel leachate and capture methane gas.

For example, the operating cost for Final Waste Processing Site in 2016 is approximately Rp 560,000,000.00, which is budgeted in the regional budget of the Office of Human Settlements and Spatial Planning of Malang Regency.

Supports obtained since 2011 for the management of Talangagung Final Waste Processing site from other parties outside the regional government, include:

• Grant from AusAID in 2012 for the construction of roads in the area of Final Waste Processing Site.
• Grant in the form of excavator from the Ministry of Public Works in 2012.
• Grant in the form of pipes for methane gas network to surrounding households at Final Waste Processing Site from the CSR of PT. Pembangkit Jawa-Bali in 2013, as well as a grant from Greenfields Foundation in 2013.
4.2 Funding for Methane Gas Utilization

Funding for methane gas use is allocated to the following components:

a. Preparation of methane-gas capturing pipelines.
b. Preparation of prototypes for gas purification and gas meter.
c. Development of innovative technology for methane gas utilisation.
d. Construction of pipelines for transmitting and distributing gas to nearby households, including construction gas stoves distributed to 205 families.

Initiators and environmental cadres initially funded the smart practice of developing methane-gas utilisation facility (waste to energy) independently. The cost reached Rp 38,000,000. Then, as demand increases for the expansion of methane-gas service coverage, the Government of Malang Regency contributes by allocating its regional budget for the construction of additional pipelines.
4.3 Funding for Use of Additional Facilities and Development

Funding for using additional facilities and their development to support routine activities at the Educational Tourism Final Waste Processing Site, include:

a. Operational support for visitors, i.e., provision of snacks/drinks
b. Support to dissemination activities, e.g., inviting universities to gain inputs and recommendations to develop further innovation
c. Support to local communities, i.e., educational activities on the waste to energy concept

FIGURE 4.3 Field Visit by Representatives of Wakatobi Regency

Source: Documentation of Knowledge Center team of the National Development Planning Agency, April 2016
The development of Talangagung Educational Tourism Final Waste Processing Site provides a great opportunity for surrounding communities to participate actively through assignment of roles and functions in the management of Final Waste Processing Site.

Local communities are involved in the maintenance of Final Waste Processing Site, methane gas facility and educational tourism facility, which raises awareness in maintaining Final Waste Processing Site and its facilities to receive its benefits continuously.

The marginalised and poor community groups benefit from a new source of income as scavengers.

The behaviour of local communities in managing waste was a challenge that underlines the birth of this smart practice. The community is expected to reduce waste by applying the 3R principles at home or in surrounding environment.

To change negative behaviours of local communities into positive ones, local communities should engage in the following activities:

a. Community as environmental cadres

Environmental cadres are local residents trained by managers of Final Waste Processing Site as volunteers who can take part in the operation and maintenance of Final Waste Processing Site. These environmental cadres also receive regular trainings on managing waste bank and 3R, held twice a year by the Agency for the Environment and Office of Human Settlements of Malang Regency. Other parties conducting these trainings include civil society and the private sector, e.g. Unilever. Some environmental cadres moved on and established their own community groups/organisations.
These environmental cadres play an extremely important role, particularly in dissemination and education activities on waste to energy. Moreover, these environmental cadres also take part in helping the initiators of smart practice spread the words on Talangagung Educational Tourism Site through the provision of technical assistance to other regions interested in replicating the smart practice.

b. Involvement in community groups

Community groups (kelompok swadaya masyarakat, or KSM) were established to support the management of Final Waste Processing Site that consists of residents from surrounding communities at Final Waste Processing Site.

Talangagung and Paras Poncokusumo Community Groups take part in the management and use of methane gas. Local communities convey their needs for maintenance to such community groups, and subsequently, managers of Final Waste Processing Site will follow up on maintenance of methane gas production based on users/customer feedbacks.

In addition, Tirtowuri Community Group manages the AMPL (environmental health and drinking water assessments), including the management of the Waste Bank to reduce the volume of waste entering Final Waste Processing Site. In these community groups, women are involved actively as members in charge of the collection and management of subscriptions for methane gas usage, as well as implementation of 3R and the Waste Bank.

