ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

Australian Government
Department of Foreign Affairs and Trade

ADB

# Battambang Smart Solid Waste Financial Management

## Diagnostics and Readiness Assessment

December 2021

| | |
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| **Project No.** | 1100040737-007 |
| **Recipient** | Asian Development Bank |
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| **Date** | 20 January 2022 |
| **Prepared by** | Claus Klitholm |
| **Checked by** | Pau Prat Busquets |
| **Approved by** | Hillarie Cania |
| **Description** | Diagnostics of waste management services and readiness assessment for smart solutions |
| **Cover Image** | Humphrey Muleba, unsplash.com |

# Introduction

**Battambang Smart Solid Waste Financial Management Project**

1. The Battambang Smart Solid Waste Financial Management project under AASCTF and SURF was initiated in April 2021, as outlined in the respective Task Order endorsed May 2021.

2. The Task Order outlines the solid waste management challenges in Battambang, and the benefit of introducing smart, digital solutions to both improve management across this sector and to leverage ongoing associated infrastructure projects. The approach of the project will be via collaboration with all key stakeholders in order to provide transparent, documented decision-making, and progress throughout the project.

3. The project shall produce 3 key outputs (D1, D2 and D3) at the conclusion of each of the 3 stages of the project. This D1 document is the first of these, which aims to document Stage 1 – the diagnostics assessment of the current solid waste management in Battambang and its challenges, and a readiness assessment for implementation of smart digital solutions supporting the overall project objective.

# Contents



## Appendices

# AASCTF: Background and Purpose

**In 2019, the ASEAN Australian Smart City Trust Fund (AASCTF) was established as a single donor Trust Fund financed by the Australian Government and managed by the Asian Development Bank (ADB).**

The Fund has an operational focus on building livable cities in the ASEAN region with the aspiration to develop green, competitive, inclusive, and resilient urban environments. This is consistent with ADB's Strategy 2030 and the ASEAN's Sustainable Urbanization Strategy which aims to promote high quality of life, competitive economies, and sustainable environments. In total, AASSCTF collaborates with 24 participating cities across 8 ASEAN countries.

**Scope of work**

The Fund will support activities that will enable cities to facilitate adaptation and adoption of digital solutions, and enhancement of governance systems in the participating cities. The Fund will support project preparation and implementation, financing and associated capacity development in 1) City planning systems, 2) Service delivery and 3) Financial management.

## Key Functional Areas

**City planning systems** could include collecting, storing, analyzing, and utilizing data on a geospatial platform, and activities such as data interpretation, location intelligence, or crowd sourcing of data.

**Service delivery** could include smart network management systems, real-time operational management of assets, and use of algorithm-based models for planning.

**Financial management** could include activities developing a seamless integration of the entire budget cycle from planning, budgeting, implementation, and reporting to ensure limited financing is utilized in the most efficient manner and promotes better transparency and accountability.

*In each of these areas, the Fund will prioritize digital solutions which enhance gender equality and women's empowerment, social inclusiveness and address climate change.*

# Battambang Smart Solid Waste Financial Management (SSWFM)

**In May 2021, a Task Order (TO) for the city of Battambang was endorsed by the procurement division of ADB. The TO recognizes the ASEAN Smart City Action Plan of Battambang, which stipulates the ambition to achieve a socially responsible, environmentally friendly, and economically successful city.**

A clear focus of the Action Plan is on improving the quality of the environment, including raising awareness on solid waste management. During the initiation phase of this TO, a consensus was reached to focus on smart solutions for financial management in the waste and circular economy sector.

**Scope of work**

In this context, the scope of work for this TO is to assess the current situation of the solid waste management and operations in Battambang, identifying the main challenges and barriers for improvement. In parallel, the digital readiness will be assessed to support identification of opportunities for implementation of smart digital solutions to improve and develop solid waste public services.

# Battambang Smart Solid Waste Financial Management (SSWFM)

## Key Stakeholders

Battambang province has worked closely with ADB and Ramboll on the TO, as well as with the Battambang municipality, its service providers for waste collection, and other relevant projects in the region.

Going forward, collaboration between public bodies, with other projects, and with private sector will become increasingly important.

## Time Plan

The first phase of the TO commenced in May 2021 and is planned to be completed by February 2022. It includes three stages:

- **Stage 1:** Diagnostics and readiness assessments
- **Stage 2:** Option analysis
- **Stage 3:** Pilot scoping

## Key Deliverables

Each of the three stages will be documented in a deliverable, planned respectively for December 2021, January 2022, and February 2022.

In addition to a kick-off meeting, 2 workshops will be held: one will be a Stakeholder Consultation Workshop concluding Stage 1 with presentations of findings and recommendations; and the second will be a Framing Workshop that will involve key stakeholders to discuss and review more detailed ideas for pilot scoping.

# Approach and Performed Activities

## General approach

Initially, the approach for the diagnostics and readiness assessments was to undertake substantial preparatory works including desktop research on relevant projects, initiatives, and reports, convening initial meetings and interviews with key stakeholders, and organising site visits to meet with key stakeholders in person and discuss initial findings.

Due to Covid-19 restrictions, the approach has been challenged and the activities have had to be re-arranged and re-scheduled. Consequently, the time plan of the TO has been continuously modified, and the volume of site meetings, site visits, and interviews has been reduced.

## Diagnostic Assessment

The purpose of the Diagnostic Assessment was to understand and describe both the current situation for solid waste management, and to identify challenges and barriers for improvements. Thus, a key prerequisite for achieving this are stakeholder engagements.

Between May 2021 and November 2021, stakeholder engagements have been limited to online calls mainly with Battambang province. On 20 September 2021, the TO team facilitated a formal kick-off meeting with representatives from the Battambang province and ADB, agreeing on an updated scope and timeline for the TO.

Preparatory works on the Diagnostic Assessment continued throughout this time, including meetings with representatives from other relevant projects in the region and in Cambodia. These representatives included government officials, local service providers, and national and international organizations, and NGOs. An appendix includes the list of meetings and stakeholder consultations.

The Ramboll task team conducted the first field visit in Battambang on 8–12 November 2021. The team visited solid waste facilities (e.g., Cintri and Leap Lim dumpsites), the new landfill under construction, communities, and local markets. The team also conducted a series of meetings with government officials from Battambang Provincial Hall and Battambang Municipality, and the team met local service suppliers. An appendix includes the list of meetings and filed visits conducted.

The stakeholder consultations together with field visit and the stakeholder consultation workshop allowed the team to develop the diagnostic assessment and identify which are the key issues, challenges, and trends impacting the solid waste sector in Battambang. *Those are summarized in the following pages.*

# Approach and Performed Activities

## Readiness Assessments

The purpose is to understand the current use of IT and digital tools for planning, monitoring, and administration related to solid waste management. Similar to the Diagnostic Assessment, this understanding can only be obtained by having stakeholder engagement and site visits.

With the international and national travel restrictions, it was decided to limit physical involvement from the Ramboll task team to only two persons, while the remaining team developed the questionnaire and guidelines for meetings. With this approach, satisfactory knowledge required for all assessments were obtained via online meetings in combination with a single site visit in November 2021.

## Stakeholder opinion on diagnostics and readiness assessments

The outcomes and main findings of the assessments were incorporated in the engagement workshop presentations, see slide 28-31 in the annex to this report.

The findings were explained to the participants, who were invited to a Menti platform to give their vote on to what they agree with the statements in the assessments.

In the voting, a score of -1 could be used if a participant disagreed with the statement. Likewise, a score of 1 could be used if participant agreed to the statement.

On left of the following slide, the 8 key findings are listed as presented in the workshop, and on the right side the final voting result of the participants is show following the same order of topic no. 1-8. This is a screen image from the workshop and unfortunately only available in Cambodian language.

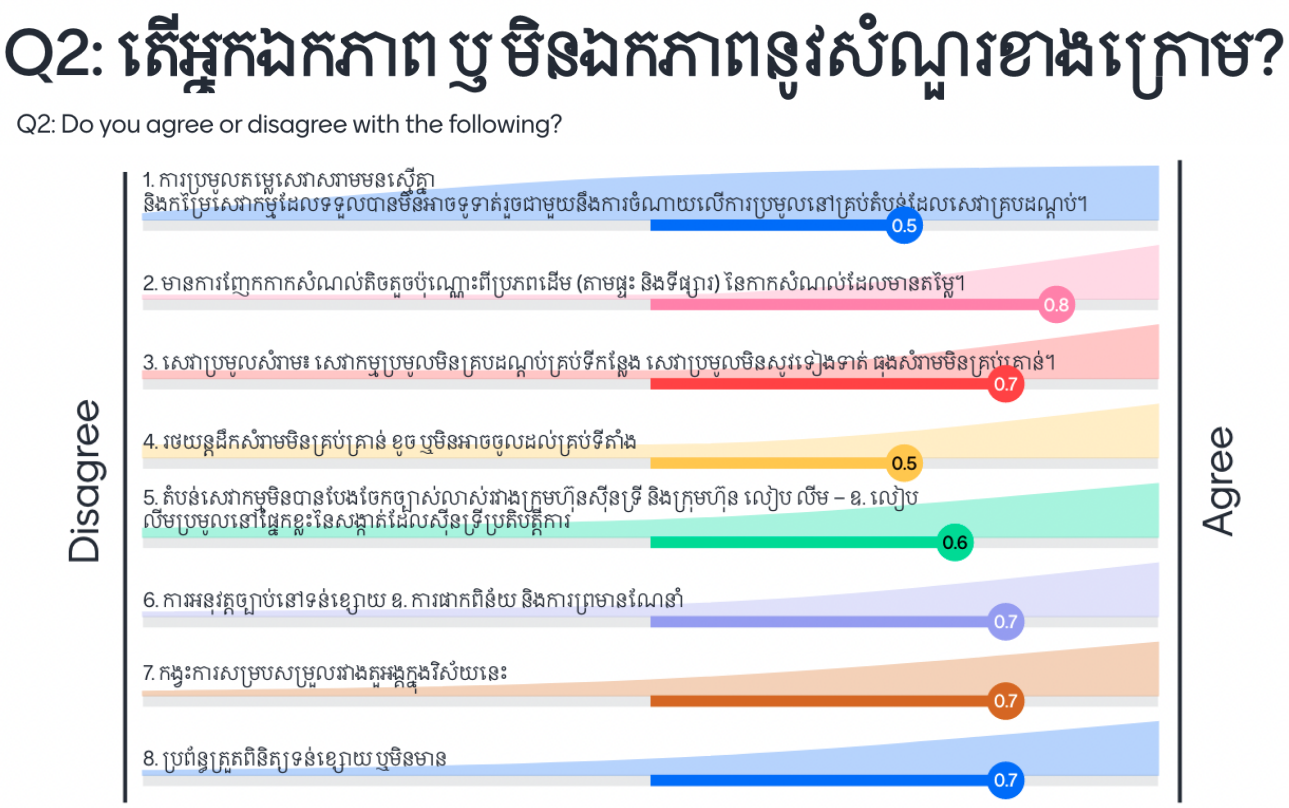
The result of the participants voting is quite clear:

- All findings score between 0.5 and 0.8, which shows that there is quite degree of alignment in perception and understanding of the current situation.
- 5 out of 8 topics are scored with a minimum of 0.7 which shows a very good degree on alignment on these topics.
- Only little difference between the highest score and the lowest score, which shows that all findings describes the current situation in a manner which can be recognized by local stakeholders.

# Approach and Performed Activities

## Issues / Assessment of Situation

1. Uneven waste fee collection and costs not recovered in all service areas.
2. Only basic waste segregation at sources (households and markets) of higher value waste.
3. Collection services: Inadequate service coverage; insufficient collection frequencies; insufficient waste containers.
4. Collection trucks inadequate, breaking down, or not able to access all areas.
5. Service areas not clearly divided between CINTRI and Leap Lim – e.g., Leap Lim collects in some parts of *sangkats* under CINTRI.
6. Weak enforcement of regulations, e.g., fines and warnings.
7. Lack of coordination between actors in the sector.
8. Weak or non-existing monitoring system.



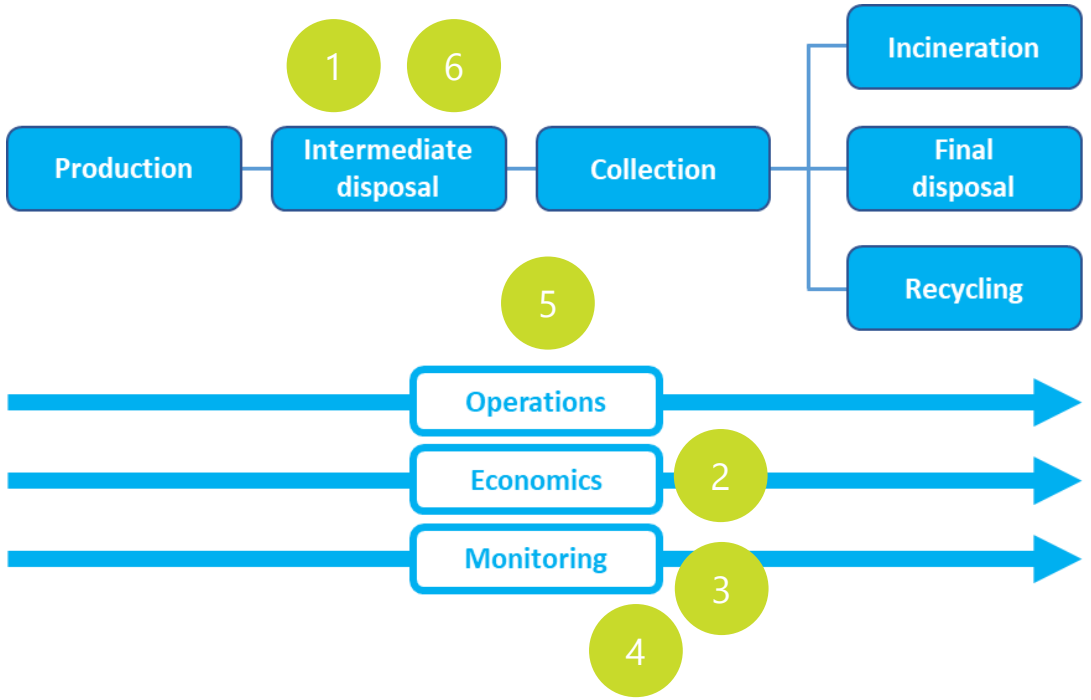
# Outcomes

## Funnel process on ideas

**An outcome of the stakeholder engagements was a long list of ideas, developed by assessing the feedback on diagnostics and readiness against the project objectives.**

This would identify gaps where solutions would be needed, and the suggested ideas would be mitigations and measures to eliminate or reduce the gaps. *The identified ideas were then clustered and mapped against a high-level process chart for waste management.*

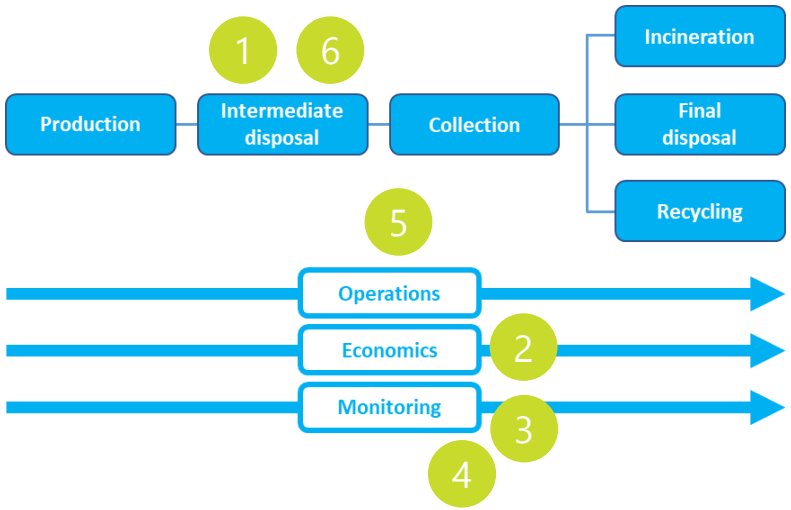
This would enable the task team to become clear on where in the process are the biggest barriers and challenges, and how can pilot ideas be developed to get the best value for money and the highest probability for success.



