Scoping Study Report on Solid Waste Management in Kep Province

Crab Statue in Kep (Christopher Godlove 2019)

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The Asia Foundation

Solid Waste Management in Kep Province

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PREFACE

Cambodia ranks among the fastest-growing economies in the East Asia Pacific region. Along with population growth, rising incomes, and increasing consumption levels, this economic growth has resulted in a dramatic increase in overall municipal solid waste generation. These factors complicate and pose challenges to solid waste management systems.

Waste collection, transportation, and disposal in major cities and some district areas in Cambodia are normally handled by private companies under the supervision of technical line agencies of the Royal Government and sub-national administration. However, the provision of collection services is limited and does not cover the entire geographical areas. Some, especially rural areas, still do not have access to solid waste collection services. Therefore, households continue to use traditional practices such as burning, burying, or illegal disposal on vacant land, roads, or into bodies of water. Improper solid waste management likely results in negative impacts on water, air, and land, and hence threatens public health, ecosystems, climate, as well as sustainable development.

Municipal solid waste management in Cambodia has now become a priority problem, particularly the lack of treatment and disposal facilities, as well as insufficient landfill operation and management practices. The heightened focus on this issue requires new approaches designed to identify technology, management, and governance interventions that can improve and manage waste separation and disposal in compliance with technical standards. This updated look at the sector also requires engagement with a range of external partners, including groups offering linkages to global best practices in waste management, to support the realignment of waste management in Cambodia,in preparation for the mounting challenges expected in the coming decades.

The Memorandum of Understanding (MOU) entered between the National Council for Sustainable Development (NCSD) and The Asia Foundation (the Foundation) in 2018 provided a framework to begin this process. Kep Municipality, where the volume of municipal solid waste was increased from 30 tons per day in 2016 up to 55 tons per day in 2018, was identified as the focus for study and engagement. The study included a series of activities designed to permit data collection while undertaking the study of existing waste management practices. The final stages of the study focused on seeking out opportunities for improvement, linking the implementation of pilot activities in response to identified challenges.

I strongly believe that this scoping study will serve as an important guiding document for relevant line ministries and sub-national administration, especially Kep Municipal Administration, Non-Governmental Organizations, development partners, and private sector in collaboratively working on developing and implementing a comprehensive and sustainable municipal solid waste management plan to reduce environmental impacts, enhance community aesthetics and social well-being, and attract more tourists. I hope that this document will be useful as a reference for other stakeholders for policy formulation and further studies.

I would like to thank the Foundation for working closely with NCSD, Ministry of Environment (MoE), and National Committee for Sub-National Democratic Development Secretariat (NCDD-S) to conduct the study and develop a comprehensive report, and Kep provincial and municipal authorities and other stakeholders for inputs and coordination.

Phnom Penh 07 August 2020

Say Samal

Chair of the National Council for Sustainable Development
Minister of Environment

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ABBREVIATIONS

ADB	Asian Development Bank
CCAC	Climate and Clean Air Coalition
CCCA	Cambodian Climate Change Alliance
COMPED	Cambodian Education and Waste Management Organization
CP	Capital and Provincial
D/M	District/Municipal
EIU	Economist Intelligence Unit
ETAGIW	Expert Team for Assessment and Guidance for the Implementation of Waste legislation
GGGI	Global Green Growth Institute
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IGES	Institute for Global Environmental Strategies
IWA Kep	International Women's Association Kep
KAS	Konrad-Adenauer-Stiftung
MA	Municipal Authorities
M&E	Monitoring and Evaluation
MEF	Ministry of Economy and Finance
MoE	Ministry of Environment
MoI	Ministry of Interior
MOU	Memorandum of Understanding
MSW	Municipal Solid Waste
NCSD	National Council for Sustainable Development
NCDD-S	National Committee for Sub-National Democratic Development Secretariat
OBG	Oxford Business Group
PA	Provincial Authorities
PDoEF	Provincial Department of Economy and Finance
PDoE	Provincial Department of Environment
PDoT	Provincial Department of Tourism
PPCA	Phnom Penh Capital Administration
RGC	Royal Government of Cambodia
SALGA	South African Local Government Association
SNA	Sub-National Authority
SWM	Solid Waste Management
TWG	Technical Working Group
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency
WRI	World Resources Institute

