

Better environment for the future

Saving landfill usage/cost

| Input waste material  | Weight  | Volume   |
|-----------------------|---------|----------|
| Food waste            | 0.9 t/d |          |
|                       | 329 t/y | 329 m3/y |
| Sewage sludge (TS2%)  | 1.4 t/d |          |
|                       | 511 t/y |          |
| Sewage sludge (TS20%) | 51 t/y  | 46 m3/y  |
|                       | 380 t/y | 375 m3/y |

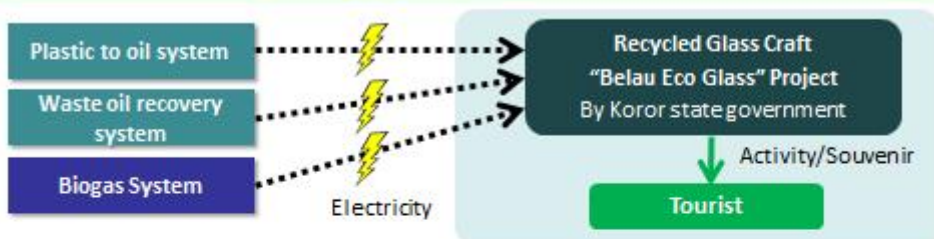
GHG reduction

|                               |            |
|-------------------------------|------------|
| GHG reduction                 | 924 tCO2/y |
| Energy oriented CO2 reduction | 108 tCO2/y |

Saving imported chemical fertilizer

|   |            |
|---|------------|
| Equal value of the liquid fertilizer                |            |
| N40%-P0-K0 Urea (sold in Palau)                     | 3.1 kg/t   |
| N6%-P24%-K24% (sold in Palau)                       | 3.4 kg/t   |
| total   | 6.5 kg/t   |
| Planned providing amount of liquid fertilizer (15%) | 164 t/y    |
| Total amount of substituting chemical fertilizer    | 1,059 kg/y |

Contribution to create local Eco-tour industry

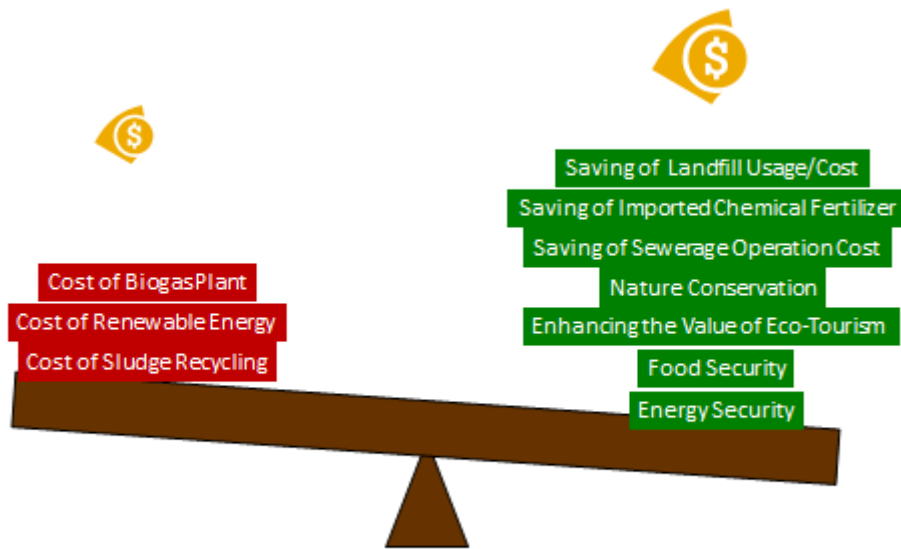


➤ Aiming to Contribute to create local Eco-industry using energy/material from waste