FIGURE 5.1 Gas Meter and Sticker in Surrounding Community

Source: Documentation by Knowledge Center team of the National Development Planning Agency, March 2016
The involvement of women in community groups has given equal opportunity for both men and women (gender equality) to participate actively in the management of Talangagung Educational Tourism Final Waste Processing Site.

c. TPS3R workers and the Waste Bank

Low-income communities are involved as workers at the TPS 3R (temporary shelter) facilities. The management of the Waste Bank also involves local communities.

During the planning period, initiators actively consulted with experts and educated surrounding communities to become environmental cadres. During implementation, the Final Waste Processing Site Managing team manages the operation of Final Waste Processing Site with local residents participating in waste sorting. The private sector provides assistance in the form of support facilities and the academics provide inputs and recommendations on managing the technology at Final Waste Processing Site, including blogs or other social media.

**FIGURE 5.2  3R Temporary Shelter Workers in Action**

*Source: Documentation by Knowledge Center team of the National Development Planning Agency, March 2016*
Dissemination to Local Communities

The surrounding communities of Talangagung Educational Tourism Final Waste Processing Site received adequate information through dissemination or socialization activities. This is to gain their support and participation in the development of Talangagung Educational Tourism Final Waste Processing Site, activities include:

- Providing the evidence of benefits from a final waste processing site to surrounding communities and the environment, so full support was given.
- Involving local communities in discussions and invites them to visit the Final Waste Processing Site for early involvement in changing the operation of Final Waste Processing Site from open dumping to controlled landfill.
- Allowing environmental cadres, after adequate training, to become source of information who conducts dissemination activities for surrounding communities.

**FIGURE 5.3  Dissemination to Local Community**

Source: processed by Knowledge Center team of the National Development Planning Agency
PART 6
Impacts

The smart practice of Talangagung Educational Tourism Final Waste Processing Site has significant impacts in the development of Malang Regency. The positive impacts are not only in the improvement of environmental quality from the operation of controlled landfill at Final Waste Processing Site, but also in the improvement of socio-economic welfare of surrounding communities.

Economic impact of Talangagung Educational Tourism Final Waste Processing Site:

a. Improvement in the economic conditions of residents around Talangagung Educational Tourism Final Waste Processing due to a decrease of energy expenses from using methane gas and self-developed stove, and an increase in income from sorting waste for reuse or recycle. Approximately 205 families use methane gas as the source of energy for cooking.

b. Creation of new employment opportunities for local communities who are involved in activities at Final Waste Processing Site.

Social and environmental impacts of Final Waste Processing Site:


b. Increasing awareness of local communities in managing waste through the use of 3R facilities and the Waste Bank.

- The smart practice is proven able to address issues of environmental pollution from the landfill’s operation by using controlled landfill method, along with the management of leachate and methane gas.
- The socio-economic impacts can be enjoyed by residents around Final Waste Processing Site through their involvement in the management system.
c. Learning on how to organise in community groups and to manage subscriptions collected for waste management and use of methane gas.

d. Creating opportunities for women to participate in the implementation of 3R and use of methane gas as an alternative source of energy.

**FIGURE 6.1 An Impact of Methane Gas Use**

Talangagung Educational Tourism Final Waste Processing Site also reaches the following achievements:

a. A location for comparative study on managing Final Waste Processing Site for other regions in Indonesia and abroad.

b. A place for research for Indonesian or international academics and college students.

c. A location for educational tourism through the management of Final Waste Processing Site.

d. Winning the eco-creative exhibition on environmental management at national level acknowledged by the Indonesian Ministry of Environment.


g. Winning Kalpataru (environmental) Award from President Susilo Bambang Yudhoyono in the name of Mr. Koderi as the Initiator of Waste Management in Talangagung Final Waste Processing Site in 2013.

h. Winning an award from the Ministry of Environment and Forestry, which chose Talangagung Final Waste Processing Site as the place for the launch of website on waste management by the Data and Information Center (Pusdatin) in 2015.