# Outcomes

## Multi-criteria ranking

**Following the initial generation and clustering of ideas, a simple multi-criteria rating of each idea was undertaken to assess and understand which of the identified ideas to be suggested at a stakeholder consultation workshop, see following slide.**




A total of 9 criteria were defined and used to do a 360-degree assessment of each idea to get an initial understanding on attractiveness and relevance of each idea. After this assessment, 6 generic themes were identified:

1. Improve waste segregation
2. Improve routines for fee collection
3. Improve data for monitoring of waste collection
4. Enforce governance and coordination
5. Improve climate friendly waste collection
6. Improve awareness and motivation

When mapped against the high-level process chart to the left, it becomes clear that the project will focus on intermediate disposal of waste (prior to collection) and the supporting process of economics, monitoring and operations. This is illustrated with the numbering of the 6 themes appearing of the process chart.

# Outcomes

High Medium Low

| Theme | Idea no. | Scope | Fit for purpose | Scale-ability | Easiness of imple-menting | Level of impact / climate mitigate | Benefit vs. cost ratio / value for money | Gender inclusive support | Involves private sector | Includes industry innova-tion | Utilizing built infra-structure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Improve waste segregation | 1 | Introduce designated waste bins for plastics and for organic waste at public waste sites and at markets, combined with incentives for use | High | High | Medium | Medium | High | High | Medium | Low | High |
| Improve routines for fee collection | 2 | Introduce e-payments for households, for industries and for markets | High | High | Medium | Low | High | High | High | High | High |
| | 3 | Introduce payment incentives – for example, pay-per-bag for non-segregated waste – free-of-charge service for segregated waste, organic waste to Comped free or small fee, and waste to landfill with entrance fee. | High | High | Low | Medium | Medium | High | Medium | Medium | High |
| Improve data for monitoring of waste collection | 4 | Introduce RFI tags on bins and skips to optimise waste collection monitoring | High | High | Low | Medium | High | Low | High | High | Medium |
| | 5 | Introduce drones and smartphones for online, digital monitoring using video or photo images, municipality to send warnings | High | High | Medium | Medium | High | Medium | High | High | High |
| | 6 | Include all digital data sources in one GIS solution supported by app-access for upload of data. | High | High | Medium | High | High | High | High | High | High |
| Enforce governance and coordination | 7 | Establish coordination forums between province, municipality and sponsors | High | High | High | Low | High | Low | Medium | Low | High |
| | 8 | Undertake waste composition studies to understand potentials and barriers in more detail | High | High | High | Low | High | Low | Medium | Low | High |
| Improve climate-friendly waste collection | 9 | Procure electric vehicles for waste collection (trucks and vans) | High | High | High | Low | Medium | Low | High | Medium | Low |
| Improve awareness and motivations | 10 | Develop information to households, public sector and private sector on importance of sustainable waste management | High | High | High | High | High | High | Medium | Low | High |

# Outcomes

## Presentation at the workshop

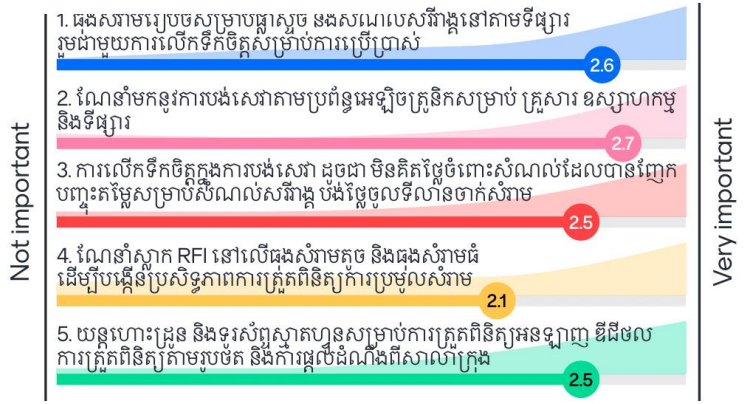
**At the stakeholder consultation workshop on 9 December 2021, the findings from diagnostics and readiness assessments were presented, as well as a short presentation of other relevant ongoing projects in Cambodia and Battambang province.***

The 6 themes and 10 pilot ideas shown on the previous slide were presented, and the participants were tasked to give their opinion and rating for each idea. This was completed using Menti.com as the survey platform, which each participant could access via QR code or website link available in Zoom chat or direct via the Menti webpage. Each participant was asked to rate each idea on 1-3 scale, where 3 would be maximum and 1 minimum. The collated average results would then immediately appear on the screen, and the final result is shown on the right (and the next slide) using the same topics numbered 1-10 as on the previous slide.

Go to **www.menti.com** and use the code **4172 5473**

Q3: (Part 1) តើអ្នកវាយតម្លៃគម្រោងសាកល្បងដែលអាចមានខាងក្រោមដោយរបៀបណា?

Q3: (Part 1) How would you rate the following potential pilot projects?




**The presentations from the workshop are included in this slide-deck as an Appendix.*

# Outcomes

## Presentation at the workshop

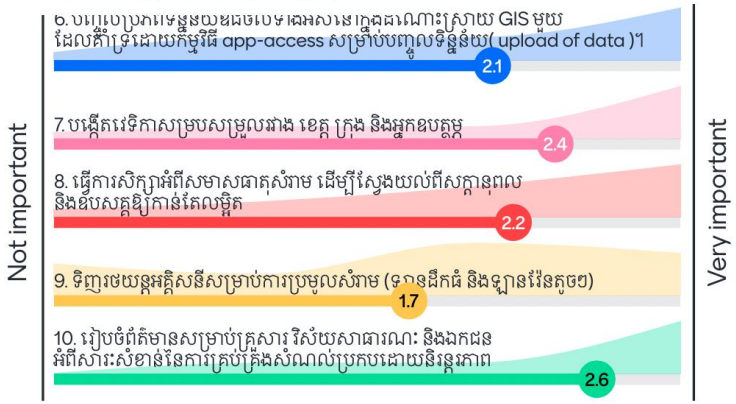
**The outcome was a recommendation to focus on the following:**

- **Improve waste segregation for intermediate disposals**
- **Introduce e-payments and payments incentives for intermediate disposals**
- **Improve data of monitoring by introducing i.e. drones and cameras for videos and digital images**
- **Improve awareness and motivation for waste management**

Go to **www.menti.com** and use the code **4172 5473**

Q3: (Part 2) តើអ្នកវាយតម្លៃគម្រោងសាកល្បងដែលអាចមានខាងក្រោមដោយរបៀបណា?

Q3: (Part 2) How would you rate the following potential pilot projects?



# Recommendations and Next Steps

## Follow-up on workshop

**Following the workshop on 9 December 2021, a coordination meeting will be scheduled with Ymeng Lim, the project point of contact for Battambang province.**

The purpose of this meeting will be to receive feedback on the workshop, including comments on the preferred, recommended pilot ideas rated by the participants at the workshop.

Together with upcoming approval of this D1 Diagnostics and Readiness Assessment report, Stage 1 of the project can be concluded and completed and with the 3 recommended ideas to be developed in Stage 2.

## Preparatory works for Stage 2

**In Stage 2 of the project, 3 initial pilot ideas will be further developed and described including a high-level business case to assess bankability, viability, sustainability, and scalability of each idea.**

The outcome of this analysis will be presented at a Framing Workshop slated for February 2022.

To achieve this, the initial activities will be to develop templates for project initiation documents (PID) and business case materials applicable for this purpose. Furthermore, weekly coordination meetings between the Battambang province and Ramboll will be arranged to enable facilitation of the analysis and the upcoming workshop.

## Appendices

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# Stakeholder Consultation Workshop/ Framing Workshop

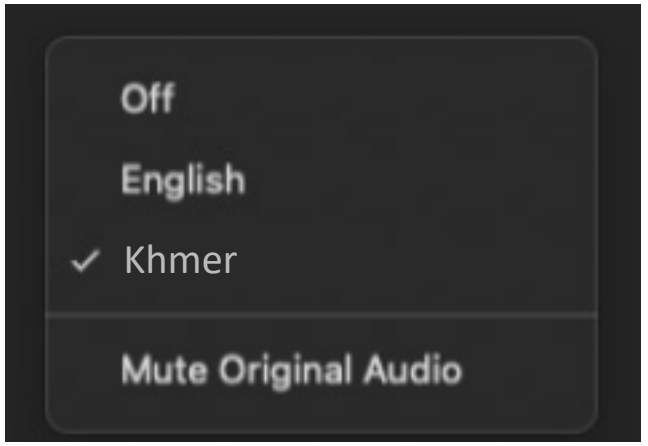
Thursday 9 December 2021

# Agenda

ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

| | |
|---|---|
| 14:00 – 14:10 | Workshop Housekeeping |
| 14:10 – 14:20 | Opening Remarks |
| 14:20 – 14:30 | AASCTF - Background of the Project |
| 14:30 – 14:45 | Diagnostic Assessment |
| 14:45 – 15:30 | Ongoing Initiatives |
| 15:30 – 15:45 | Coffee break |
| 15:45 – 16:00 | Readiness Assessment |
| 16:00 – 17:00 | Pilot Ideas / Digital Solutions |
| 17:00 – 17:30 | Wrap up / Open Discussion |

# ការប្រកាសកម្មវិធី / Housekeeping announcements


សូមចុចលើប៊ូតុង ដើម្បីជ្រើសរើស “Interpretation” ភាសា

ជ្រើសរើសភាសាដែលលោកអ្នកចង់ស្តាប់ (ចុចលើពាក្យ Khmer ដើម្បីបើស្តាប់ខ្មែរ) ចុចលើ “Mute Original Audio” ប្រសិនបើអ្នកចង់ស្តាប់អ្នកបកប្រែ

# ការប្រកាសកម្មវិធី / Housekeeping announcements

## អ្នកគាំទ្រសិក្ខាសាលា (តាមអនឡាញ)

គ្រីស្ទីន លុកស៊ីរ

ម៉ៃលហ្គា ម៉ាយ៉ែស

ជំនាញការទំនាក់ទំនងនៃ AASCTF

## អ្នកគាំទ្រសិក្ខាសាលា (នៅទីតាំង)

សោម សង្ហាសក្តិ

មន្ត្រីបង្គោលថ្នាក់ជាតិរបស់ AASCTF (កម្ពុជា)

# ការប្រកាសកម្មវិធី / Housekeeping announcements

សូមបើក ទូរស័ព្ទ /អាយផែត ឬ កុំព្យូទ័រ/ laptop របស់អ្នកដើម្បី ត្រៀមស្មង់មតិ & ឆ្លើយនឹងការអង្កេតរបស់យើងខ្ញុំ

'លើកដៃ' ហើយរង់ចាំ ដើម្បីអោយអ្នកស្រុបសម្រួលឃើញ

ម៉ោង 15:30 សម្រាក 15 នាទី

# ការប្រកាសកម្មវិធី / Housekeeping announcements

សូមបើកកាមេរ៉ារបស់អ្នក ដើម្បីថតរូបជាក្រុម។

សូមឆ្លើយសំណួរក្នុងទម្រង់វាយតម្លៃ
សិក្ខាសាលាដើម្បីកែលម្អសិក្ខាសាលា
ខាងមុខ

# អ្នកសម្របសម្រួលសិក្ខាសាលា / Workshop facilitator

ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

## Claus Klitholm

Task Team Leader

Rambøll

# Agenda

ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

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# ការស្ទង់មតិ (Quiz)

## ចូលរួមក្នុងការស្ទង់មតិតាមរយៈវិធីសាស្ត្រមួយខាងក្រោម៖

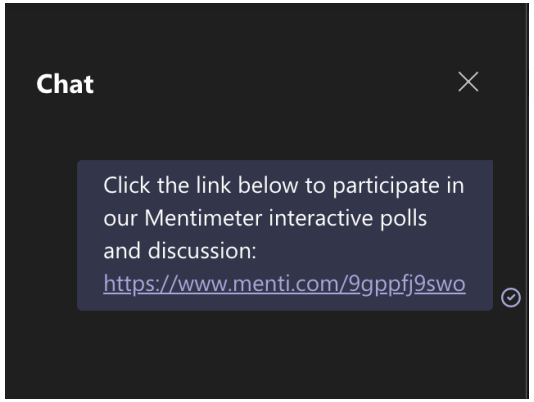
ជម្រើស 1:

ស្កេនលេខកូដ **QR**

ខាងក្រោមជាមួយទូរស័ព្ទដៃរបស់អ្នក

*Scan the QR code above with your smartphone*

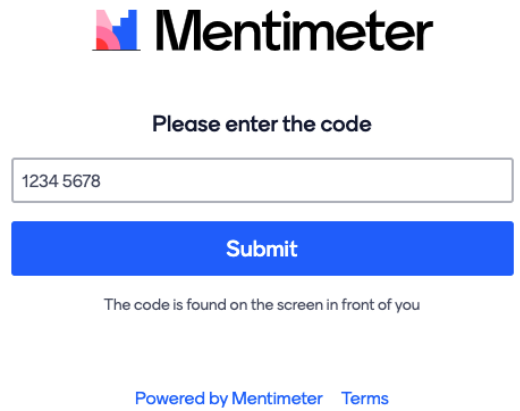
ជម្រើស 2:




ចុចលិងនៅលើ **Zoom chat**

*Click on the link found on the Zoom chat*

ជម្រើស 3:



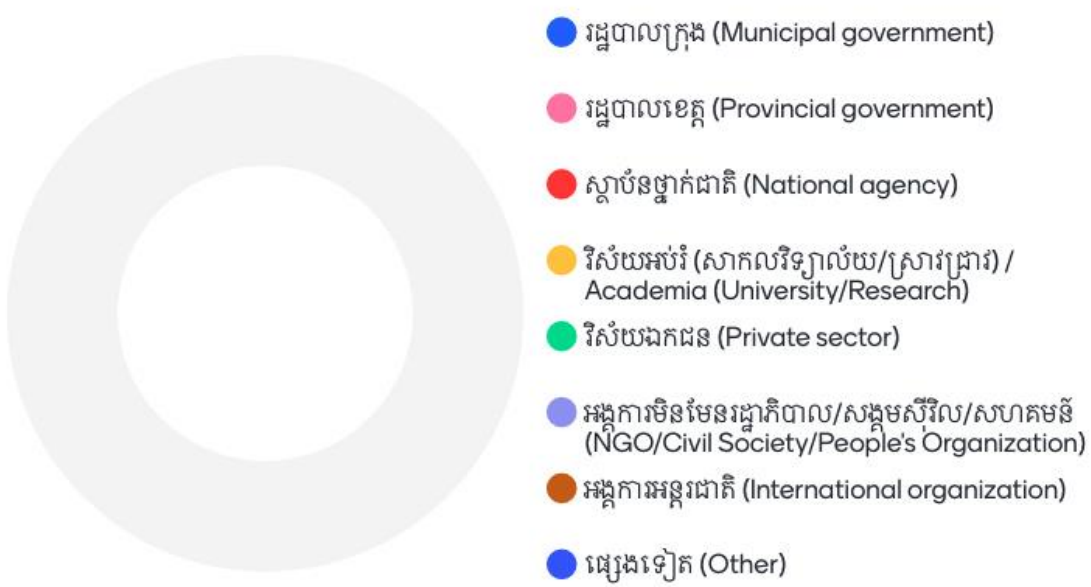

ចូលទៅកាន់វ៉ែបសាយ **www.menti.com**

ហើយ វាយលេខកូដ **41725473**

*Go to www.menti.com and enter the code* **41725473**

ចូលទៅកាន់ដីឈសាយ www.menti.com ហើយ វាយលេខកូដ 41725473

# តើអ្នកមកពីស្ថាប័នណា?




## ការស្ទង់មតិ (Quiz)

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# AASCTF Overview

**PROJECT DURATION:**
2019 to 2024

**TOTAL FUNDING:**
$ 13.95 M
(A$ 20 M)

**ADOPTION OF DIGITAL SOLUTIONS TO IMPROVE KEY FUNCTIONAL AREAS:**

- CITY PLANNING SYSTEMS
- SERVICE DELIVERY
- FINANCIAL MANAGEMENT

**ADDRESSING CROSS-CUTTING THEMES:**

- GENDER EQUALITY & SOCIAL INCLUSION
- CLIMATE CHANGE
- PRIVATE SECTOR

**OUTPUTS:**
Capacity development
Partnership support
Investment grants

**IDENTIFY**
scalable & replicable best practices in ASEAN

# Background for the Project

**Battambang Smart Solid Waste Financial Management**

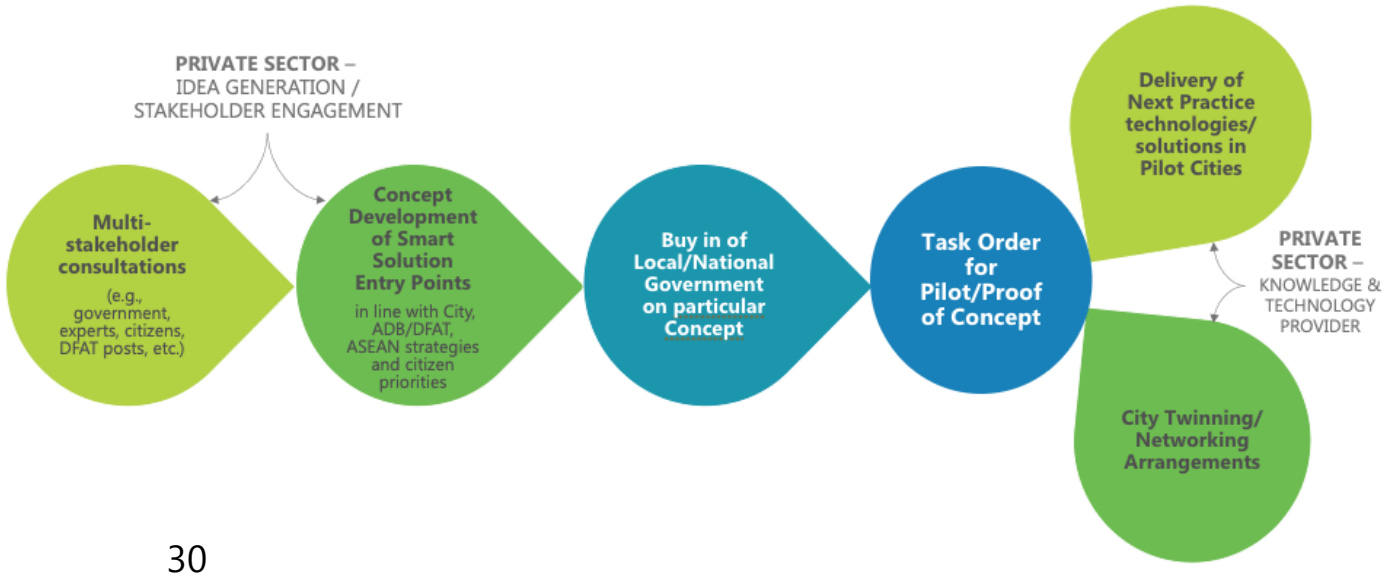
Development of proposal for sustainable municipal solid waste collecting system, co-developed with key stakeholders for Battambang city using smart city concepts.

Designed to increase quality of service, efficiency, revenues and service monitoring to improve engagements and access to circular solid waste management for households and private sector.

*Phase 1 – April 2021 – January 2022*
Sector diagnostics, readiness and option analysis and scoping.

*Phase 2 – February 2022 – TBC*
Implementation of Smart/Digital solution pilot intervention

**Determination of Priority Pilot**



# Agenda

ASEAN AUSTRALIA SMART CITIES TRUST FUND
Asian Development Bank

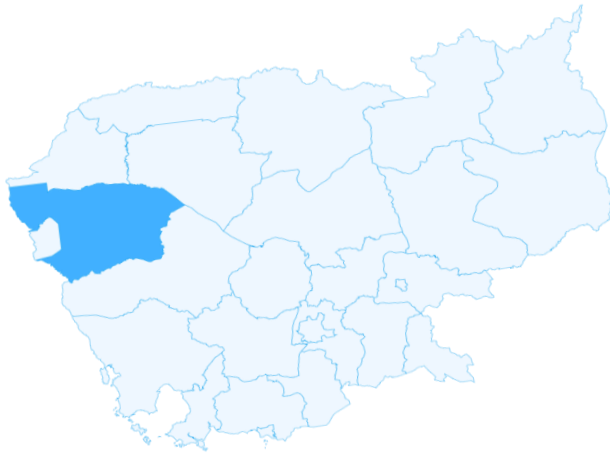
| | |
|---|---|
| 14:00 – 14:10 | Workshop Housekeeping |
| 14:10 – 14:20 | Opening Remarks |
| 14:20 – 14:30 | AASCTF - Background of the Project |
| 14:30 – 14:45 | Diagnostic Assessment |
| 14:45 – 15:30 | Ongoing Initiatives |
| 15:30 – 15:45 | Coffee break |
| 15:45 – 16:00 | Readiness Assessment |
| 16:00 – 17:00 | Pilot Ideas / Digital Solutions |
| 17:00 – 17:30 | Wrap up / Open Discussion |

# Diagnostics Assessment

| Item | Facts | Matureness |
|---|---|---|
| Population serviced | ○ Approximately more than half of the population in Battambang are having their waste serviced by an official waste operator. | |
| Economics of waste | ○ Waste ollection fees: Households approx. 1-1.5 USD. Businesses/orSubsidized by approx. 145,000 USD yearly.ganizations depending on size.<br>○ Compost sales price 130 USD/ton. | |
| Infrastructure | ○ Poor collection service and poor solid waste infrastructure, e.g., big solid waste trucks and small roads. In some areas waste is dumped in public areas or in rivers.<br>○ No regular and often delayed schedules of collection. | |
| Waste composition | ○ 66% organic waste, 12% plastic, and 22% others.<br>○ No proper hospital waste management system in the town. Hence, expected to end up at the dumpsite.<br>○ Construction and demolition waste not collected. | |

Legend:

○ =low ; ● =high



# Diagnostics Assessment

### Waste Collection

- CINTRI - 8 Sangkats
- Leap Lim - 2 Sangkats

*Estimated waste collection of ~130 tons/day (2017)*

### Waste Dumpsite

- A: Operated by CINTRI

*8 ha uncontrolled open dump. No planned cell staging*

- B: Operated by Leap Lim

*1-2 ha uncontrolled open dump*

### Waste Composting

- Operated by COMPED

*Capacity 8-10/10-12 tons per day of organic waste (4 tons from local markets)*

### MRF

- Operated by DPWT/Municipality

*Process 60 $m^3$ per day*
*Dry, source segregated recyclable materials*
*Team of 30 workers*

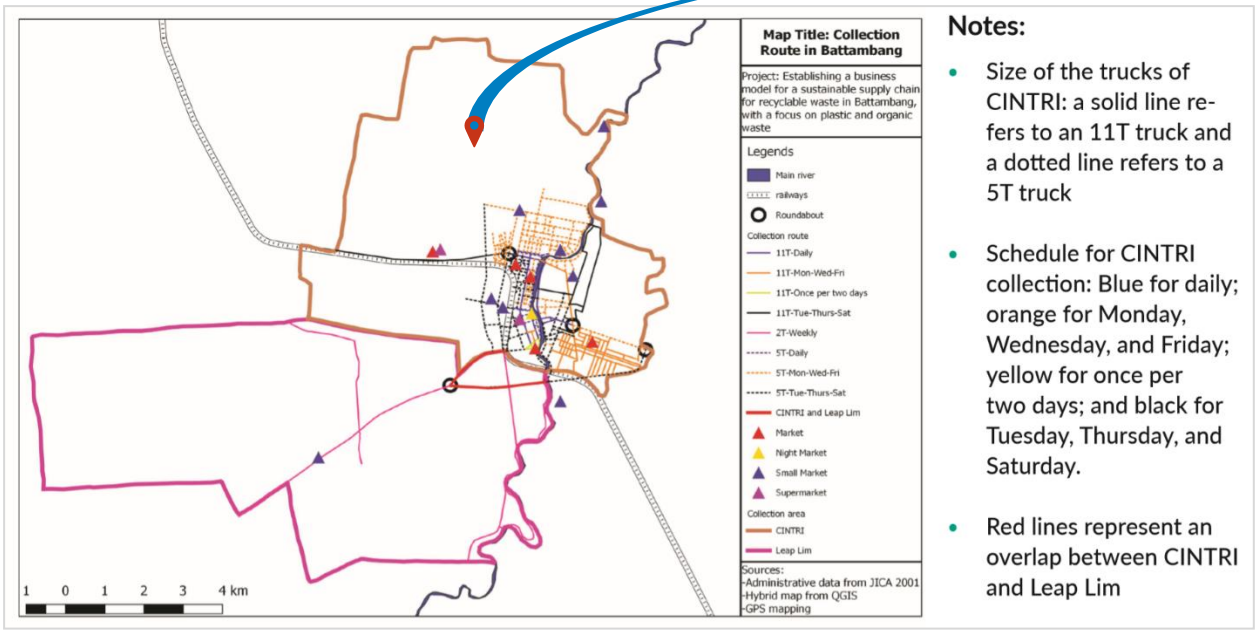



**Figure 1: Waste collection schedule in the serviced area (GGGI, Scaling up Waste Recycling in Battambang Cities).**


**Figure 2: Battambang dumpsite**

# Diagnostics Assessment

## Issues / Assessment of situation

1. Uneven waste fee collection and costs not recovered in all service areas.
2. Only basic waste segregation at source (households and markets) of higher value waste.
3. Collection services: Inadequate service coverage; insufficient collection frequencies; insufficient waste containers.
4. Collection trucks inadequate, breaking down or not able to access all areas.
5. Service areas not clearly divided between CINTRI and Leap Lim – e.g. Leap Lim collects in some parts of Sangkats under CINTRI.
6. Weak enforcement of regulations, e.g. fines and warnings.
7. Lack of coordination between actors in the sector (7).
8. Weak or non-existing monitoring system (8).

## Challenges and trends impacting waste management

Segregation of waste is not supported by designated waste containers at markets or households.

There is no support or personal incentives to reduce waste or improve segregation at source.

Lack of designated refuse sites and containers make waste collection difficult to manage and control.

Unsegregated wastes make recycling difficult and increases share disposed at landfills.

Plastic pellets/recyclables are exported to Thailand and Vietnam that will ban plastic waste imports.

New landfill under construction, 2 MRFs, composting plant will require integrated management of solid waste infrastructure and facilities.

Distance to landfill to increase from 7km to 23km, adding approx. 32 km per truck load.

# ការស្ទង់មតិ (Quiz)

## ចូលរួមក្នុងការស្ទង់មតិតាមរយៈវិធីសាស្ត្រមួយខាងក្រោម៖

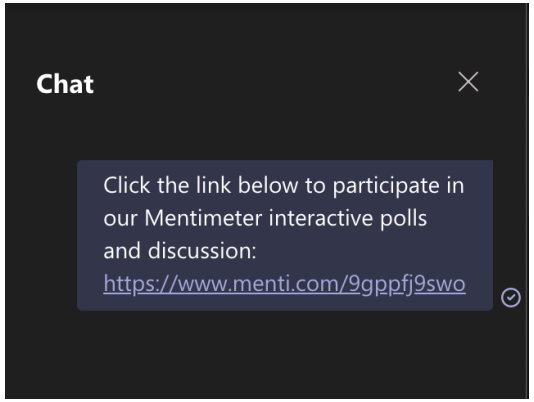
ជម្រើស 1:

ស្កេនលេខកូដ **QR**

ខាងក្រោមជាមួយទូរស័ព្ទដៃរបស់អ្នក

*Scan the QR code above with your smartphone*

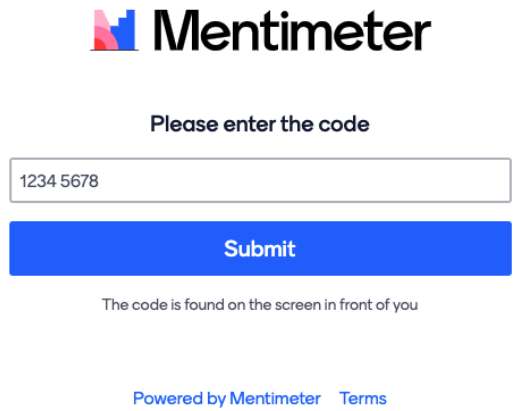
ជម្រើស 2:




ចុចលិងនៅលើ **Zoom chat**

*Click on the link found on the Zoom chat*

ជម្រើស 3:




ចូលទៅកាន់វ៉ែបសាយ **www.menti.com**

ហើយ វាយលេខកូដ **41725473**

*Go to www.menti.com and enter the code* **41725473**

# ការស្ទង់មតិ (Quiz)

## Do you agree or disagree with the following?
## តើអ្នកឯកភាព ឬ មិនឯកភាពនូវសំណួរខាងក្រោម?

### Issues / Assessment of situation

1. Uneven waste fee collection and costs not recovered in all service areas.
2. Only basic waste segregation at source (households and markets) of higher value waste.
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6. Weak enforcement of regulations, e.g. fines and warnings.
7. Lack of coordination between actors in the sector.
8. Weak or non-existing monitoring system.