"Belau Eco-Glass" test studio of Koror state solid waste management office

## Comparison of the Value for PALAU



*Which is more valuable for our future generation ?*

## Financing and Mid-term Schedule

| Mid term schedule | Reference                               |                          | Biogas System   |   |   |  |
|-------------------|---|--------------------------|---|---|---|--|
|                   | New National Landfill Construction Plan | PPUC STP construction PJ | Construction<br>JICA Grant for Overseas expansion for Small and Medium Enterprise (SME) Investigation/Transfer FY2019_1st | Detail Investigation and Design Phase<br>MOE Grant for Overseas expansion of circulation Industry In Japan FY2019_1st | MOE Grant for Overseas expansion of circulation Industry In Japan | Construction<br>Green Climate Fund(GCF)                            |
| January           | JICA investigation                      | Detail Design            |   |   | Basic Design  | Preparing Concept Note   |
| February          |   |                          |   | Application   | Consensus building  | Arrangement w/ KSG, NCA.   |
| March             |   |                          |   |   |   |  |
| April             | Screening                               |                          |   |   |   |  |
| May               | → Bidding                               |                          |   |   |   |  |
| June              | → Construction                          |                          |   | Application   |   |  |
| July              | (Building charging system)              |                          |   |   |   |  |
| August            |   | Construction             |   | Detailed Design, Planning for construction and operation  |   | Screening process  |
| September         |   |                          |   |   |   | → Approval at the board meeting (Minimum 6 months from submission) |
| October           |   |                          |   |   |   |  |
| November          |   |                          |   |   |   |  |
| December          |   |                          |   |   |   |  |
| January           |   |                          |   |   |   |  |
| February          |   |                          | Application   |   |   |  |
| March             |   |                          |   |   |   |  |
| April             |   |                          |   |   |   |  |
| May               |   |                          |   |   |   |  |
| June              |   |                          | Application   |   |   |  |
| July              |   |                          |   |   |   |  |
| August            |   | Operation                |   |   |   |  |
| September         |   |                          | Construction  |   |   |  |
| October           |   |                          |   |   |   |  |
| November          |   |                          |   |   |   |  |
| December          |   |                          |   |   |   |  |
| January           |   |                          |   |   |   |  |
| February          |   |                          |   |   |   |  |
| March             |   |                          |   |   |   |  |
| April             |   |                          |   |   |   |  |
| May               |   |                          |   |   |   |  |
| June              |   |                          |   |   |   |  |
| July              | Operation                               |                          | Operation   |   |   |  |
| Remark            | → 2019/2020?                            |                          | Maximum: 1M USD   | Maximum: 300 K USD  |   |  |

## Challenge/Key Point for Success

- How to secure the input materials
  - Food waste
    - Plan/situation of promoting pig farming?
    - Collaborating with resort project >> raising land value as eco-resort
  - Sludge
    - Whether the planned amount is attractive for PPUC or not?
  - Other possible source?
    - Septic tank sludge
    - Shredded cardboard
- Improve the balance of the cost/benefit
  - ↓ Initial/O&M cost
  - ↑ Providing value (electricity, liquid fertilizer)
- Financing
  - Find other possible financing sources for the initial cost to be compensated

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## Improvement in Waste Management and Recycling

Cases in Asian Cities

February, 28th, 2017

 MITSUBISHI RESEARCH INSTITUTE, INC.  
Environment and Energy Division

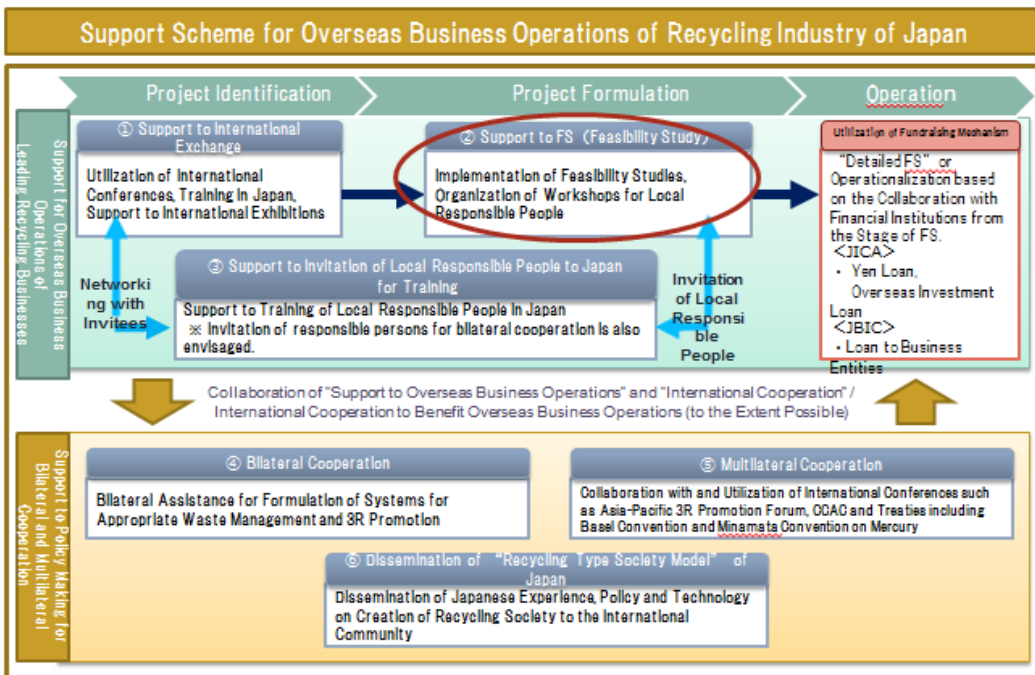
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## 1. MOE Project and MRI