i. Winning the Public Service Innovation Award from the Ministry of Administrative Reform and Bureaucratic Reform in 2015.

j. Winning the national record award from the Indonesian World Records Museum (MURI) for mass cooking using methane gas involving 260 people in 2015.
In general, Talangagung Educational Tourism Final Waste Processing Site can be a good example for other regions in Indonesia in complying with Law no. 18/2008 on Waste Management. The creativity and innovation developed in Talangagung Final Waste Processing Site do not only address existing challenges, but also benefit local communities and create an educational center or laboratory for the development and implementation of waste technology in Malang Regency.

Supporting conditions for the success of smart practice Educational Tourism Final Waste Processing Site are:

1) Regulations
To guarantee the continuation and sustainability of Talangagung Educational Tourism Final Waste Processing Site, the Regional Government of Malang Regency has issued a Regional Regulation no. 10/2012 on Waste Management. Article 30 states that a Final Waste Processing Site should operate using methods of controlled landfill, sanitary landfill and environmentally friendly technology. Furthermore, Article 31 to 37 elaborates on the location of Final Waste Processing Site, the infrastructure of Final Waste Processing Site, the provision of waste processing and waste final processing facilities, and the managing institutions. Article 7 of the same regulation, states that the regional government is obliged to give and disseminate information about waste management to the community. The legitimacy of waste management activities is also supported by the Instruction of Malang Regency no. 1/2011 on Waste Management in Malang Regency.
2) Supports from other parties

The successful implementation of smart practice is inseparable from supports of other stakeholders i.e., local universities, community groups, relevant regional work units in Malang Regency, the private sector and international development partners.

- Local communities participated actively through their involvement in community groups e.g., Ardirejo and Talangagung Village. Community groups are partners in the use of methane gas that manages the subscriptions from the community towards repair and maintenance of methane-gas distribution system.

- ITS Surabaya provides support through environmental inputs and recommendations for the management of Final Waste Processing Site.

- The Environmental Agency of Malang Regency is in charge of the environmental quality control at Final Waste Processing Site.

- The Office of Research and Development in Malang Regency provides support in ensuring safety of methane gas use as fuel.

- The Health Department of Malang Regency provides free health examinations for scavengers and other workers at Final Waste Processing Site.

- The Office of Park of Malang Regency provides plants for the parks in Final Waste Processing Site.

- The Office of Women Empowerment and Child Protection brings in around 3,500 students per year.

Strong commitment from all regional work units and other parties who support the smart practice is an important indicator showing sustainability for its implementation.
3) The roles of initiators

The management of Final Waste Processing Site has long been a challenge in Indonesia. The regulations, studies and reviews on the management of Final Waste Processing Site are available. However, to date, only a few regional governments adhere to Law no. 18/2008 on Waste Management that bans the operation of Final Waste Processing Sites using open dumping method. In this case, the initiators of smart practice Talangagung Educational Tourism Final Waste Processing Site play a crucial because they:

- Are indefatigable in realizing their critical thinking against the challenges they face.
- Are able to generate and implement new creative ideas.
- Start from trivial things but can give real results.
- Succeeded in moving local communities to make changes to their environment.
Therefore, the initiators have addressed some challenges of managing Final Waste Processing Site and turn the Site rejected initially by surrounding communities into the pride of the same communities, as it provides social, environmental and economic benefits.

The proper management of waste can garner many benefits, for either the local economy or education, and it can even serve as a new renewable source of energy. Talangagung Final Waste Processing Site in Malang Regency, East Java, Indonesia, has produced many innovations that transform waste that caused problems into blessings.

