Briefing for Request for Proposals on Landfill Conservation

13 April 2018
**Agenda**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Time</th>
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<tbody>
<tr>
<td>1</td>
<td>Background on the Closing The Waste Loop R&amp;D initiative</td>
<td>14:00</td>
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<tr>
<td>2</td>
<td>Request for Proposals on Landfill Conservation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Scope</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Reference Values</td>
<td>14.15</td>
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<tr>
<td></td>
<td>c. Sampling of IBA/IFA</td>
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<td></td>
<td>d. Administrative Details</td>
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</tr>
<tr>
<td>3</td>
<td>Q&amp;A</td>
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<td>4</td>
<td>End</td>
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</table>
1 Background on CTWL
Programme Objectives
Closing the Waste Loop

**Strengthen resource resilience, enhance liveability and sustainability**

- **Landfill Avoidance**
  - Convert residues to resources

- **Value Capture**
  - Create societal and economic value

- **Resource Efficiency**
  - Improve segregation and material recovery yield
  - Improve labour productivity
  - Improve energy efficiency
  - Minimise water usage

- **Maintaining high levels of public health**
  - Maintain a clean and liveable environment
  - Minimise environmental impacts

- **Extend Semakau Landfill lifespan to beyond 2035**

- **Contribute to SSB target of 70% recycling rate**

- **SSB vision of a liveable and sustainable city**
Singapore’s Waste Management System

**Total Waste Generated**
- 21,107 t/d

**Non-Incinerable Waste**
- 616 t/d
  - 3%

**Incinerable Waste**
- 7,827 t/d
  - 37%

**Total Recycled Waste**
- 12,943 t/d
  - 61%

**Recyclable Waste**
- 12,664 t/d
  - 60%

**Metals Recovered**
- 279 t/d

**Ash**
- 1,531 t/d

2017 figures
At the current rate of waste disposal, we will need to build:

1. WTE Plant
   Every 7-10 years

2. Landfill
   Every 30-35 years

Semakau Landfill
Programme Themes

Closing the Waste Loop

Theme 1: Segregation and Value Recovery

Theme 2: Landfill Conservation

Residue to Resource

Theme 3: Environmental Remediation

Landfill Remediation


Electricity

Recycling

Collection

Landfill

Ash

Waste-to-Energy

Consumers

Commercial & Retail

Residential

Factories & Industries

Producers

Theme 4: Digital and Data-Driven Management Systems
Programme Themes

Focus Areas

Closing the Waste Loop R&D Programme

Theme 1: Segregation and Value Recovery
- Hydrometallurgy methods for e-waste recycling
- Sustainable and bio-benign plastic packaging materials
- Food waste conversion to energy and nutrients

Theme 2: Landfill Conservation
- Cost-effective & energy efficient treatment processes for incineration ash and non-incinerable waste
- Treatment for recycling of industrial residues
- Novel applications for incineration bottom ash/residues

Theme 3: Environmental Remediation
- Rapid site investigation and assessment methods
- Cost-effective remediation technologies
- On-site treatment of soil and residues

Theme 4: Digital and Data-Driven Management Systems
- Analysis of waste generation and management in the whole value chain
- Modelling and simulation to inform on planning and policy decisions
- Influence human behaviour through behavioural science
Request for Proposals on Landfill Conservation
Details of Grant Call

Innovative proposals are sought to process the IBA and/or IFA into:

Outcome A: Aggregates for construction industry; AND/OR
Outcome B: Novel materials for industrial or commercial applications
Aggregates for construction industry

i. unbounded loose form for replacement of conventional aggregates in construction industry
e.g. road sub-base layer and non-structural concrete

ii. meet the Reference Values and specific requirements prescribed by relevant authorities
e.g. aggregates for road sub-base with LTA’s material specifications

iii. provide estimations of the cost effectiveness and resource efficiency vs state-of-the-art technologies and have significantly lesser environmental impact
e.g. lesser water and energy consumption, raw material inputs, waste generation, emissions and pollution etc
Details of Grant Call – Outcome B

Novel materials for industrial/commercial applications

i. processed into novel material/product
   e.g. light weight aggregates, refractory materials and catalyst

ii. highlight the characteristics of ash favouring the application

iii. describe the life cycle of the material/product developed
    e.g. the manufacturing process, storage, use and the eventual
disposal and fate of the material/product

iv. cost effectiveness and resource efficiency vs state-of-the-art
technologies and environmental impact

v. meet the Reference Values and/or any other
   requirements/standards for safe use of the material/product
Details of Grant Call