EXECUTIVE SUMMARY

National Council for Sustainable Development and The Asia Foundation's joint initiative focused on improvement of municipal solid waste (MSW) management in Kep offers a comprehensive picture of waste operations in a secondary Cambodian municipality. To develop an accurate understanding of the current situation and to establish a solid baseline for future actions to address needed areas in Kep's municipal waste management operations, NCSD and the Founation developed a research approach, which involved the development of a desk study report combined with a field visit to Kep to collect and analyze available information. The product of this research is a structured scoping report and a policy brief made to inform the development of targeted pilot activities that address specific challenges present within the existing system, and a series of policy recommendations designed to move the sector toward improvements in the medium and long-term.

Status of waste management in Kep

Waste generation in Kep Municipality is significantly affected by the seasonal impact of tourism. There is roughly a daily variation in waste generation of 10 tons between peak and off-peak tourist seasons, with off-peak generation estimated at between 45 and 51 tons per day and generation during peak season estimated to be about 55 tons per day.

Key data related to MSW in Kep	
Provincial population	40,470
Number of tourists annually	5,671
Volumes of waste/day	1,676,509
Volumes of waste/day (peak season)	45 to 51 tons
Waste disposed to landfill/day	55 tons
Service provision coverage	50%
Service provision coverage	50%

An important part of the waste challenge in Kep is linked to the low rates of waste collection. It is estimated that only around 50% of all generated waste is collected and disposed. The study also notes the important role that women and informal waste workers play in current operations, roles that are particularly important when considering their contributions to material recovery and recycling.

Solid waste management challenges

The specifics of Kep's decentralization challenges are presented along with an analysis highlighting the reasons why these challenges exist both at the sub-national and national levels. These subnational challenges stem mainly from provincial rather than municipal authorities entering into contracts with private company. The challenges include non-compliance by district/municipal (D/M) authorities in terms of arranging the contract with waste collection service provider and spending and implementation of Sub-National Authority (SNA) Sanitation Service Funds, and limited enforcement and monitoring and evaluation (M&E) by provincial and/or D/M authorities of contractual implementation. Sub-decree No. 113 on Management of Garbage and Solid Waste of Municipalities officially dictates that solid waste management (SWM) is left to authorities at the district and municipal levels.

At the national level, these challenges are primarily a lack of reliable data on the current situation of waste management contractual arrangements at both provincial and D/M authority levels, the limited and un-coordinated M&E at the national level on SNA waste management, and limited coverage by Sub-decree No. 113 and Inter-ministerial Prakas No. 073 on Using Sanitation Service Fund to Implement Function of Managing Solid Waste and Wastewater of Municipalities of SNAs upon market place waste management.

Considering an approach to reform

Building on this solid understanding of Kep's waste management system, careful planning for reform requires consideration of several aspects that include governance, technology and systems, partner engagement, and resources.

The five pilot concepts detailed in this report are recommended to represent a truly holistic approach designed to address the essential components required to move Kep towards SWM solutions. The five proposed overarching pilot concepts include:

1. Governance – This approach is designed to address challenges posed by an incomplete decentralization process where overlaps in government authority and oversight may contribute to an inefficient SWM system. This concept will incorporate a focus on M&E for management and operational improvement.
2. Decentralized technology and systems – This approach is based on a theory of waste management that advocates for treatment of waste using small-scale, low-tech, and low-cost treatment approaches close to the point of generation. This concept is readily applicable to decentralized use at a neighborhood or district level.
3. A full waste collection service coverage and landfill improvement – This approach focuses on a targeted effort to expand waste collection coverage by mapping unserved or underserved waste collection areas and identifying steps for expansion, accompanied by implementation of environmental safeguards at the Kep landfill.
4. Role of informal sector – This approach is designed to initiate dialogue between the municipal authorities and informal waste workers. Through ongoing discussions and agreements, the municipal authorities can support the informal waste workers to work towards solutions that will benefit the whole community, including better separation and recovery of recyclable materials.
5. Education and awareness – This approach focuses on the development of awareness campaigns adapted to a Cambodian context, seeking engagement with different levels and segments of society. This activity also focuses on the development of educational messages centered around themes that reflect local values, history, and culture, and connects them to SWM.