**FIGURE 7.2 Benefits of Smart Practice Talangagung Educational Tourism Final Waste Processing Site**

*Source: processed by Knowledge Center team of National Development Planning Agency*
Annexes
# Annex A

## Definition and List of Smart Practice Indicator Operational Terms

<table>
<thead>
<tr>
<th>NO</th>
<th>CRITERIA</th>
<th>PRACTICE</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Impact</td>
<td>Real result (impact) from addressing challenges and improvement of conditions for local communities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Percentage of problems can be addressed.</td>
<td>The smart practice can be a solution for at least X percent of issues the region or within a segment of community.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Number of people receiving positive impacts.</td>
<td>The smart practice can produce positive impact and benefit local communities in improving existing conditions where the practice is implemented. The number of people affected by positive impact at least reaches X percent of the total population living in that area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. New organisational system/rule/mechanism developed from the smart practices.</td>
<td>With the smart practice, a system for managing challenges is developed and government regulations are issued (by the regional government and/or central government), or a new management mechanism is designed. The system/regulation/mechanism developed from the smart practice must be well-documented, so that it can be verified/proven (e.g. regulation copy, mechanism chart, system development process as written documents or photos/videos).</td>
</tr>
<tr>
<td>2</td>
<td>Transferability</td>
<td>The ease in which a smart practice can be replicated by other regions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Having 70 percent of the total number of replication criteria (to determined later).</td>
<td>The selected practice must meet at least 70 percent of total number of designated replication criteria to be called “Smart Practice”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Was replicated for addressing similar or different challenges.</td>
<td>The initiative/process/system of a smart practice management was implemented for different challenges, but was similar in the mapping of issues, political situation, geographic/natural conditions, and social and economic backgrounds. Information on replication can be explored through clear documentation of the smart practice (e.g. guest book/photo/video) as the evidence.</td>
</tr>
<tr>
<td>NO</td>
<td>CRITERIA</td>
<td>PRACTICE</td>
<td>DEFINITION</td>
</tr>
<tr>
<td>----</td>
<td>----------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>3</td>
<td>Feasibility</td>
<td></td>
<td>Feasibility in terms of the institutionalisation and funding mechanisms of the smart practice.</td>
</tr>
<tr>
<td></td>
<td>a. Has simple institutional structure complete with basic organisational functions in planning, operation, and funding to be done by different individuals.</td>
<td></td>
<td>The institutionalisation of a smart practice has a simple management framework, which supports the effectiveness of implementation processes. The institutional framework must have a clear, updated, provable, visible and printable organisational chart as reference to those interested in replicating this component of the smart practice. The organisational functions must also include planning, operation and funding roles of other parties to lessen dependency on smart practice initiators.</td>
</tr>
<tr>
<td></td>
<td>b. Easy to replicate pattern and source of funding, as well as affordable by regional budgeting standards.</td>
<td></td>
<td>The smart practice has a source of funding that is simple and easy to replication for the management of operational activities. The sequence of funding sources must be documented in a funding chart that includes various actors involved in the funding scheme. The chart must be clear, updated, provable, visible, or printable as a reference for those interested in replicating the smart practice.</td>
</tr>
<tr>
<td></td>
<td>c. Clear implementation stages, supported by well-documented materials and manuals.</td>
<td></td>
<td>The implementation stages of the smart practice should be very systematic and divided into planning, implementation, maintenance and development. These stages should be documented clearly in a standard operational procedures (SOP) or a manual.</td>
</tr>
<tr>
<td>4</td>
<td>Innovation</td>
<td></td>
<td>New initiative never developed/attempted before or an adaptation of products, implementation processes, business processes to local conditions from previous smart practice.</td>
</tr>
<tr>
<td></td>
<td>a. As new solutions to address existing challenges.</td>
<td></td>