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# Ongoing Initiatives

Battambang Municipality

T4GC

GRET
Professionals for Fair Development

TS2 – Battambang Landfill

# Ongoing Initiatives

**Battambang Municipality**

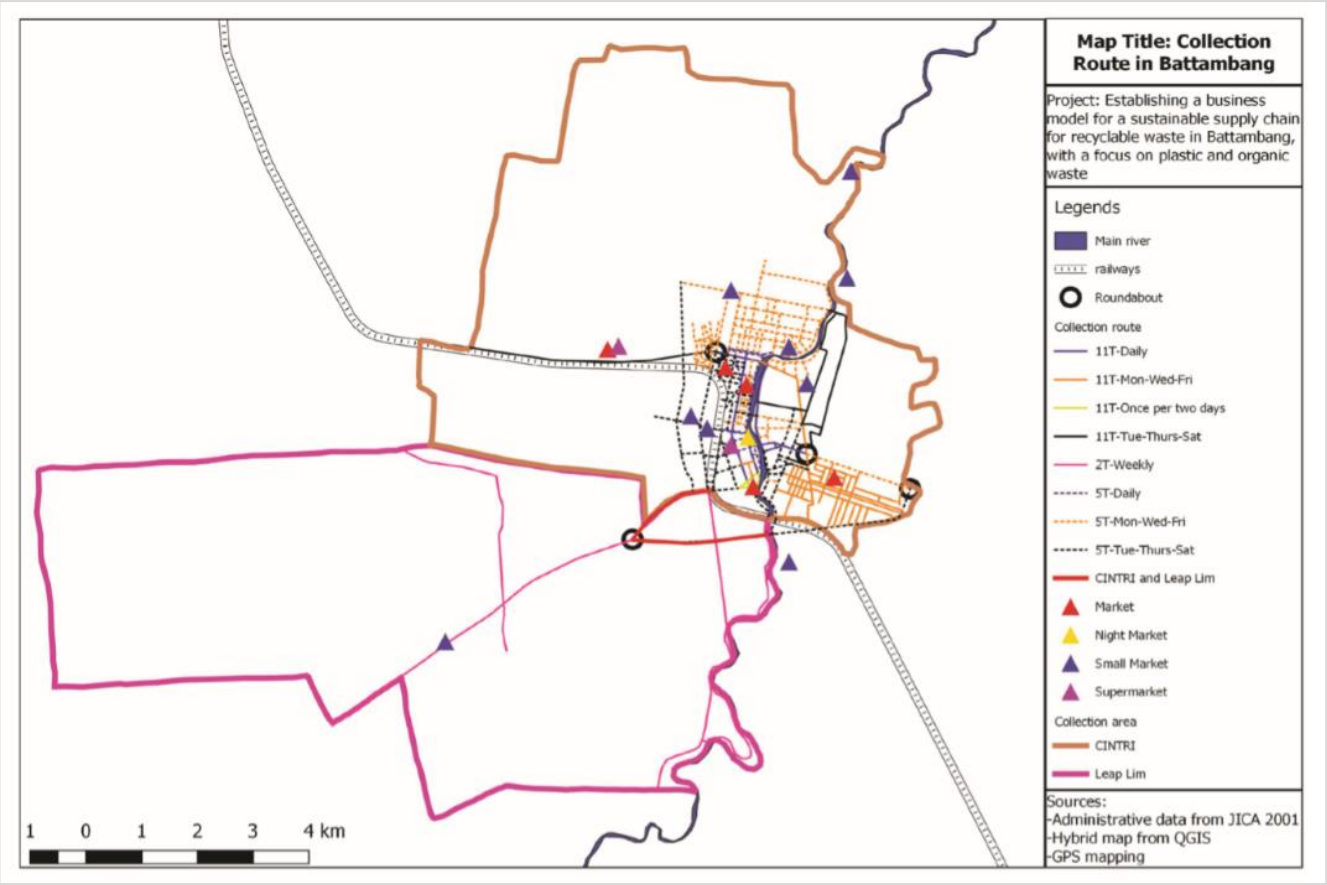


**Figure 1: Waste collection schedule in the serviced area (GGGI, Scaling up Waste Recycling in Battambang Cities).**

- 2 Sangkats operated by Leap Lim
- E-billing system – Following the system applied in Phnom Penh and Sihanoukville.
- Improve service and monitoring of the solid waste service.

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# USAID Tech for Green Cities (T4GC)

Smart Solid Waste Financial Management Stakeholder Consultation Workshop / Farming Workshop


**Bunthoeun Ho**

**Strategic Mobilization and Governance Manager**

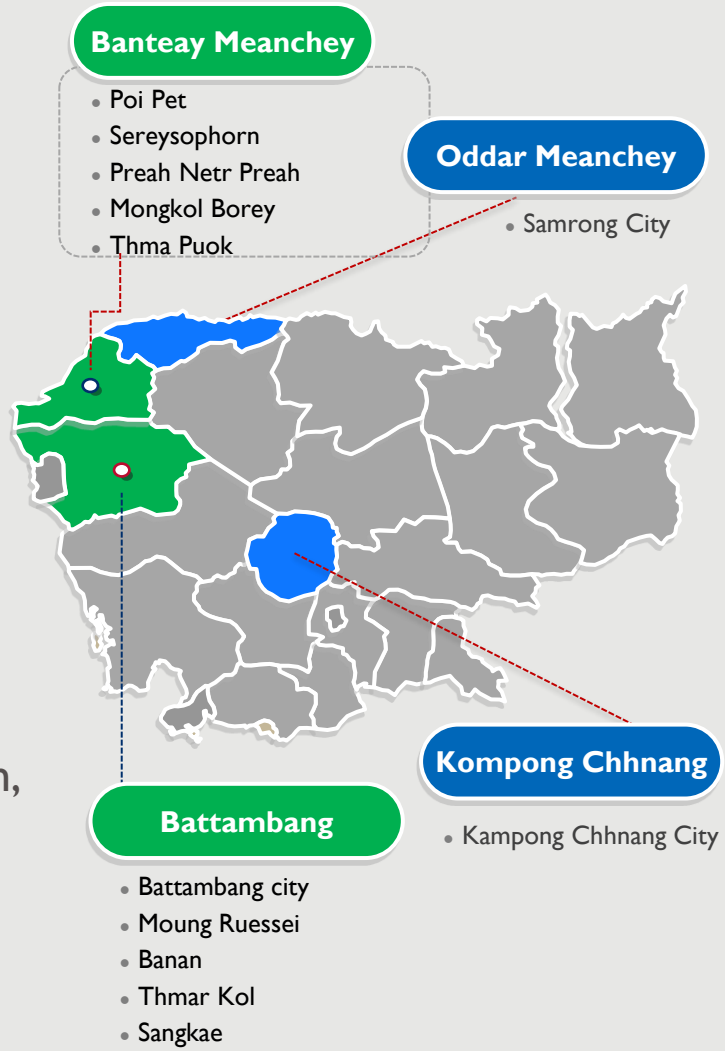
**USAID Tech for Green Cities**

# T4GC OBJECTIVES & LOCATIONS

**Bring transparency** to waste management: the context, challenges and opportunities

**Build a platform to support citizen feedback**

Bring entrepreneurs together to **stimulate economic opportunities** based on waste reduction, reuse and recycling for a clean Cambodia



# Initial Release: Apple App Store & Google Play

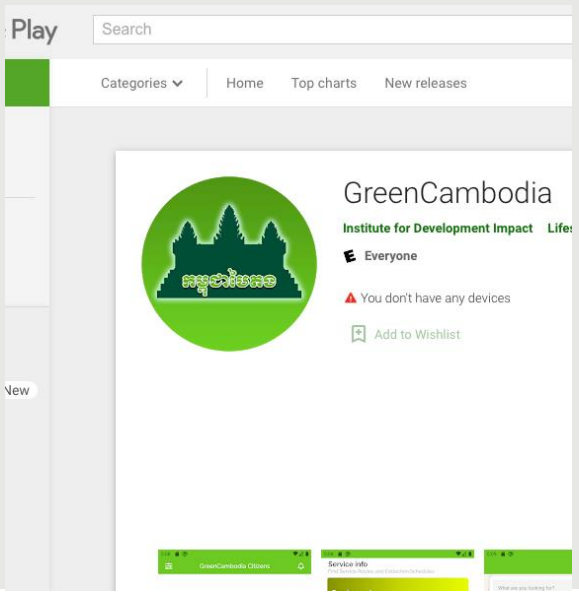
- Apple App Store:

https://apps.apple.com/us/app/id1542775058

- Google Play:

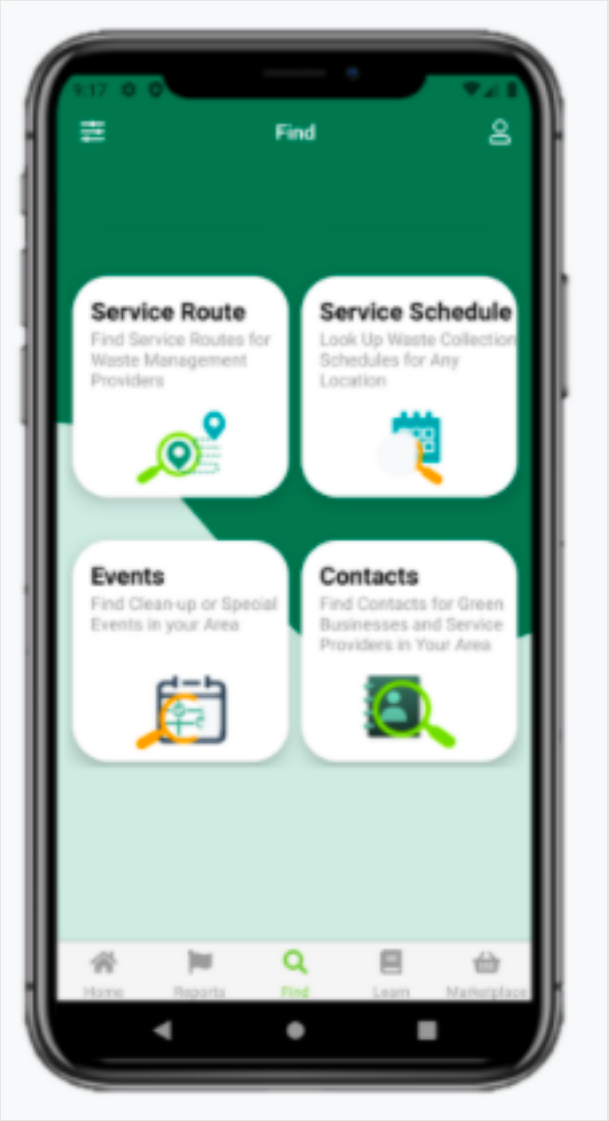
https://play.google.com/store/apps/details?id=org.i4di.t4gc&hl=en&gl=US





# Green Cambodia Mobile Application

- Total mobile app uptake (as of Dec 09h)
  - Total # of downloads: **14,982**
  - Total # of sign-ups: **15,527**
  - Total # of WM reports: **477**
- Current app version: 1.5.2
  - Updated overall *look & feel*



Home Report Learn About Admin Panel

Hello Raty EN

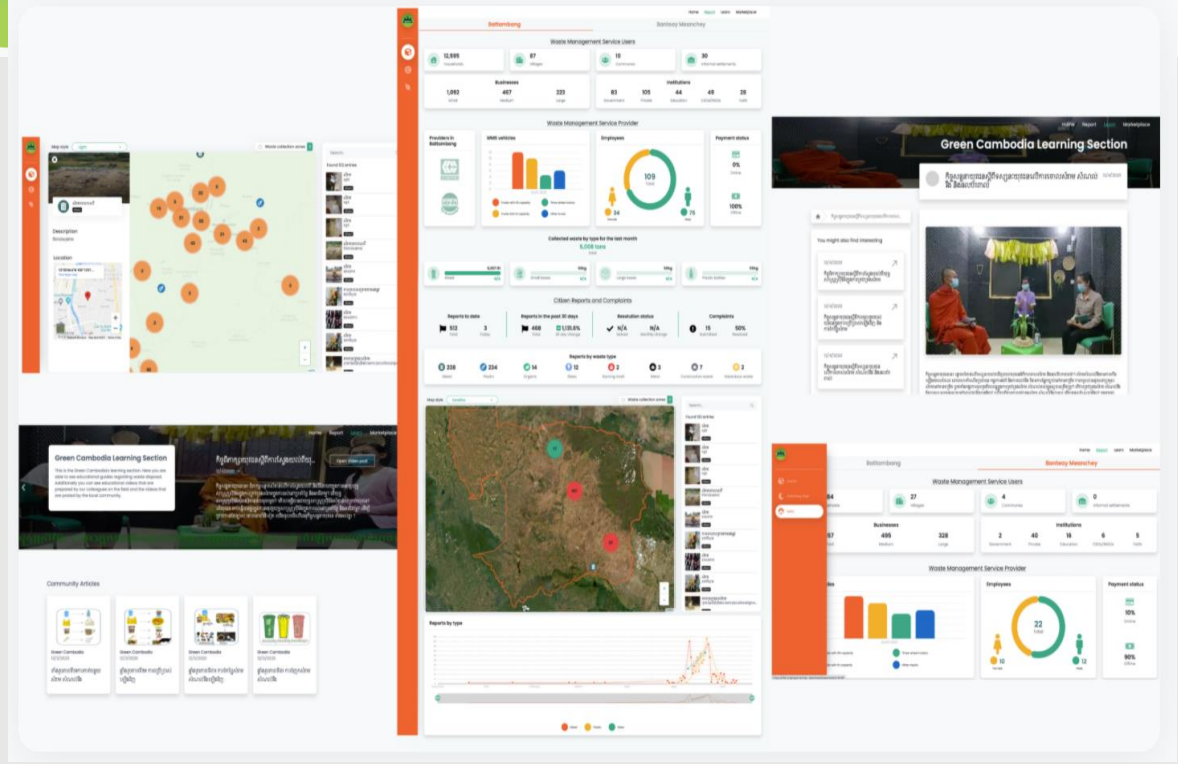
# Green Cambodia

Teach enabled, locally-led community action to strengthen credible voices and foster transparent, quality and sustainable practice of solid waste management.