Policy reform focus

Following and in parallel with the aims of the proposed pilot activities is a series of linked policy recommendations. This series of recommendations seeks to address multiple objectives simultaneously, but are centered around several basic concepts including green growth, environmental sustainability, circular economy, improved livelihoods, and cost effectiveness. Key policy recommendations connected with each pilot activity are:

1. Strengthen Public Works, Transportation, Hygiene, Environment, and Public Order Office within Kep Municipal Administration: This action serves to reinforce municipal accountability for waste management at the local level while permitting the development of municipal personnel's understanding of duties and SWM operations. This act is also a focus on ensuring a successful transition of oversight for waste management services to Kep Municipal authorities, especially the newly established office with enough personnel and budget.

   Pilot activity under: Governance

2. Institutionalize M&E that supports ongoing decentralization and operational improvements via focused data management: To ensure operational efficiency and strong system performance, an enhanced focus on M&E must be adopted. This focus should be applied to both management and operations in the form of financial and administrative performance of the Public Works, Transportation, Hygiene, Environment, and Public Order Office, in coordination with national and provincial oversight, as well as linked to monitoring of operational performance of local SWM operations. Comprehensive understanding of waste composition and quantity is vital for operational and investment planning and decision making in waste management, especially in the determination of the appropriate handling and management of different waste streams.

   Pilot activity under: Governance

3. Identify resources required to meet SWM goals and develop revenue enhancement strategies responsive to those needs: In parallel with the strong focus on M&E, Kep provincial and municipal authorities must ensure that resources are sufficient to support SWM objectives through local partnerships. This will require analysis of alternative funding mechanisms to support MSW operations. At present, operations in Kep rely on a fee collection scheme managed by a private operator, resulting in service most focused on the needs of large commercial generators. To adequately address waste management at a community level, funding for waste operations must be expanded and diversified.

   Pilot activity under: Governance

4. **Pilot a public-private partnership model, which includes economic incentives, in order to promote waste separation at source as a part of circular economy:** Well-designed economic incentive schemes have been found effective in promoting awareness of waste recycling and increasing participation in separation waste at source. Kep Municipal Administration could achieve this by testing an existing model of a Waste Bank. Residents are paid based on the amount of dry recyclable materials (plastics, metal, aluminum) they deposited. Another model could be an integration of informal waste workers into the existing waste management system. Collection efforts of both formal and informal workers can significantly reduce disposal rates to landfill while supporting improved livelihoods for vulnerable populations. Kep Municipal Administration should establish dry recyclable collection points and work with informal waste workers to create a collaborative approach for collection and sale of recyclables for conversion into new products and sources of energy. Partnerships with recycling depots and/or private sector should be a part of these two models to channel the materials to the recycling facilities.

   Pilot activity under: Education and awareness and role of informal sector

5. **Launch partnership to pilot the integration of anaerobic digestion of biowaste from Kep's markets, permitting diversion of organic waste from final disposal site, and conduct a feasibility study on possible on-site composting:** Markets and other institutional food service and food processing operations produce large quantities of organic waste. Organic waste serves as a feedstock to the bio-digestion process, a process which simultaneously reduces waste volumes while producing biogas. Markets in Kep offer an opportunity to pilot a partnership with the National Biodigester Program in support of the sustainable treatment of Kep MSW. Organic waste also provides another opportunity for producing compost for agriculture. Kep Municipal Administration should conduct a feasibility analysis for on-site composting in the areas with poor access to waste collection service.

   Pilot activity under: Decentralized technology and systems

6. **Create roadmap for achieving a full waste collection service coverage in Kep:** Establishing a full waste collection service coverage is essential to addressing the waste management challenges faced in Kep. The effort for a fully expanded collection coverage will assist Kep Provincial Administration to address open burning and marine plastics. Establishing clear milestones and the steps needed to reach them offers a path to successfully achieving this goal.