<td>The smart practice is considered as a new initiative or solution for existing challenges that was never attempted before. An effort to adapt to local conditions that resulted in development or creation of new products, processes, business processes</td>
</tr>
<tr>
<td></td>
<td>b. Conduct preliminary studies/assessments to understand local context and conditions.</td>
<td></td>
<td>Prior to the implementation of a smart practice, initiators or management team conduct a preliminary study/assessment to prepare an adaptation and measure feasibility of the smart practice replication program.</td>
</tr>
<tr>
<td></td>
<td>c. Effort to adapt other smart practices to local contexts and conditions.</td>
<td></td>
<td>A smart practice does not provide solutions to existing challenges but can be adapted with local context and situations, and socio-economic backgrounds of the replicating area.</td>
</tr>
<tr>
<td>NO</td>
<td>CRITERIA</td>
<td>PRACTICE</td>
<td>DEFINITION</td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>Sustainability</td>
<td>The smart practice has been in existence for at least two (2) years complete with detailed action plan and community-based funding that is sustainable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a.</td>
<td>In implementation for more than two (2) years.</td>
<td>The smart practice is at least two (2) years old to ensure that related activities have strong organisational/institutional foundation and robust funding mechanism.</td>
</tr>
<tr>
<td></td>
<td>b.</td>
<td>Local communities are involved in the maintenance of smart practice.</td>
<td>The smart practice involves local communities in the maintenance and operation of activities even when initial funding or management support expired.</td>
</tr>
<tr>
<td></td>
<td>c.</td>
<td>There is a guaranteed funding source available after the smart practice was implemented or beyond two (2) years initial implementation.</td>
<td>The smart practice can guarantee the sustainability of its practice by providing and attempting to generate funds to ensure continuity in the maintenance and operation of activities after initial program or funding expired or exceeded the two (2)-year limit.</td>
</tr>
<tr>
<td></td>
<td>d.</td>
<td>There is a regulatory framework to ensure division of labours and functions of various stakeholders.</td>
<td>The smart practice resulted in issuance of a regulatory framework that recognises activities of the smart practice and regulates the division of labours and functions of various stakeholders. Managers of a smart practice must have copies of existing regulations as verifiable and proven documentations.</td>
</tr>
<tr>
<td></td>
<td>e.</td>
<td>Partnership, scaling up with an addition of the number of the beneficiaries and the products.</td>
<td>An initiative of the smart practice must be developed by involving partnership with the other stakeholders so the number of the parties receiving the benefits and the products resulted from a smart practice increases.</td>
</tr>
<tr>
<td>6</td>
<td>Participative</td>
<td>The smart practice is multi-stakeholder in nature and has participatory system for every implementation stages of the smart practice.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a.</td>
<td>There is a mechanism for community involvement in the planning of smart practice.</td>
<td>The smart practice has a mechanism for community involvement in one or more stages of the smart practice. The mechanism of community involvement in the planning stage should be explicitly mentioned in the planning documents. Managers of the smart practice must have copies of the action plan to ensure a verifiable, proven, implementation of activities that also serves as reference.</td>
</tr>
<tr>
<td></td>
<td>b.</td>
<td>There is a mechanism for community involvement in the implementation of smart practice.</td>
<td>The smart practice has a mechanism for community involvement in one or more stages of the smart practice. The mechanism for community involvement in the implementation stage should be explicitly mentioned in the planning documents. Managers of the smart practice must have copies of the action plan to ensure a verifiable, proven, implementation of activities that also serves as reference.</td>
</tr>
<tr>
<td>NO</td>
<td>CRITERIA</td>
<td>PRACTICE</td>
<td>DEFINITION</td>
</tr>
<tr>
<td>----</td>
<td>----------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Accountability</td>
<td>The smart practice has a mechanism for community involvement in one or more stages of the smart practice. The mechanism for community involvement in the operation stage should be explicitly mentioned in the planning documents. Managers of the smart practice must have copies of the action plan to ensure a verifiable, proven, implementation of activities that also serves as reference.</td>