- MRI conducts a MOE project for improving waste management (WM) and recycling in Asia and Pacific Regions through introducing system and technology of Japanese WM and Recycling industry.
- Business Target
  - Waste collection and transport service
  - Recycling
  - Waste to Energy
  - Appropriate treatment of hazardous waste
- Supported projects since 2011
  - More than 70 projects

## 1. MOE Support Scheme



## 2. Trend of Waste Management and Recycling in Asia Countries

- Closure of open dumping site
  - Transition to the managed landfill site
  - Promotion of appropriate treatment of hazardous waste
  - Promotion of recycling of municipal solid waste
  - Introduction of Waste to Energy

< Landfill site / Collection of hazardous waste in Philippines >



Photo by MRI

## 2. Challenges of improvement of WM and Recycling in Asia Countries

- Legal system and governance
  - Enforcement of legal systems
  - Awareness of citizens
- Technology
  - Appropriate treatment
  - Recycling
- Education
  - Citizens for segregated collection
  - Operators for efficient operating of facilities
- Financing
  - Insufficient budget / tipping fees of local government
    - ✓ Still responsibility of local government in PPP cases...
  - Small market for recycled products / recovered energy

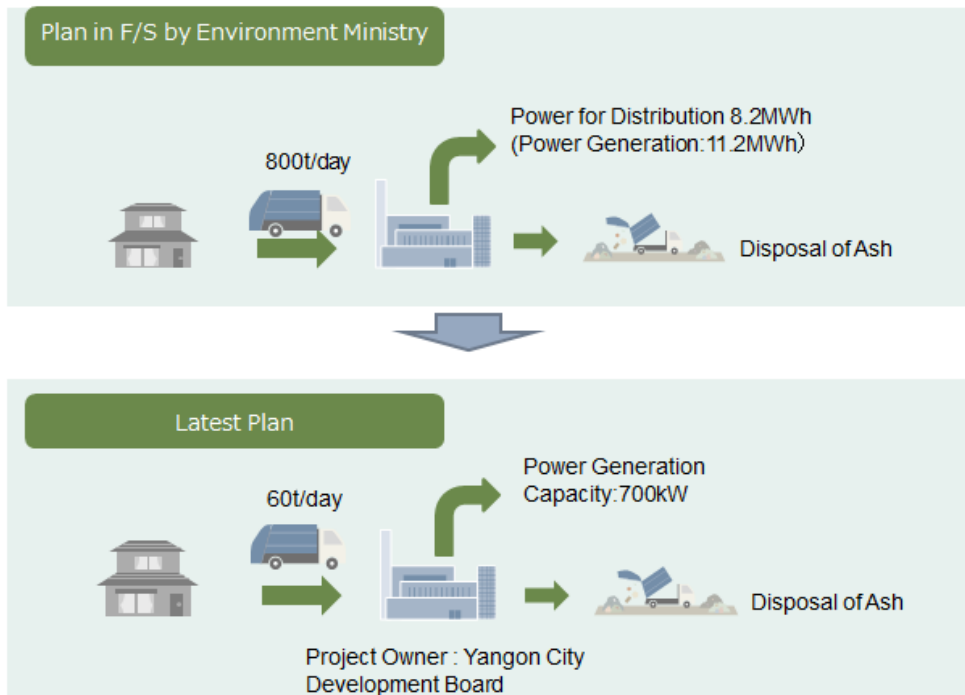
### 3. Case of WtE facility in Myanmar

- WtE facility in surrounding of Yangon, a largest city in Myanmar
- Planning of facilities with 800t/d in feasibility study of JFE Engineering
- Financial analysis in the feasible study project
  - PPP : need high price for generated power, grant fund, subsidies
  - Independ management : difficult realize it
- Down sizing of capacity
  - Capacity 800/t day was financially difficult for Yangon City.
  - Capacity 60t/d would be feasible for Yangon City with subsidy of MOE-J.