   Pilot activity under: A full waste collection service coverage and landfill improvement

7. **Endorse action plan to secure landfill and implement low-cost operational improvement practices designed to reduce environmental impacts:** Kep should direct attention to an upgrade of operations at the landfill. Kep Municipal Administration should improve site access. Operational changes, such as reducing waste burning, ensuring consistent waste placement, and regular application of cover material, should be made to mitigate environmental impacts.

   Pilot activity under: A full waste collection service coverage and landfill improvement

8. **Support targeted awareness initiative to educate inhabitants on the importance of proper waste disposal, the health and environmental hazards of open burning, penalties for improper disposal:** Only through the support and engagement of local inhabitants can real progress towards improved waste management be accomplished. Strong signals from local leaders will convey this message by demonstrating a commitment to action. This may involve be beach clean-up events led by local officials, events linked to waste separation, reduced use of plastic, or commitments to anti-burning and illegal dumping.

   Pilot activity under: Education and awareness

In summation, this report seeks to gather critical information from the Kep experience needed to develop the next phase of action-oriented reforms. The implementation of targeted pilot activities combined with an analysis of needed reforms will move the discussion a step closer to the development of key policies. These efforts are designed to transform a currently weak and under resourced sector, offering new tools to transition to updated technologies, a reorientation of management, and an increased focus on public engagement that supports this transformation.

1. INTRODUCTION

This 'scoping study report' seeks to collect and organize the knowledge gathered about current waste management practices and challenges in Kep. This information is accompanied by a brief description of the Cambodian waste management context, provided to orient the reader within national waste outlook. This is followed by an analysis of the challenges specific to Kep, a description of possible solutions including the inputs and resources required, and finally a description of several pilot activities designed to address these challenges. Based upon this framework of analysis and recommendations, the report concludes with a section dedicated to policy recommendations for the consideration of waste management decision-makers at both the national and sub-national levels.

1.1. Background

Cambodia's rapid economic growth in recent years has led to an urgent need to address the country's waste management challenges. It is estimated that Cambodia generated just over 1 million tons of waste in 2014, with this number growing exponentially to an estimated 3.65 million tons in 2017 (Modak et al., 2017; Pech, 2018). Rapid economic growth and the associated upward trend in domestic consumer consumption is driving this surge in waste generation, estimated by the Ministry of Environment (MoE) to grow by 10% each year (Bual, 2018).

The issue of waste management has only in recent years begun to receive attention as an environmental priority, with most of the focus being placed on waste management in Phnom Penh and several secondary cities (Min, 2016). An example of this is the Foundation's completed project- Urban Services Program- which aimed to improve SWM in Phnom Penh, focusing on the identification of constraints and facilitation of access to information and resources with the goal of identifying solutions to real waste management challenges. Research efforts undertaken within the context of this program were designed to reshape waste collection within the city and to offer input into the ongoing reform process of the SWM sector (Denny, 2016). On the other hand, outlying cities and provinces have only received attention to waste management issues largely in response to inadequate waste management at places with special national and international importance (Gordon, 2015).

In addition to the increased packaging waste associated with a growing and increasingly prosperous population, a growing tourism sector is another major driver of waste generation, particularly in the more visited regions of the country, notably in coastal communities as well as in Siem Reap and Phnom Penh. By one estimate, tourists visiting Cambodia generate 10 million plastic bottles every month, bottles that end up in dumpsites or in the landscape, at times carried by a stream or river to the sea (Refill Asia, 2019).

Some of the key consideration to have in mind when considering waste management in Cambodia are:

- Waste collection in larger secondary cities is largely outsourced to private companies (Kaza et al., 2018);
- Collection rates are far from universal, with collection ranging from 30% to 80% in most urban areas (Sour, 2017);
- Enforcement of environmental norms and regulations is limited as is oversight of waste disposal (Min, 2016);
- Dump sites are the main form of disposal combined with the burning of waste, contributing to air pollution, degraded land, and associated negative health impacts (MoE & UNEP, 2009);
- Formal treatment of waste is largely inexistent and is mostly performed by the informal sector, which earns income from the sale of collected materials like metals and plastics (Min, 2016);
- The organic component of Cambodian MSW is estimated to range from 50% to 70% in urban areas (Sang-Arun & Chau, 2011).