<td>Relevant stakeholders of the smart practice must be able to explain and implement all components of the practice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. There is a mechanism for reporting activities implemented.</td>
<td>The manager of smart practice has a reporting mechanism to ensure well-documented practices through written documents, photos/video. Reports must be updated regularly in accordance to activities being implemented. Reports should be truthful, verifiable and able to serve as reference.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. There is a mechanism for financial reporting</td>
<td>The manager of smart practice has a financial reporting mechanism that is clear and transparent. Reports must be updated regularly in accordance to activities being implemented.</td>
</tr>
<tr>
<td>8</td>
<td>Pro-poor</td>
<td>The result of a smart practice implementation is designed to provide maximum benefit to poor, vulnerable, and marginalise communities.</td>
<td>The result of a smart practice implementation is designed to provide maximum benefit to poor, vulnerable, and marginalise communities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Marginalised communities benefitted from the implementation of a smart practice.</td>
<td>Activities of a smart practice targets poor communities to receive the benefit of its implementation. This has to be included in the detailed or annual action plan of a smart practice. These marginalised groups is not limited to those living below the poverty line, but also those with limited access to basic services i.e, clean water, health, etc.</td>
</tr>
<tr>
<td>9</td>
<td>Pro-gender equality</td>
<td>From start to finish, the implementation of a smart practice must have equal representation of women and men.</td>
<td>The smart practice involves women in one or more implementation stages (planning, implementation, maintenance, development) and receive benefits from their involvement. This principle must be incorporated and well-documented in routine activities through list of attendance, photos/video, and other verifiable materials for use as reference.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. There is involvement of both genders in the implementation of a smart practice that also benefitted both genders.</td>
<td>The smart practice involves women in one or more implementation stages (planning, implementation, maintenance, development) and receive benefits from their involvement. This principle must be incorporated and well-documented in routine activities through list of attendance, photos/video, and other verifiable materials for use as reference.</td>
</tr>
</tbody>
</table>
# Annex B
## Definition of Operational Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity reporting</strong></td>
<td>Documentation of any task completed by all parties involved in the implementation of smart practice in a particular time.</td>
</tr>
<tr>
<td><strong>Adaptation</strong></td>
<td>A change made as adaptation to the conditions and needs of local context where the smart practice is being implemented.</td>
</tr>
<tr>
<td><strong>Available</strong></td>
<td>Allocated and usable for the continuation of implementing the smart practice.</td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td>Residents or population living around the location of a smart practice.</td>
</tr>
<tr>
<td><strong>Community involvement</strong></td>
<td>Residents or population living around the location of a smart practice taking part in the implementation of a smart practices.</td>
</tr>
<tr>
<td><strong>Completed</strong></td>
<td>A condition in which challenges faced was resolved.</td>
</tr>
<tr>
<td><strong>Completion</strong></td>
<td>A smart practice is a project with specific start and end time according to its initial planning.</td>
</tr>
<tr>
<td><strong>Completing</strong></td>
<td>A condition in which challenges faced are being resolved.</td>
</tr>
<tr>
<td><strong>Different challenges</strong></td>
<td>A type of challenge that is different from challenges faced where a smart practice originated.</td>
</tr>
<tr>
<td><strong>Easy to replicate</strong></td>
<td>A smart practice has implementation stages that are uncomplicated, well and clearly-documented as written document/manual that is available for learning by others.</td>
</tr>
<tr>
<td><strong>Ended</strong></td>
<td>End of implementation.</td>
</tr>
<tr>
<td><strong>Ever</strong></td>
<td>Evidence that a smart practice was implemented by different parties in other region/area at least once.</td>
</tr>
<tr>
<td><strong>Evidence form</strong></td>
<td>Evidence of a smart practice that is recorded as data, information, document, of text in the form of digital data, video, or audio, etc.</td>
</tr>
</tbody>
</table>
Feasibility  A condition where the institutionalisation and funding mechanisms of a smart practice support the successful implementation of that practice.