Read more

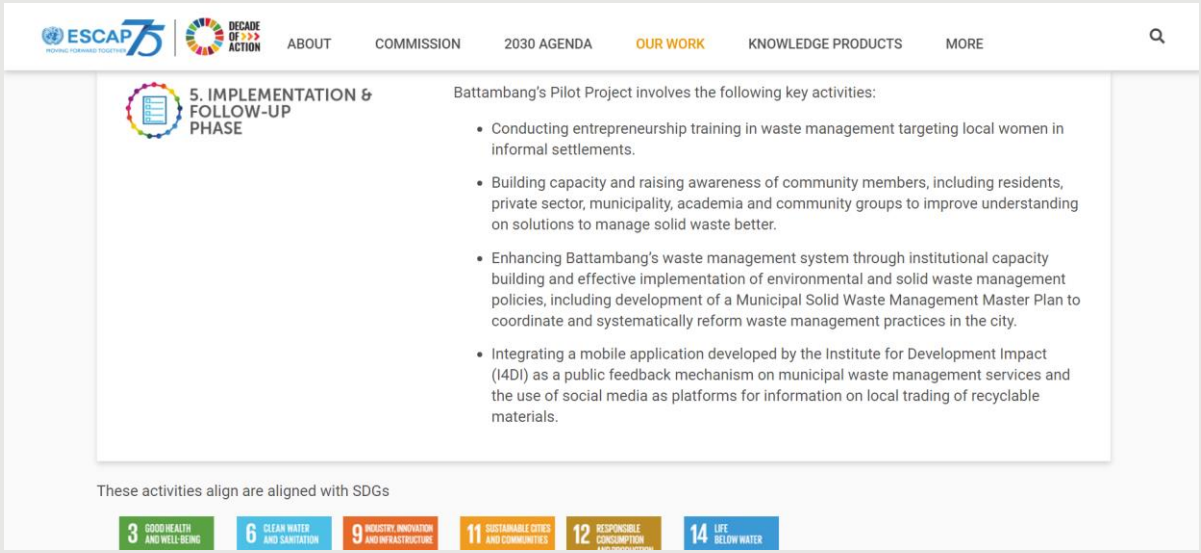

GET IT ON Google Play

Download on the App Store

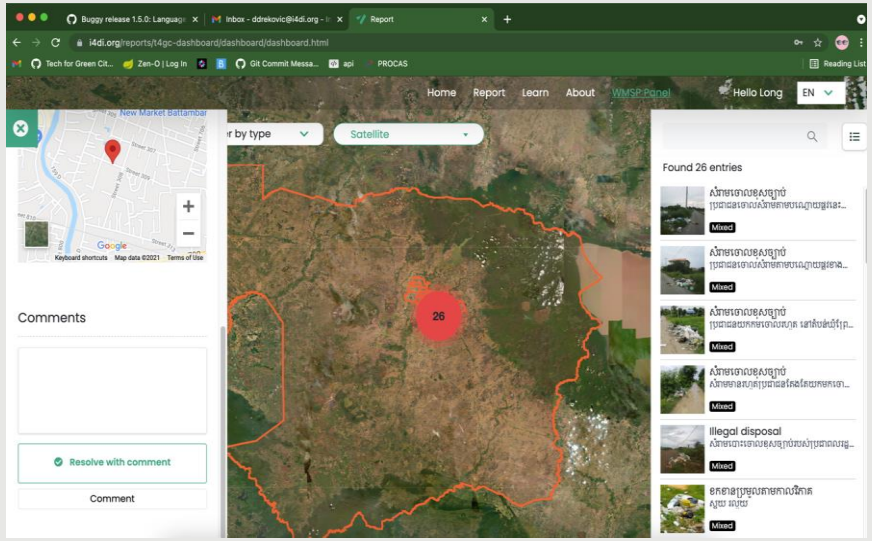


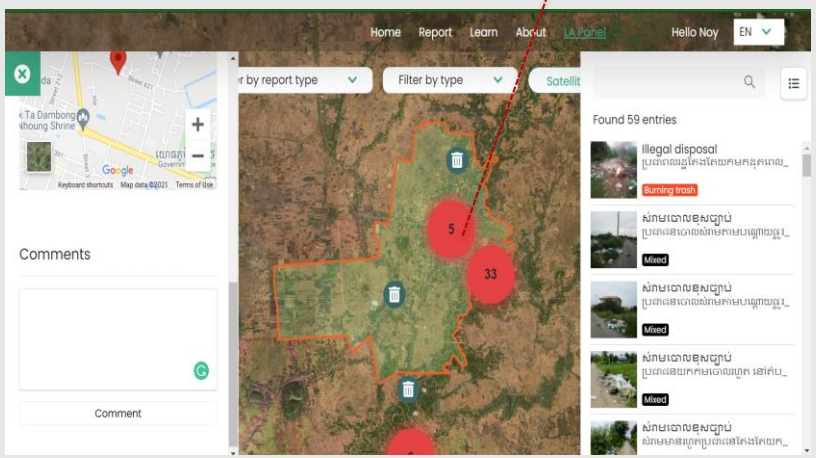
# Localizing the #2030agenda

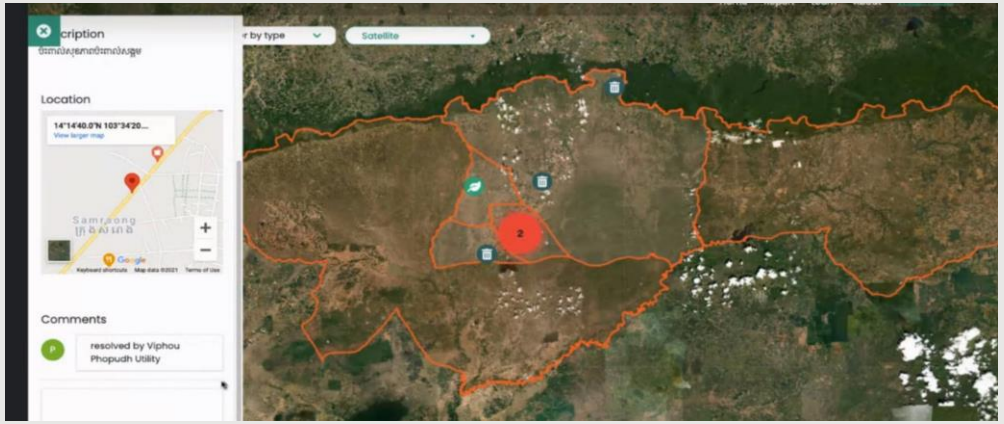
- Battambang Municipality in northern Cambodia is participating in the Localizing the #2030agenda in Asia & the Pacific Cities Project.
- Municipality's interest in further #scalingup Tech for Green Cities collaboration.



# Waste issue response




**Waste Service Provider**

**Waste Management Authorities**

Stay in touch:

Bunthoeun Ho
Strategic Mobilization and Governance Manager

bho@i4di.org
012 445 923


# Thank you !

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GRET

Professionals for Fair Development

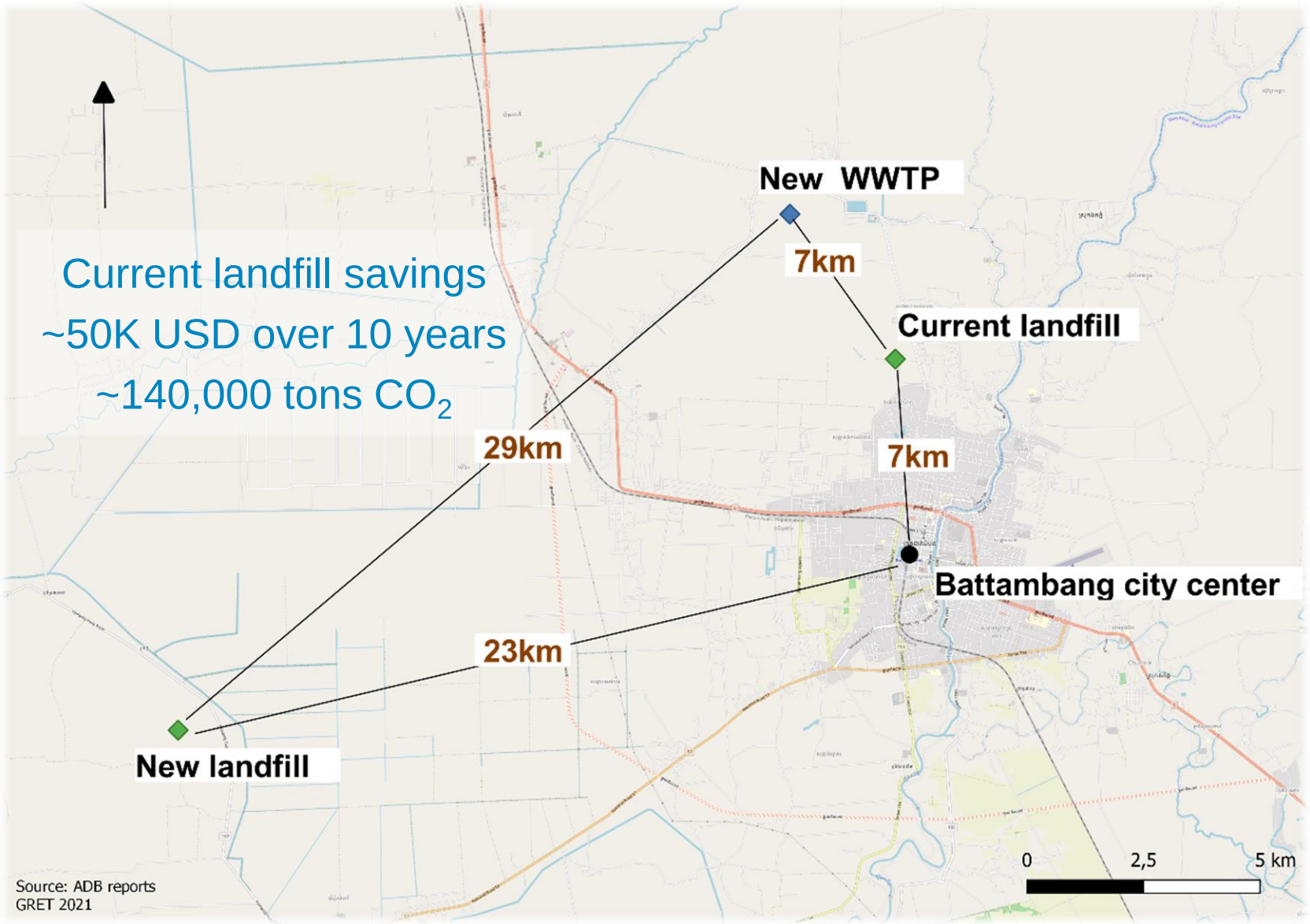
Terra Michaels, Gret Cambodia Country Representative

November 9, 2021

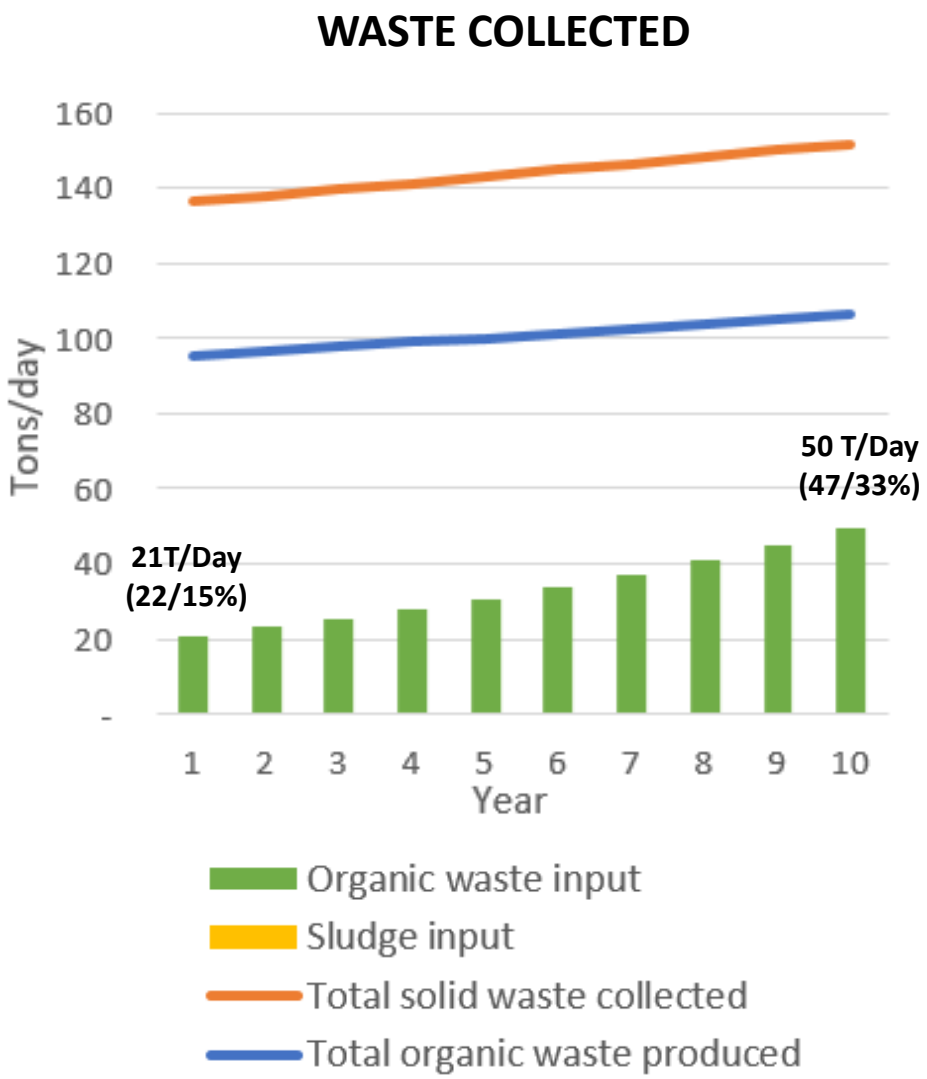
# Potential for SDG Fund loans for SWM, sanitation, and piped water supply sectors