1.2. National Council for Sustainable Development and The Asia Foundation partnership

Cambodia's NCSD is engaged in efforts to address the country's waste management challenges, seeking to innovate by assessing opportunities to implement circular economy approaches as well as through an increasing acknowledgement of the need to incorporate waste hierarchy principals into policy solutions (Sok, 2019). This increased interest to streamline new environmental approaches that integrate concepts of green growth and sustainability with SWM practices appears to stem both from a recognition of the environmental pressures associated with rapid economic development, as well as from a desire to conserve resources while protecting the country's natural landscapes for future generations (MoE & UNEP, 2009).

With these ideals in mind, NCSD and the Foundation formalized an agreement in October 2018 designed to support policies to address environmental sustainability in the face of the country's rapid economic development. This agreement took the form of the MOU and provided a mechanism for NCSD to access the Foundation's global reach and know-how in addressing questions of sustainable development and green growth.

In early 2019, NCSD and the Foundation reconvened to discuss how to build on the precedent for collaboration established by the MOU. This led to an idea centered around a 'model city' approach focused on the need to improve waste management within the country, with the town of Kep serving as the basis for analysis and evaluation. This effort sits alongside a number of other government and donor-supported efforts focused on urban service improvement and environmental protection, including the development of a green growth themed secondary city strategic planning effortby the Global Green Growth Institute (GGGI), and the promotion effort of circular economy approaches led by the United Nations Development Programme (UNDP) with support from the Swedish government (Sen, 2019). This NCSD-the Foundation effort also connects the waste management issue with the Cambodian government's multi-year focus on decentralization of the decision-making process, an effort coordinated by the Ministry of Interior (MoI) through its NCDD-S (Niaza, 2011).

1.3. Objectives of the study

The objectives of the study are to:

1) Understand existing SWM systems and infrastructure;

2) Understand financial sustainability of waste operations;

3) Explore the gender roles in waste management;

4) Identify key challenges of implementation at the sub-national level and national level on SWM;

5) Analyze opportunities to streamline oversight and resources required to support the overall good functioning of systems operations by proposing recommendations and pilot activities.

2. APPROACH AND METHODOLOGY

In launching a Kep-focused initiative, it was important to first develop an understanding of the present state of waste management there. In order to portray an accurate picture and to establish a solid baseline understanding of the situation, NCSD and the Foundation developed a research and analysis approach designed to identify areas of potential policy recommendations that address needed areas of reform within the municipal waste management sector.

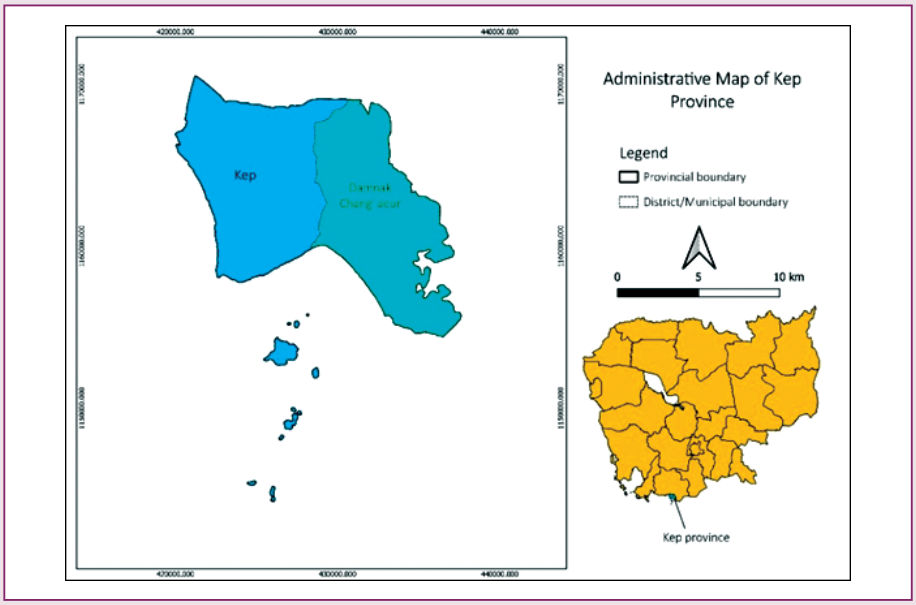

Figure 1: Location of Kep Municipality and Province

2.1. Work products and activities

As outlined in the approach described above, a series of interlinked tasks were initiated in order to provide a strong foundation for future decision-making related to municipal waste management. A brief description of each of the inputs into this process follows:

Desk study – An initial desk study report was designed to compile and organize all available data related to waste management in Kep. This study was led by an international consultant with knowledge of global waste management best practices and an understanding of the challenges faced by developing countries seeking to improve and reform waste management systems. This study looked at the various components of waste management in Kep: collection, transport, treatment, and disposal. Other important aspects for consideration included: generation of marine litter and plastics, waste management on two islands (Rabbit Island and Pou Island) comprising part of Kep Municipality's waste management system, and the opportunity for waste treatment focused on dry recyclables and organic waste streams (a copy of this report is provided in the Annex 1).

Field Visit – A field visit to Kep was coordinated in parallel with the development of the Desk Study report. The objective of this visit was to facilitate first-hand observations of waste management practices in Kep and to discuss waste management challenges with provincial and DM authorities. The visit consisted of meetings with local government; the company contracted to collect, transport, and dispose of waste; technical visits to the landfill and to material processing and recycling facilities; as well as visits to markets, hotels, restaurants, beaches, and two islands included within the boundaries of Kep's MSW management system. A visit to a neighboring composting facility in Kampot province was also included within the agenda.

Scoping study report – This scoping study report consolidates and analyzes findings from the various activities and serves as a document that consolidates and organizes all Kep waste management information collected to date. This report also seeks to provide an analysis of the priority areas requiring policy maker attention, as well as initial ideas for recommended policy reform. A concluding element of the document highlights the policy reform steps required to address the identified

challenges present within the existing systems, as well as opportunities to further improve the sector through reforms that will be pre-screened via the implementation of targeted pilot activities designed to address specific waste management challenges observed in Kep.

Consultation workshops – in late May 2019, a consultation workshop in Kep was conducted with an aim to share and validate the primary results of the study with representatives of NCSD, MoE, NCDD-S, MoI, provincial and municipal/district authorities, provincial departments, local business operators, and the community. In mid-September, another internal consultation meeting was held with relevant departments of MoE and NCSD to seek their final feedback and support on both the full draft scoping study report and the policy brief, including a draft workplan of the proposed pilot activities before receiving the endorsement of MoE for publication.

2.2. Coordination of organizational participation and inputs

In order to ensure equitable and full participation within this initiative, a technical team was established consisting of consultants of the Foundation, representatives of NCSD and MoE, and a representative from NCDD-S.

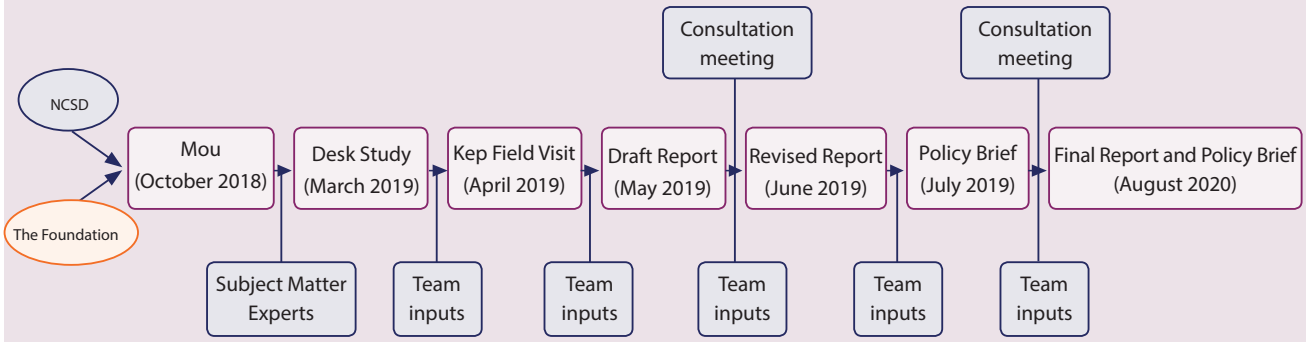

Figure 2: Overview of Kep information gathering, analysis and activities

NCSD's participation included technical staff from the Department of Green Economy. MoE is represented by technical staff from the Department of SWM. NCDD-S's participation addressed the need to look at the impact of decentralization upon waste management in urban areas. The Foundation's participation included senior and junior technical staff representatives in addition to external international and national consultants. The participation of external consultants permitted the integration of expertise in global waste management, sustainability, and governance.