Financial reporting  Documentation of all forms of income and expenses during a particular period used as control of cash flow by managers of a smart practice.

Formal regulation  An official government regulation at various levels of government issued to support the continuous implementation of a smart practice.

Gender  Individual male and female with relation to equality and representation in the implementation of a smart practice.

Has been (was) done  The term used to describe a period since the first implementation of a smart practice to the assessment that is at least two (2) years.

Involved  Participated, engaged, contributed in the implementation of a smart practice.

Maintenance  An activity performed to maintain well-functioning equipments, infrastructure, and properties. Maintenance should be done to prevent the high cost of early upgrade or replacements.

Mechanism  Procedures

Meeting the 70 percent  There are nine (9) criterias to determine if a development practice can be considered a smart practice. If a region meets 70 percent of the set criteria, an initiative can be called a smart practice.

New solution  A new unprecedented way of addressing a challenge.
Operation: The implementation of a smart practice that produces benefits and positive impacts in line with the planning's objectives.

Organisation: Institutional structure.

Organisational structure: A mechanism that determines the roles and functions of an institution.

Other regions: Places other than the location where a smart practice is being implemented.

Owning: Evidence of a written document that can be mentioned or showed.

Pattern: Mechanism, procedures.

Planning document: A document containing the initial plan of a smart practice that includes objectives, outputs, activities, implementation procedures, implementation schedule, duties and functions of individuals involved.

Positive impact: A change in condition or improvement from previously condition as a result of the implementation of a smart practice.

Preliminary study: An initial study on the local conditions, target beneficiaries, potential impacts, and preparedness of initiators in carrying out activities prior to planning for a smart practice.

Problem: A discrepancy between the number and quality of public services in reality in the field.

Regulation: Written policy or rule.

Replication: An adaptation of a smart practice to suit local context and conditions.
<table>
<thead>
<tr>
<th><strong>Resulted</strong></th>
<th>Byproducts of a smart practice implementation.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Similar challenge</strong></td>
<td>A type of challenge that is similar to challenge faced where the smart practice originated.</td>
</tr>
<tr>
<td><strong>Simple</strong></td>
<td>Simple, uncomplicated, and close to common rules within an institutional arrangement at local level.</td>
</tr>
<tr>
<td><strong>Simple program funding</strong></td>
<td>The implementation budget is within the standard costs of regional budget plan.</td>
</tr>
<tr>
<td><strong>Source of funding</strong></td>
<td>Source of funds accessed for the implementation of a smart practice.</td>
</tr>
<tr>
<td><strong>System</strong></td>
<td>A single unit of regulations, mechanism, organisation and human resources that determine the division of duties, responsibilities and functions of relevant stakeholders in managing a smart practice.</td>
</tr>
</tbody>
</table>
Annex C  
WASTE MANAGEMENT RULES

Waste management consists of control of waste generation, waste collection, transfer and transport, processing and final processing.

1. Waste Generation
   Ideally, to know the amount of waste generation, a study must be conducted. For practical purpose, the Ministry of Public Works has stipulated some standards, one of which is the SK SNI S-04-1993-03 that the waste generation for moderate cities amounts 2.75-3.25 liters/person/day or 0.7-0.8 kg/person/day.

2. Source of Waste
   a. Waste coming from high-, moderate-, and low-income settlements.
   b. Waste coming from commercial places such as market, shops, restaurants, hotels, etc.
   c. Waste coming from public facilities, such as schools, hospitals, offices, meeting halls, parks, football stadium, etc.
   d. Waste coming from social facilities, which are urban infrastructures for social interests, such as mosques, churches, orphanage, etc.
   e. Other sources.

3. Types of Waste
   a. Organic waste, the waste that easily decomposed naturally, e.g. leaves, twigs, vegetables and fruits.
   b. Non-organic waste, the waste difficult to decompose and cannot decomposes naturally, e.g. paper, plastic, cans.
   c. Specific waste (containing dangerous substances, waste, building debris).

4. On site handling
   On site handling is all treatments toward waste before it is placed in the disposal. The activities cover sorting, reuse, and recycle. The main objective of the activities at this stage is to reduce the amount of waste pile.

5. Collecting
   Consist of collecting waste from its sources to the location of Temporary Shelter (TPS), generally done using a cart.
6. **Transfer and Transport**  
Consist of transfer and transport of waste from Temporary Shelter to the Final Waste Processing Site.

7. **Treatment**  
Various alternatives are available in waste treatment, including:
   a. Physical transformation, including waste components sorting and waste compacting, to ease storage and transport.
   b. Incinerate, can reduce the volume of waste up to 90-95 percent, but it is not suggested as it may cause air pollution.
   c. Composting, a process of waste decomposition accelerated by adding organic fertiliser or, if necessary, manufactured fertiliser, such as urea.
   d. Energy recovery, a transformation of waste into energy, either heat energy or electrical energy.