For all proposals:

i. Show process flow and include technical details
e.g. mass/energy balance, important intermediate products,
identification and treatment of the potential waste, waste water,
emissions and by-products

ii. illustrate the novelty and/or innovations of the technique

iii. Ideally use all IBA and/or IFA in its entirety

iv. Encourage consortiums with demo/prototyping capabilities for
end-to-end solutions.
Technology Readiness Level <5 should include development of
prototypes/demonstrating the proof-of-concept
### Reference Values for IBA Use

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample Preparation Method</th>
<th>Test Method</th>
<th>Maximum Allowable Value (in terms of mg of parameter / kg of dry material)</th>
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<tbody>
<tr>
<td>Antimony</td>
<td>BS EN12457-1:2002</td>
<td>USEPA 6010C or APHA 3120B</td>
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<tr>
<td>Arsenic</td>
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<td>USEPA 7196A or APHA 3500-Cr (B)</td>
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<tr>
<td>Barium</td>
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<tr>
<td>Cadmium</td>
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<td>USEPA 6010A or APHA 3125B</td>
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<td>Chromium (total)</td>
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<td>USEPA 6010C or APHA 3120B</td>
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<td>Chromium (VI)</td>
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<td>Cobalt</td>
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<td>Copper</td>
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<td>Manganese</td>
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<td>Mercury</td>
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<td>Molybdenum</td>
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<td>Selenium</td>
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<td>Tin</td>
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The Maximum Allowable Values are subject to review.
Sampling of IBA/IFA

i. Interested applicants may request for ash sample collection on the following dates
   ○ 24 Apr 2018
   ○ 8 May 2018
   ○ 22 May 2018

ii. Interested applicants are to submit the duly filled sample request form to the Secretariat at least 3 days in advance of the desired collection date

iii. Applicants will be notified of the designated collection site and are required to bring their own containers for collection
Application Instructions

• Submission via the Integrated Grants Management System (IGMS) at https://researchgrant.gov.sg

• Applicants have to register and activate their account to log into the IGMS.

• All applications must be endorsed online by the Director of Research (or equivalent) and lodged in the IGMS by **25 Jun 2018, 11 am** Singapore Time.

• Successful proposals will be notified in writing by Dec 2018.

• Details are also available on NEA’s website http://nea.gov.sg/grants-awards/closing-the-waste-loop-initiative

Please note that IGMS is scheduled for maintenance in April and May 2018
Eligibility

The RFP is to support R&D work carried out in Singapore and is extended to the following organisations.

• Institutes of Higher Learning (IHLs)
• Public sector agencies
• Research Institutes
• Singapore-registered companies
### Evaluation Criteria

<table>
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<th>S/N</th>
<th>Evaluation Criterion</th>
<th>Weightage (%)</th>
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<tbody>
<tr>
<td>1</td>
<td>Sustainable waste management solution for Singapore</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>Technological competency and manpower capability building</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Value for money</td>
<td>25</td>
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<tr>
<td>4</td>
<td>Execution capabilities</td>
<td>10</td>
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<tr>
<td>5</td>
<td>Potential for other market applications</td>
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**Total Score** 100
Budget and Schedule

<table>
<thead>
<tr>
<th>Entities</th>
<th>Funding</th>
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</thead>
<tbody>
<tr>
<td>IHLs, public sector agencies and not-for-profit organisations</td>
<td>Up to 100% funding support for approved qualifying direct cost items of a project.</td>
</tr>
<tr>
<td>Singapore-registered companies and for-profit research organisations</td>
<td>Up to 70% of the approved direct qualifying costs of a project</td>
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</table>

- The applicant and its collaborators should provide in-kind services, industry spending, and tangible contributions towards the proposed project.

- Project duration shall not exceed 3 years
For Enquiries

For RFP related matters, please contact :

Mr Bai Yihao
DID: 6731 9091
Email: bai_yihao@nea.gov.sg

Mr Seow Teow Gay
DID: 6731 9465
Email: seow_teow_gay@nea.gov.sg

For IGMS-related matters please contact :

helpdesk@researchgrant.gov.sg
Our Environment

Safeguard • Nurture • Cherish