- Case studies for understanding of viability of composting/co-composting, piped water supply facilities
- Potential impacts to SDGs
- Location opportunities

# Battambang Case Study



# Composting Specifications



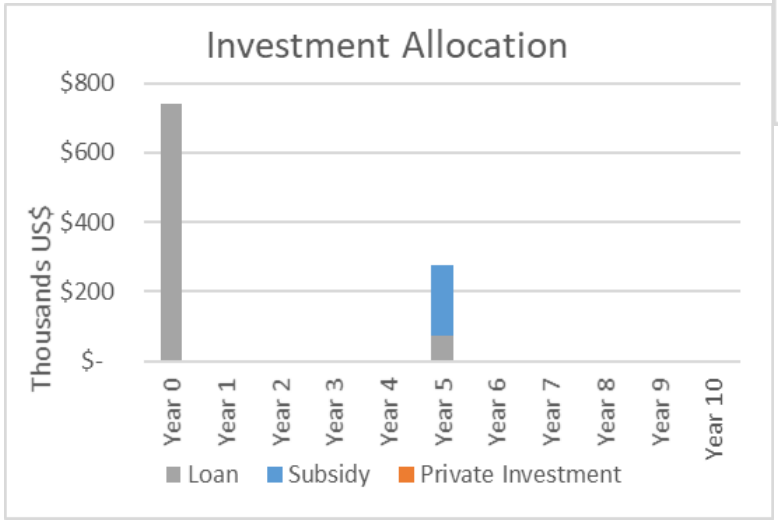

| | |
|---|---|
| **Compost Facility Area** | ~1.25 ha |
| **Facility Cost** | 1 Million US$ |
| **Total Organic Waste Diverted** | 96,000 tons (48%/34%) |
| **CO2 Reduction from Waste Diversion** | ~43,000 tons |
| **Total Compost produced (10 years)** | 9,300 tons |
| **Compost Sales Price** | 130 US$ / ton |
| **Waste intake growth** | 10% annually |
| **Composting production yield** | 10% of waste input, but can be raised |
| **Challenges and Opportunities** | Very high organic waste recovery = need for high separation and collection rates beyond markets |

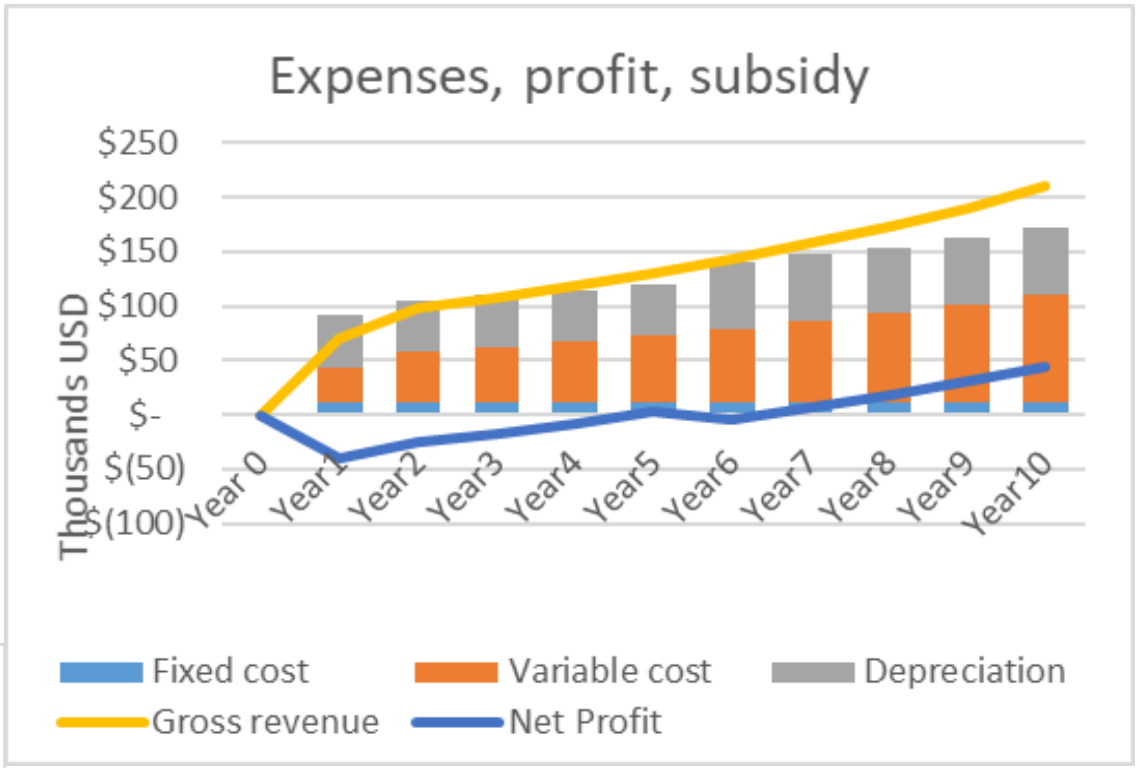
# Financial Analysis: Compost

Total net profit:
7,000 US$

Est. investment:
1M US$

80% loan,
20% subsidy



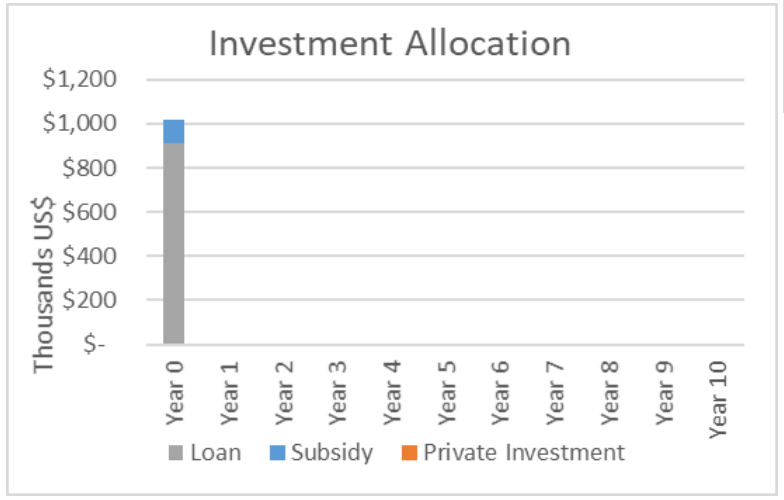

Gross revenue covers fixed and variable costs, but not depreciation

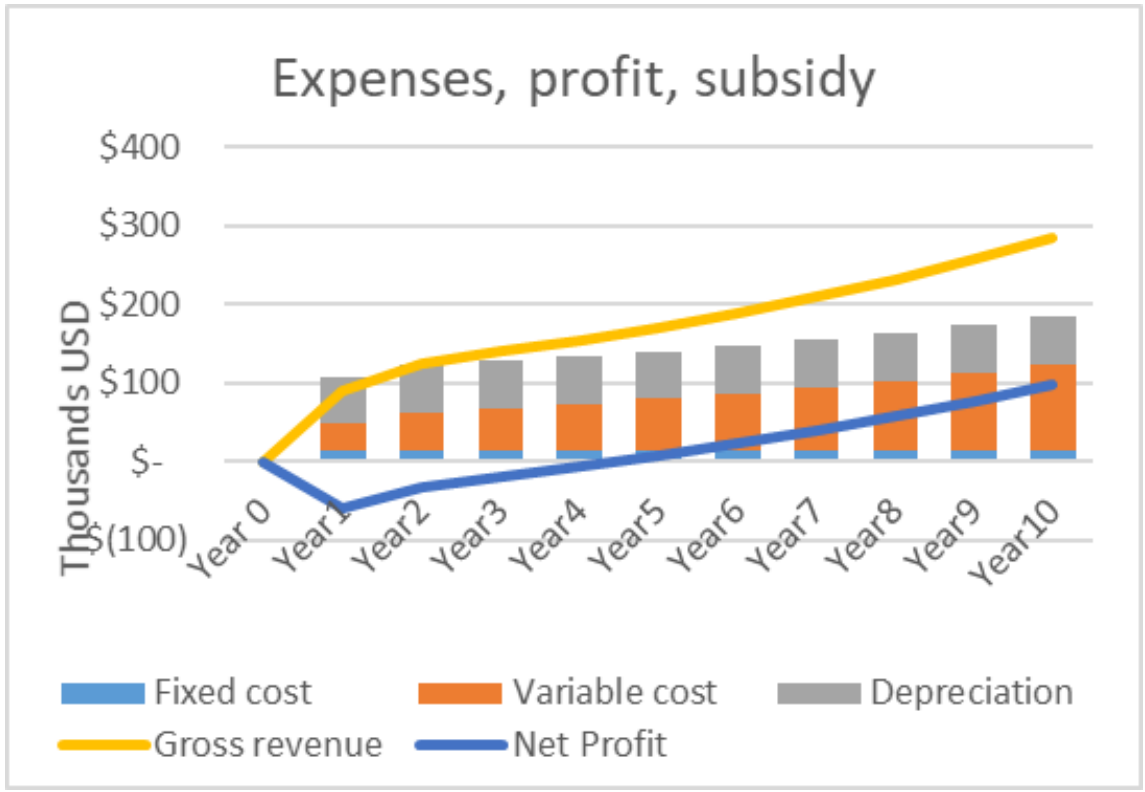
# Financial Analysis: Co-compost

Total net profit:
184,000 US$

Addition of co-compost
Improved waste separation
2$ provided per ton of waste

10% Subsidy
90% Loan (5% interest rate)



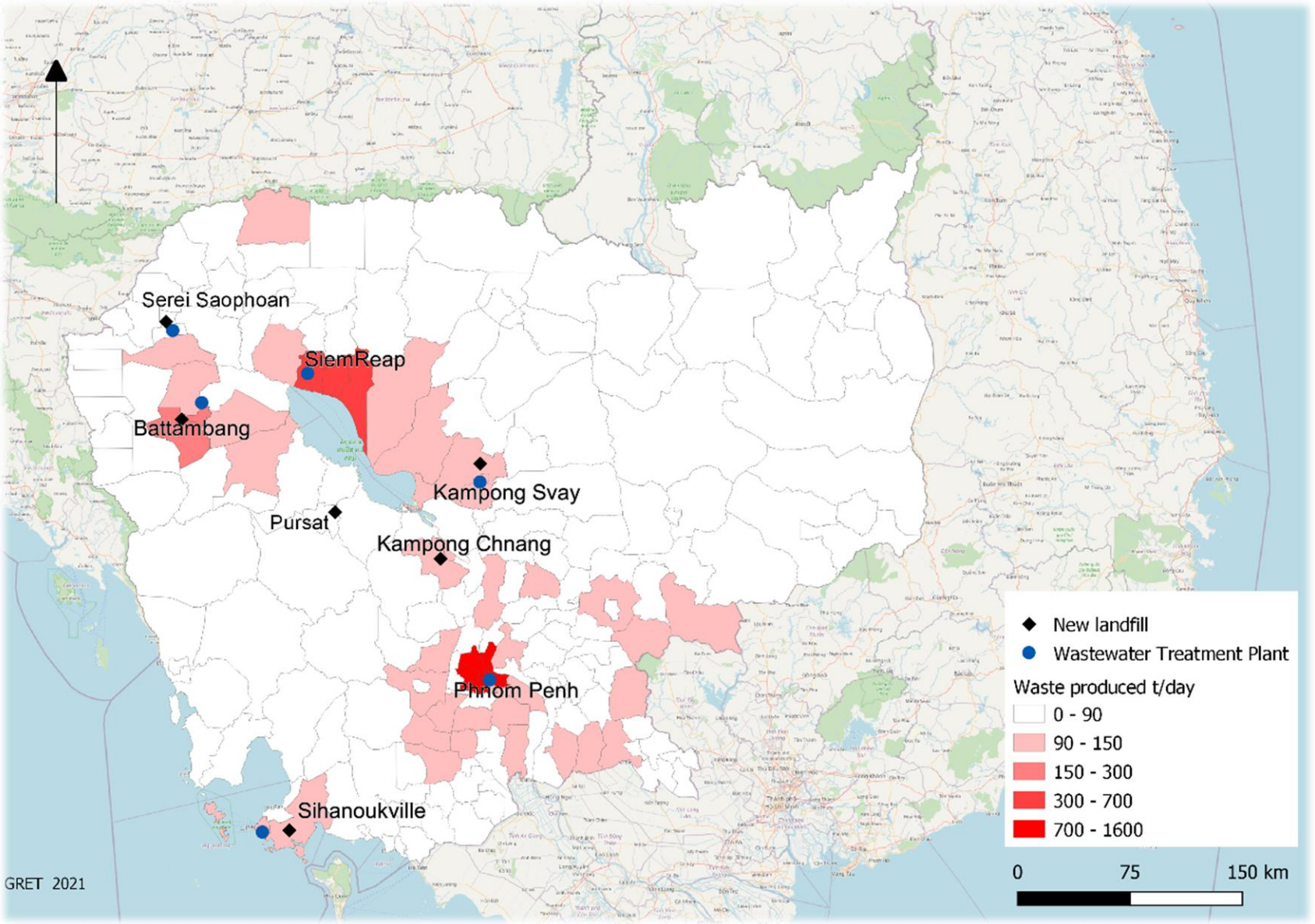

Gross revenue fixed and variable costs, *and* depreciation

Use of sludge – increases composting rate!