8. **Final Processing**  
Based on the operational system, there are three methods of waste final processing:
   a. **Sanitary Landfill**  
   Landfill that has taken into account the environmental sanitation aspect. Waste is placed in a basin with waterproof layer at the bottom, complete with pipes collecting and channeling leachate. The waste is spread over and compacted. Every day at the end of operation, the waste is covered with covering soil and compacted. The thickness of the layer is 10-15 percent of the waste layer to prevent growth of diseases, vectors and environmental pollution. The following day, the waste is spread and compacted than covered with covering soil, and it goes on. There are channels of gas to process the methane gas produced from organic waste degradation process.

   b. **Controlled landfill**  
   Controlled landfill is an improvement or upgrade of open dumping method, but not as good as sanitary landfill. In this scheme, the bottom is covered by a geomembrane layer. The daily soil covering is done every 5-7 days. After the term is completed for a particular area, a final covering is applied.

   c. **Open dumping scheme**  
   The open dumping scheme is most frequently implemented in Indonesia. The waste is disposed without any follow-up treatment, left decomposing to be a land suitable for the growth of bacteria and other disease vectors, causing unpleasant smell and reducing aesthetic value and environmental beauty.
9. Waste allocation method
   a. Method for flat areas is done by accumulating waste lengthwise on a land spread. Every layer of waste is compacted then covered with covering materials at the thickness of 15-20 cm.
   b. Semi-anaerobic landfill method to accelerate waste degradation process and to reduce negative impacts of leachate.
   c. Aerobic landfill method by adding some oxygen into the pile of waste to accelerate waste degradation process, so stable materials such as compost can be produce.
   d. Reusable landfill method by using materials dug from the old Final Waste Processing Site and formerly dug places to receive more waste.
Annex D
Regions Replicating Smart Practice Talangagung Educational Tourism Final Waste Processing Site

1. Tlekung Final Waste Processing Site, Batu City, East Java Province, covering an area of 4.6 Ha.
2. Supit Urang Final Waste Processing Site, Malang City, East Java Province, covering an area of 16 Ha.
3. Benowo Final Waste Processing Site, Surabaya City, East Java Province, 1 waste cell covering an area of 0.5 Ha.
5. Kenep Final Waste Processing Site, Beji District, Pasuruan Regency, East Java Province, covering an area of 2.5 Ha.
15. Puwatu Final Waste Processing Site, Kendari City, South-East Sulawesi Province, covering an area of 16 Ha.
17. Cahaya Kencana Final Waste Processing Site, Banjar Regency, South Kalimantan Province.
18. Final Waste Processing Site of Banjarmasin City, South Kalimantan Province.
19. Maburai Final Waste Processing Site of Tabalong Regency, South Kalimantan Province.
27. Final Waste Processing Site of Barru Regency, South Sulawesi.
28. Final Waste Processing Site of Semarang City, Central Java Province.
32. Final Waste Processing Site of Madiun City, East Java Province.
33. Final Waste Processing Site of Tuban City.
34. Final Waste Processing Site of Pekalongan City, Central Java Province.
35. Final Waste Processing Site of Pemalang City, Central Java Province.
36. Final Waste Processing Site of Banyumas Regency, Central Java Province.
37. Final Waste Processing Site of Blitar City.
38. Final Waste Processing Site of Pasuruan City.
41. Final Waste Processing Site of Bondowoso Regency.
42. Final Waste Processing Site of Majalengka Regency.
43. Final Waste Processing Site of Indramayu Regency.
44. Final Waste Processing Site of Cirebon Regency.
45. Final Waste Processing Site of Magetan.
47. Final Waste Processing Site of Tanjung Pinang City.
49. Final Waste Processing Site of Kalinda Lampung.
50. And some Final Waste Processing Site which have not been documented.