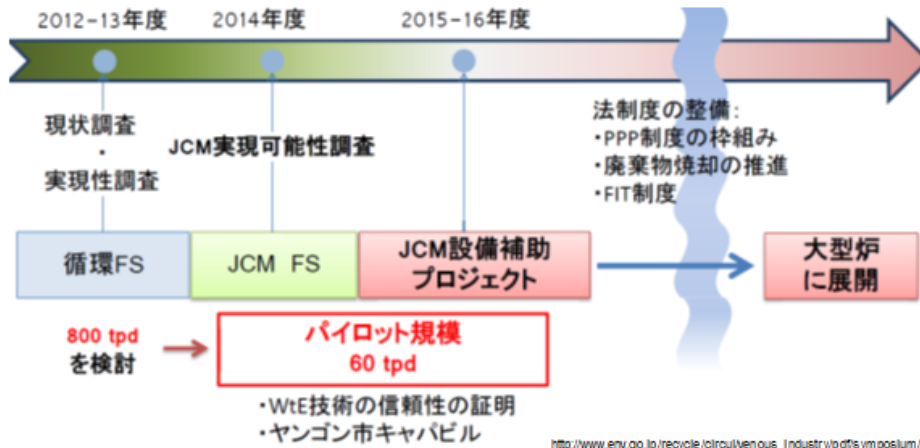
<http://www.jfe-eng.co.jp/en/news/2015/20151112.html>

### 3. Case of WtE facility in Myanmar



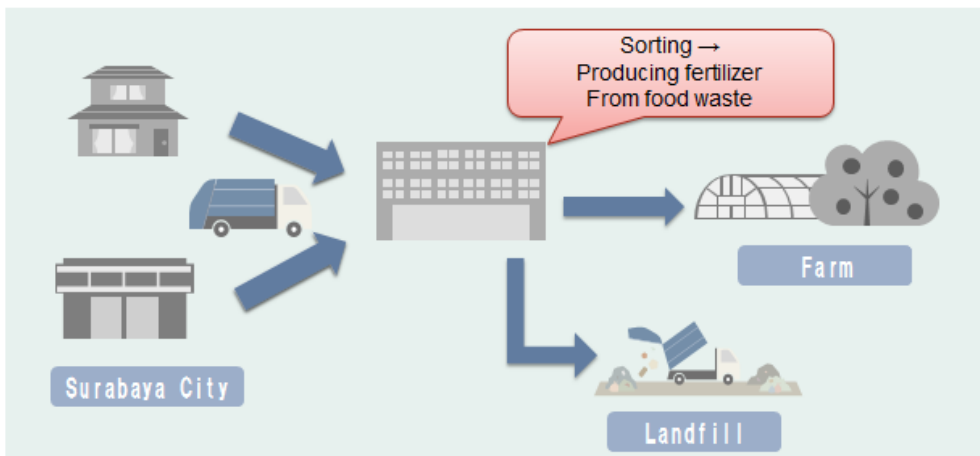
### 3. Case of WtE facility in Myanmar

- Starting from small size pilot WtE facility
  - Verify the WtE technology
  - Capacity building in Yangon City
- Developing to larger size facilities
  - Legal system (Incineration, PPP, FIT )



### 4. Case of Sorting center in Indonesia

- Sorting facility center in Surabaya city in Indonesia
- Planning of introducing of recycling facilities
- Feasibility study of Nishihara Corporation found out needs for sorting center prior to recycling / landfilling



## 4. Case of Sorting center in Indonesia



Photo from Nishihara Corporation

## 5. Recommendations from cases in Asian Cities

- Starting from pilot / small
  - Check the feasibility and applicability
  - Understanding by stakeholders
  - Step up to larger
- Showing the actual case
  - How to do, What to do
  - Benefit and effectiveness
- Consider the way for sustainability
  - Understanding for necessary cost
  - Increasing efficiency and value