# Technical Assistance

| Package | From Project | From Authorities |
|---|---|---|
| **TA-1: Awareness Raising Campaign in Markets** | FGDs and testing of messages<br>Some bins/dumpsters<br>Organization, training<br>Event activities and materials | Bins/Dumpsters<br>Event attendance, promotion |
| **TA-2: TA to Local Authorities and Collectors** | Guidelines, enforcement planning<br>Collection scheduling<br>Training to private sector | Dedicated staff for SWM<br>Support and collaboration with TA and private sector |
| **TA-3: TA to Private Composter** | Business plan and loan application<br>Engineering design and construction oversight | Land and PPPs, where necessary<br>Support for project |
| **TA-4: Testing and Marketing of Compost Products** | Testing of compost quality<br>Marketing, packaging<br>Market linkages | Support for project |

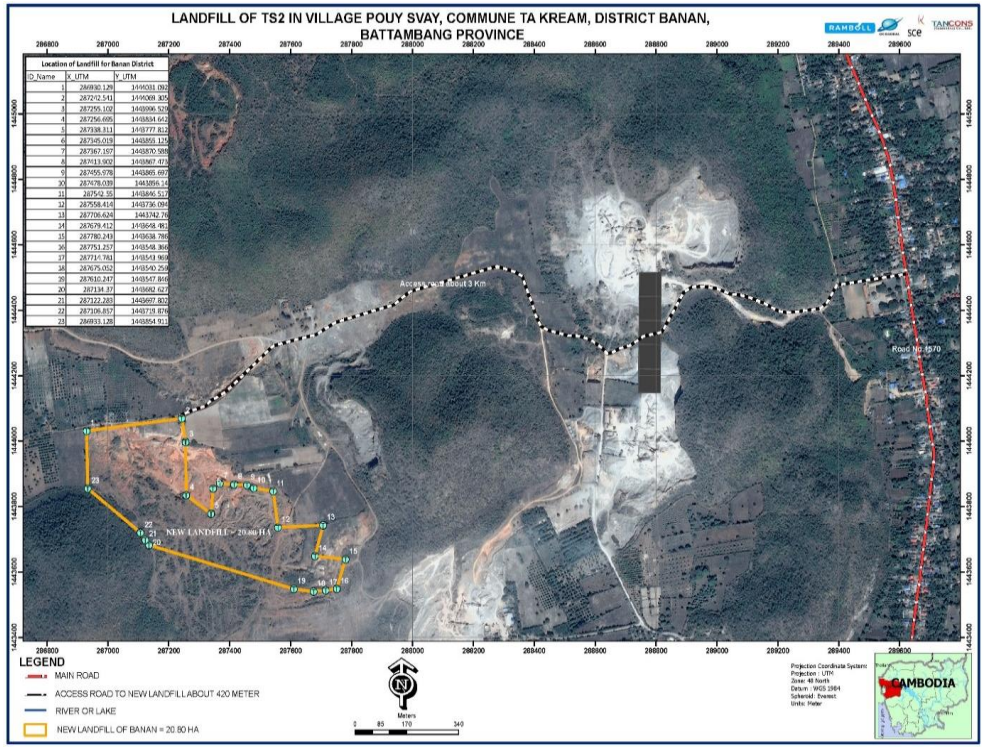
# SWM and Sanitation Opportunities

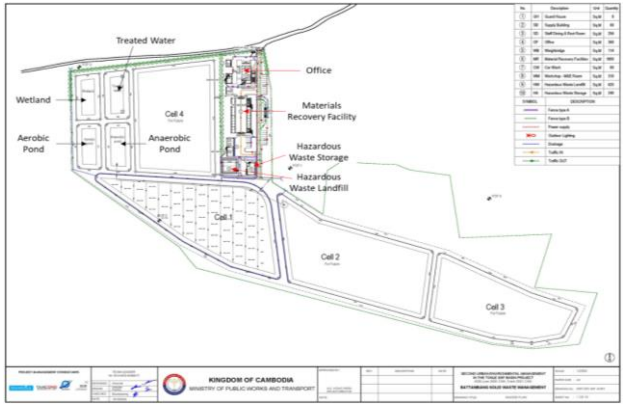


***Thank you***

# Ongoing Initiatives

**TS2 – Battambang Landfill**




- Total area: 20.8 ha
- Cells: 4 + hazardous waste cell
- Capacity: 1 million tons (2040)
- 22 km distance to Battambang town
- Construction start : 3Q2021 - Construction complete beginning 2022
- Leachate collection, storage, treatment system and recirculation system
- Non-mechanical materials recovery facility (MRF) – 2nd one in the city

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TRUST FUND
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# Coffee Break

15:45 – 16:00

# Agenda

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Asian Development Bank

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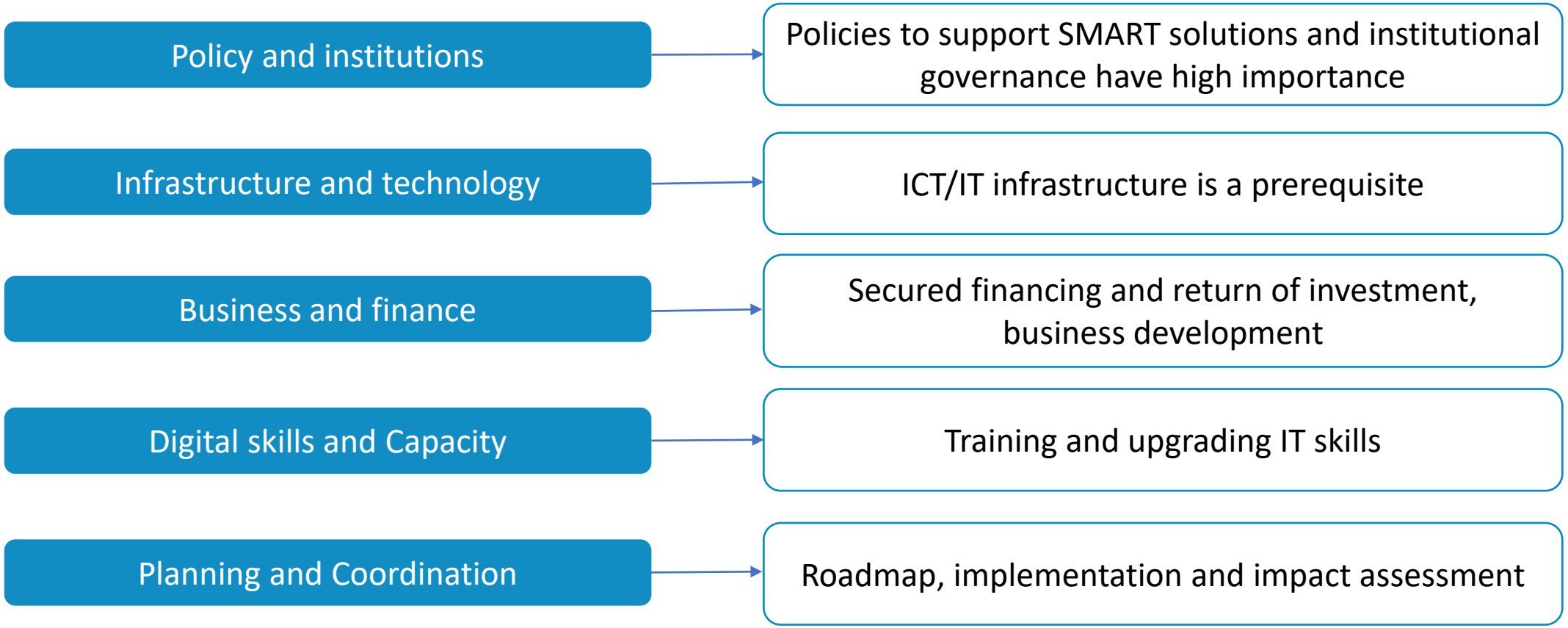
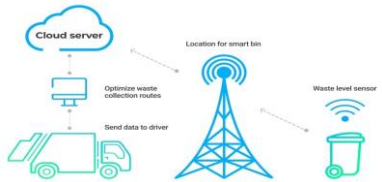
# Readiness Assessment



# Readiness Assessment – Technical Building Blocks




**Low SMART City Integration**

- GPS in Trucks
- GPS registration of Waste containers on arrival
- App or manual based local data collection – waste amount, segregation.
- Route planning based on GPS data and waste amount
- E-billing system

**Actions**

- Capacity building – IT skills needed
- Small equipment investment
- No IT infrastructure investment
- Service provider oriented – they will need to adapt to new work flows
- Development of e-Billing system

**Benefits**

- Low implementation actions
- More efficient waste collection
- Better service level

**Medium SMART City Integration**

- Install GPS in containers
- Install RFI tags/sensors to monitor if containers are full and ready to be collected
- Improve survey of containers using drone or camera images uploaded to GIS map
- Sensor and drone based route planning
- User observations

**Actions**

- Capacity building – IT skills needed
- Computing resources
- IT infrastructure investment for data flow
- App for user/service provider registration
- Service provider oriented – they will need to adapt to new work flows
- Development of e-Billing system

**Benefits**

- More data driven waste collection
- Better knowledge about best collection practices – better service level
- Better payment overview

**Full SMART City Integration**

- IoT based sensor LoRaWan infrastructure – location and sensors monitor when containers are full and ready be collected
- Cloud solution
- LoRa
- Real time route planning
- Optimisation of container location – machine learning

**Actions**

- Capacity building – IT skills needed
- Computing resources
- High IT and ICT infrastructure investment
- App for user/service provider registration
- Service provider oriented – they will need to adapt to new work flows
- Automated e-billing

**Benefits**

- Optimized data driven waste collection
- High service level
- Automized payment

Readiness Factors - Increasing importance

# Readiness Assessment

| | Policy & Institutions | Infrastructure & Technology | Business & Finance | Digital Skills & Capacity | Planning & Coordination |
|---|---|---|---|---|---|
| Description | e-commerce law<br><br>Lack of the necessary policies<br><br>Lack of regulation and service level monitoring<br><br>Clear governance structures?<br><br>Institutional capacity must be built<br><br>Municipality will support companies with e-billing system | The GSM coverage in Battambang is good and is served by 4G – 4G+ connectivity.<br><br>Opennet offers ADSL (slow) at low prices. Broadband connectivity is very expensive (Online, Ezecom)<br><br>ICT Infrastructure not extensive. Low amount of home routers and computers (low IP activity) | Public–private partnerships?<br><br>NGO involvement?<br><br>Investment in smart technology is a prerequisite for smart waste handling<br><br>Payment apps are interoperable offering opportunities for Cambodian SMEs and for bigger businesses and e-commerce platforms | More than 90% of the population (youth) have access to smart phones.<br><br>Low rate of computer ownership and digital literacy rate.<br><br>Some waste pickers have access to smart phones.<br><br>A number of mobile payment apps exists.<br><br>I4di Web Portal – municipality, service provider and users | Smart city action plan for Battambang<br><br>Sectoral coordination needed<br><br>Waste handling – limited awareness, strong interest<br><br>No IT Tools used by service providers. No monitoring of services<br><br>GIS for routing, drones/sensors for location |
| Maturity Assessment | **Low/ Medium** | **Medium** | **Low** | **Low/ Medium** | **Low** |

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# Presentation of pilot ideas

**Improve waste segregation**

**Scope**
Introduce designated containers, bins and skips for plastics and for organic waste at markets and larger collection points.

To be designed and have colours to be easy to identify, and being prioritised by pickup services. Sites could be manually staffed in the introduction period, to ensure that the containers are used in the correct way and that waste actually gets segregated.

**Possible digital elements**

- Include location of the designated containers in the GIS map
- Improve survey of containers using drone or camera images uploaded to GIS map
- Install RFI tags/sensors to monitor if containers are full and ready to be collected

**Improve routines for fee collection**

**Scope**
Introduce existing digital payment services for private households, for industries and for markets. Payments can be setup either as in-advance subscriptions, or as pay-when-served.

Digital payments can facilitate differentiated prices, for example pay-per-bag or reduced price for segregated waste. Different price categories can easily be adapted in the payment services, and efficiently monitored.

**Possible digital elements**

- End user payments can be fully digital in existing bank services
- Payment records can be added as a layer in the GIS map
- Payment records can be stored and monitored in accounting system

**Improve data for monitoring of waste collection**

**Scope**
Introduce a geographical information system (GIS) where all collected digital data can be stored and presented in a map, possible interfacing with other project.

Introduce new digital data collection sources, i.e. images and video from drones and smartphones, records from RFI tags or records from digital payments. Data can be sorted and stored in categories and thematic layers on the map, and customising the map to specific needs.

**Possible digital elements**

- Web based digital map with extensive data sources, designed for expansion and scale-up
- Interfaces to digital data from video and images, and other digital data sources i.e. RFI tags, digital payments or GPS trackers

# Presentation of pilot ideas

**Enforce governance and coordination**

**Scope**
Establish governance and enforce coordination on relevant initiatives and activities, i.e. regular meetings on all levels from steering group on policy level to working groups on operational level.

Coordinate use of resources and competences on projects and activities, in order to maximise efficiency and outcomes. Including arranging for sharing of data, and for hardware and equipment.

**Possible digital elements**

- Alignment on data requirements and standards
- Shared use of hardware and digital equipment
- Shared use of data and coordination of data collection

**Improve climate friendly waste collection**

**Scope**
Identify opportunities for introducing climate friendly waste collection services, i.e. using electric vehicles (trucks or vans) or establishing production of renewable energy for internal use only (i.e. vehicle charging or operations of equipment).

Investigate possibilities to procure renewable energy from external suppliers, and investigate possibilities to reduce use of water/recycling of water.

**Possible digital elements**

- Monitoring of operations documenting climate impact by use of electric vehicles, use of renewable energy or reduced use of water

**Improve awareness and motivations**

**Scope**
Develop communication and information program with the objective to raise awareness and improve knowledge on the importance of solid waste management.

Investigate opportunities for developing teaching materials for schools, with the option to include gaming or voluntary schemes for waste collection for schools, NGOs or communities.

**Possible digital elements**

- Web based community information and learning for capacity building and raising awareness

# Pilot ideas for discussion

| Theme | Idea no. | Scope |
|---|---|---|
| Improve waste segregation | **1** | Introduce designated waste bins for plastics and for organic waste at public waste sites and at markets, combined with incentives for use |
| Improve routines for fee collection | **2** | Introduce e-payments for households, for industries and for markets |
| | **3** | Introduce payment incentives – for example, pay-per-bag for non-segregated waste – free-of-charge service for segregated waste, organic waste to Comped free or small fee, and waste to landfill with entrance fee. |
| Improve data for monitoring of waste collection | **4** | Introduce Radio Frequency Identification (RFI) tags on bins and skips to optimise waste collection monitoring |
| | **5** | Introduce drones and smartphones for online, digital monitoring using video or photo images, municipality to send warnings |
| | **6** | Include all digital data sources in one GIS solution supported by app-access for upload of data. |
| Enforce governance and coordination | **7** | Establish coordination forums between province, municipality and sponsors |
| | **8** | Undertake waste composition studies to understand potentials and barriers in more detail |
| Improve climate friendly waste collection | **9** | Procure electric vehicles for waste collection (trucks and vans) |
| Improve awareness and motivations | **10** | Develop information to households, public sector and private sector on importance of sustainable waste management |

# ការស្ទង់មតិ (Quiz)

## ចូលរួមក្នុងការស្ទង់មតិតាមរយៈវិធីសាស្ត្រមួយខាងក្រោម៖

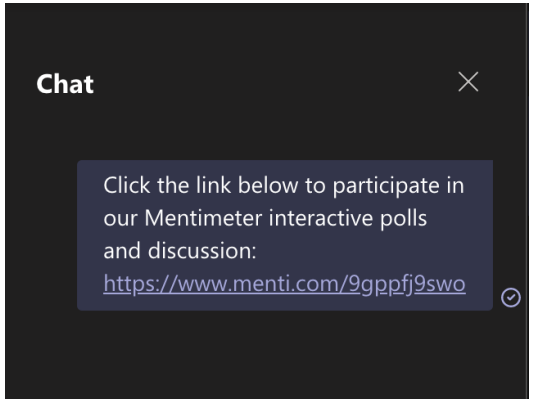
ជម្រើស 1:

ស្កេនលេខកូដ **QR**

ខាងក្រោមជាមួយទូរស័ព្ទដៃរបស់អ្នក

*Scan the QR code above with your smartphone*

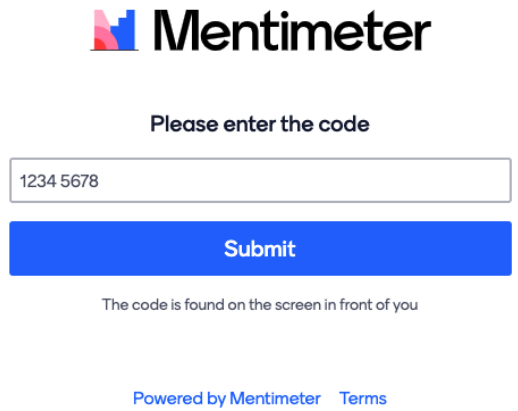
ជម្រើស 2:




ចុចលិងនៅលើ **Zoom chat**

*Click on the link found on the Zoom chat*

ជម្រើស 3:




ចូលទៅកាន់វ៉ែបសាយ **www.menti.com**

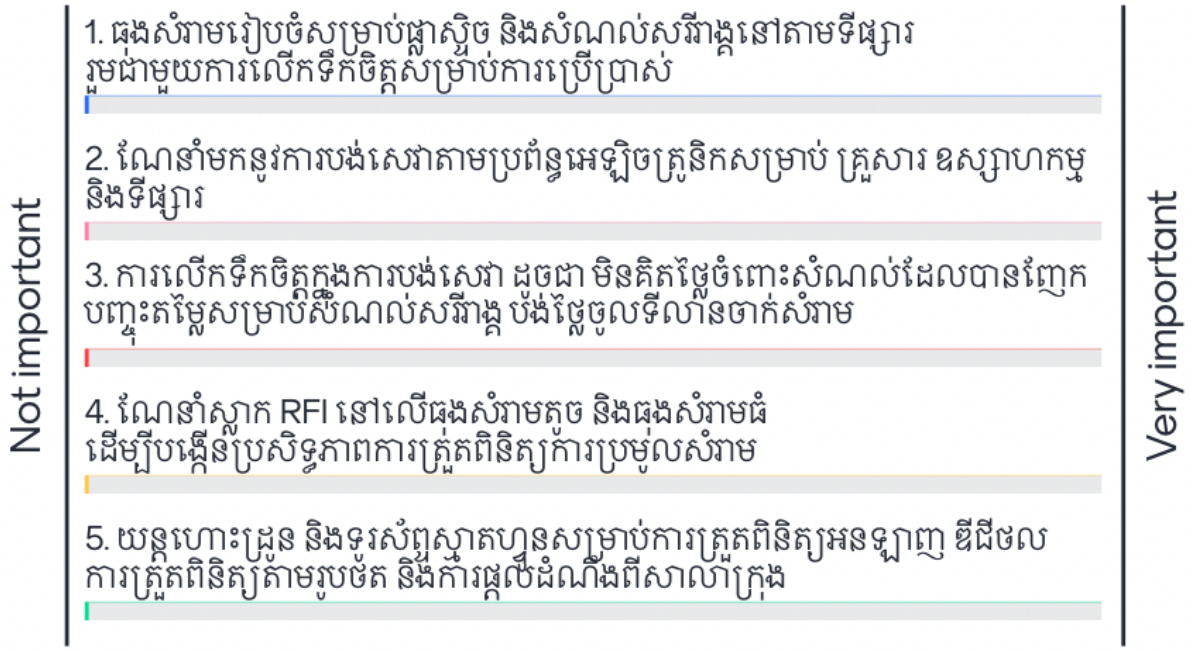
ហើយ វាយលេខកូដ **41725473**

*Go to www.menti.com and enter the code* **41725473**

# ការស្ទង់មតិ (Quiz) – Part 1

**How would you rate the following potential pilot projects?**
**តើអ្នកវាយតម្លៃគម្រោងសាកល្បងដែលអាចមាន ខាងក្រោមដោយរបៀបណា?**

| Idea no. | Scope |
|---|---|
| 1 | Introduce designated waste bins for plastics and for organic waste at public waste sites and at markets, combined with incentives for use |
| 2 | Introduce e-payments for households, for industries and for markets |
| 3 | Introduce payment incentives – for example, pay-per-bag for non-segregated waste – free-of-charge service for segregated waste, organic waste to Comped free or small fee, and waste to landfill with entrance fee. |
| 4 | Introduce Radio Frequency Identification (RFI) tags on bins and skips to optimise waste collection monitoring |
| 5 | Introduce drones and smartphones for online, digital monitoring using video or photo images, municipality to send warnings |

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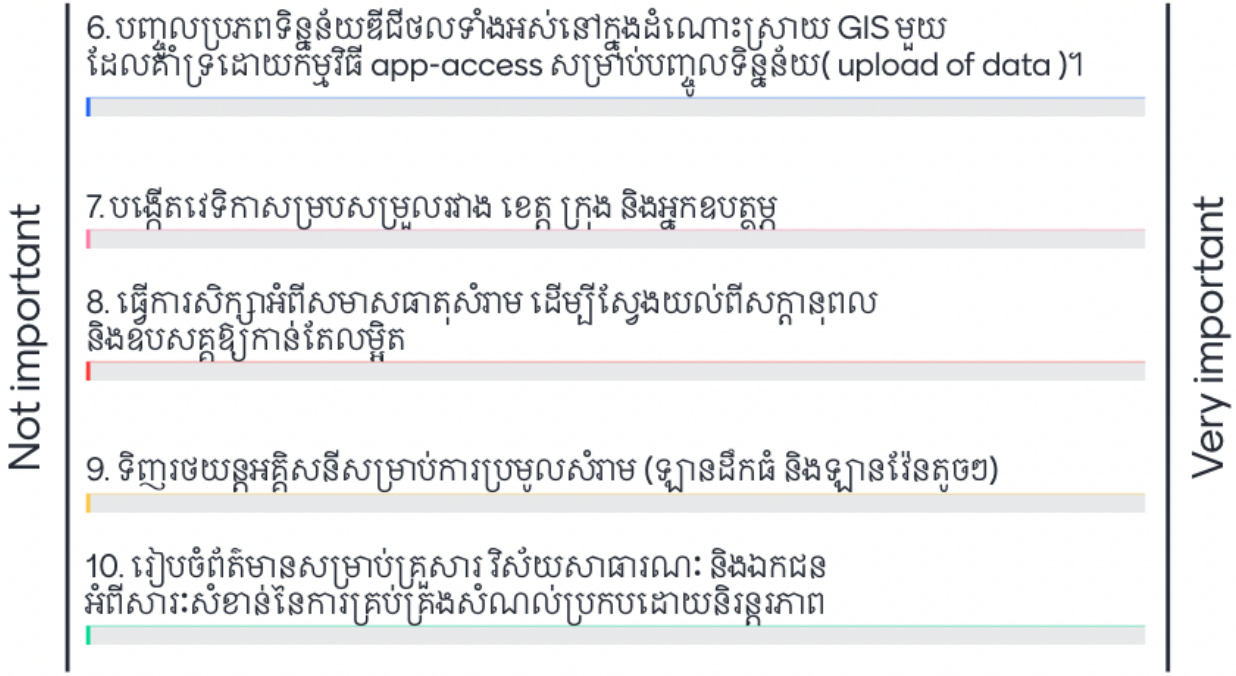
# ការស្ទង់មតិ (Quiz) – Part 2

**How would you rate the following potential pilot projects?**
**តើអ្នកវាយតម្លៃគម្រោងសាកល្បងដែលអាចមាន ខាងក្រោមដោយរបៀបណា?**

| Idea no. | Scope |
|---|---|
| 6 | Include all digital data sources in one GIS solution supported by app-access for upload of data. |
| 7 | Establish coordination forums between province, municipality and sponsors |
| 8 | Undertake waste composition studies to understand potentials and barriers in more detail |
| 9 | Procure electric vehicles for waste collection (trucks and vans) |
| 10 | Develop information to households, public sector and private sector on importance of sustainable waste management |

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# Agenda

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| | |
|---|---|
| 14:00 – 14:10 | Workshop Housekeeping |
| 14:10 – 14:20 | Opening Remarks |
| 14:20 – 14:30 | AASCTF - Background of the Project |
| 14:30 – 14:45 | Diagnostic Assessment |
| 14:45 – 15:30 | Ongoing Initiatives |
| 15:30 – 15:45 | Coffee break |
| 15:45 – 16:00 | Readiness Assessment |
| 16:00 – 17:00 | Pilot Ideas / Digital Solutions |
| 17:00 – 17:30 | Wrap up / Open Discussion |

# ការប្រកាសកម្មវិធី / Housekeeping announcements

bit.ly/3dxdzTH

**សូមឆ្លើយសំណួរក្នុងទម្រង់វាយតម្លៃសិក្ខាសាលាដើម្បីកែលម្អសិក្ខាសាលាខាងមុខ**

*Please answer our workshop evaluation form to improve future workshops*

Scan the QR code or visit bit.ly/3dxdzTH to answer our evaluation survey

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Australian Government
Department of Foreign Affairs and Trade

ADB

# អរគុណសម្រាប់ការចូលរួមជាមួយយើងខ្ញុំ!

*Thank you for joining us!*

## ជួបគ្នានៅព្រឹត្តិការក្រោយ

*See you at our next event*

@AASCTF AASCTF @AASCTF bit.ly/watchAASCTF

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# Thank you very much

Appendices

# List of Stakeholder Engagements and Site Visits

# List of Completed Stakeholder Engagements

## Consultation Meetings

1. **10/03/2021 - Battambang networking for development partners (VM)**
**Participants:** Alex Nash and Kway Thu (ADB); Jeremy Fakhry (GGGI); Nim Sour and Georg Jansen (GIZ); Terra Michaels and Chanmeakara Suong (GRET); Carmela Centano (UNIDO); Phet Pichera (Ministry of Environment); Sarin Say and Manny Sanchez (Tech for Green Cities); Chek Noy (Battambang Municipality); Leif Holmberg, Moeko Saito-Jensen and Eric Buysman (UNDP); Pau Brat Busquets, Hillarie Cania; Jacob Olsen, James MacGregor (Ramboll).

2. **12/04/2021 – GIZ – Ramboll (VM)**
**Participants:** Rathpiphos Lim, Georg Jahnsen, Peter Koeppinger, Chhin
Kapfensteiner, Christian Kapfensteiner, Phearith Chhat (GIZ); Alexander Timmermann, Pau Prat Busquets (Ramboll).

3. **20/04/2021 – GGGI – Ramboll (VM)**
**Participants:** Jerome Fakhry, (GGGI); Inga Stein Burgaard, Alexander Timmermann, Pau Prat Busquets (Ramboll).

4. **22/04/2021 – GRET – Ramboll (VM)**
**Participants:** Terra Michaels, Chanmeakara Suong, Chhay Hoklis, Clémence Robin (GRET); Alexander Timmermann, Pau Prat Busquets (Ramboll).

5. **23/04/2021 – UNDP – Ramboll (VM)**
**Participants**: Leif Holmberg, Moeko Saito Jensen (UNDP); Alexander Timmermann, Pau Prat Busquets (Ramboll).

6. **27/04/2021 – i4Di – Ramboll (VM)**
**Participants:** Many Sanchez (i4di); Alexander Timmermann, Pau Prat Busquets (Ramboll).

7. **10/06/2021 – CiNTRI – KCC (PM)**
**Participants:** Long Pidi Oun (CiNTRI); Sangva Sak (KCC)

8. **10/06/2021 – Leap Lim – KCC (PM)**
**Participants:** Som Samnang (Leap Lim); Sangva Sak (KCC)

9. **11/05/2021 – COMPED, BBP – Ramboll, KCC (VM)**
**Participants:** Sean Bopha (COMPED); Neang Chanthara (BBP); Inga Stein Burgaard, Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak (KCC).

# List of Completed Stakeholder Engagements

## Consultation Meetings

10 **30/11/2021 – i4Di – ADB – Ramboll (VM)**
**Participants:** Many Sanchez, Azra Nurtic Kacapor (i4di); Alexander Nash (ADB); Pau Prat Busquets (Ramboll).

11 **01/12/2021 – GRET, UNDP – Ramboll**
**Participants:** Terra Michaels (GRET); Leif Holmberg (UNDP), Claus Kiltholm, Pau Prat Busquets (Ramboll).

12 **02/12/2021 – EGIS – Ramboll**
**Participants:** Benjamin Biscan (EGIS); Pau Prat Busquets (Ramboll).

## Field Visits: 8–12 Nov 2021

1 **09/11/2021 – COMPED – Ramboll, KCC**
**Participants:** Reth Sarin (COMPED); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

2 **09/11/2021 – New Battambang Landfill/MPWT – Ramboll, KCC**
**Participants:** Von Pisith (MPWT); Alexander Timmermann, Pau Prat Busquets (Ramboll); Lars Orio (PMC – Ramboll); Sangva Sak, Seam Hak (KCC).

3 **09/11/2021 – Leap Lim Dumpsite – Ramboll, KCC**
**Participants:** Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

4 **10/11/2021 – Battambang Province Hall – Ramboll, KCC**
**Participants:** Ymeng Lim (Battambang Province Hall); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

5 **10/11/2021 – Leap Lim – Ramboll, KCC**
**Participants:** Som Samnang (Leap Lim); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

6 **10/11/2021 – Battambang Municipality – Ramboll, KCC**
**Participants:** Chek Noy (Battambang Municipality); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

# List of Completed Stakeholder Engagements

## Field Visits: 8–12 Nov 2021

7. **11/11/2021 – Central Market – Ramboll, KCC**
**Participants:** Vong Ka Onn, Ith Sothea (Central Market); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

8. **11/11/2021 – CiNTRI – Ramboll, KCC**
**Participants**: Long Pidi Oun (CiNTRI); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

9. **11/11/2021 – Phou Puy Market – Ramboll, KCC**
**Participants:** Van Charoen (Phou Puy Market); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

10. **11/11/2021 – CiNTRI workshop – Ramboll, KCC**
**Participants:** Vorn Sa Rorn (CiNTRI); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

11. **12/11/2021 – i4Di – Ramboll, KCC**
**Participants:** Bunthoeun Ho (i4Di); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak, Seam Hak (KCC).

## Field Visits: 7–10 Dec 2021

1. **8/12/2021 – Provincial department of MoE – Ramboll, KCC**
**Participants:** Koth Boran (PdMOE); Alexander Timmermann, Pau Prat Busquets (Ramboll); Sangva Sak (KCC).

2. **9/12/2021 - Stakeholder Consultation Workshop/ Framing Workshop**

# List of Completed Stakeholder Engagements

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