This team of organizational representatives and subject matter experts met at key points during the information collection and analysis process, as well during the field visit consultations. From the start of discussions, well-coordinated team interaction and decision-making permitted efficient planning and activity implementation.

2.3. Solid waste data collection and organization

From the start of this initiative, an effort was made to seek out sources of reliable data to ensure sound analysis and recommendation outputs. As noted in the Desk Study exercise discussion above, waste data availability in Cambodia poses significant challenges, particularity when information is being sought on the operations of specific municipal waste management systems. A description of the data collection efforts from both secondary and primary sources follows. The administrative boundary for this effort was defined by as being the Province of Kep, including the islands of Koh Pou and Koh Tonsay (Rabbit Island), with a primary focus on Kep Municipality.

Secondary data collection – A first step in the data collection process involved an initial literature review,

which served to document available publications relevant to waste management in Cambodia and specifically in Kep. Using information obtained from publications identified during the literature review phase, a number of useful secondary data inputs were gathered. The most relevant information gathered during this process included information on waste characteristics, regulations, and municipal management operations such as disposal. This exercise was also useful in helping to identify proxy data, mostly composed of waste composition of secondary Cambodian cities, designed to supplement analysis related to Kep where data was missing and not otherwise accessible.

Primary data collection – During the field visit to Kep, meetings and interviews were conducted to collect primary data related to waste management in Kep, supplementing the secondary data already collected. This collection of primary data involved waste collection and disposal data, demographic information related to population and tourism, in addition to information on existing contractual and managerial arrangements related to waste. Meetings and interviews were one of the most effective ways to identify specific challenges faced by waste management operators in Kep. These discussions were held over a 3-day period in early April 2019. To supplement these discussions, a series of pre-field visit meetings were held in Phnom Penh with relevant Cambodian waste sector actors – UNDP, Cambodian Education and Waste Management Organization (COMPED), and Global Green Growth Institute (GGGI).

As a further tool to facilitate analysis and data collection, the NCSD-the Foundation technical team utilized a data collection tool designed specifically to aid cities in structuring data management efforts in a way that is clear and straightforward, based upon the experiences of many cities participating in waste management capacity building activities globally. This tool is the Climate and Clean Air Coalition (CCAC) City Assessment tool (CCAC MSW Initiative, 2013).[1]

1 The City Assessment Tool was developed by CCAC Waste Initiative. The tool can be found: via https://www.waste.ccacoalition.org/document/city-msw-rapid-assessment-data-collection-tool-english

3. OBSERVATIONS AND ANALYSIS

Waste management in Kep municipality is similar to the waste management operations found in other similar sized Cambodian cities. While Kep has a relatively small urban population when compared with other Cambodian provinces, numbering approximately 40,000 (UNDP, 2019), the waste management context in Kep remains representative of that found in other regions, with officials responsible for waste management facing similar challenges in terms of capacity, resources, and regulatory enforcement (Min, 2016).

As highlighted in the initial Desk Study, obtaining reliable data on waste management operations remains a significant challenge to addressing waste management reform in Cambodia. As in other cities, Kep faces substantial gaps in data availability and existing data are approximations given the lack of actual instrument-based measurement. With this caveat, some basic data has been compiled, permitting a fairly reliable analysis of existing operations.

The key data available include:

Waste generation – Waste generation has risen over the past several years and stood at 45 to 51 tons per day in 2018. [2]

Table 1: Demographic background, tourism statistics, and solid waste data in Kep

Demographic Background and Tourism Statistics in KEP Province	
Number of communes/sangkats	05
Population	40,470 (5,671 urban) (UNDP, 2019)
Households in province	8,917
Restaurants, hotels and other entertainment facilities	12 hotels/57 guesthouses/22 bungalows/59 other entertainment facilities, and 30 restaurants (PDoT, 2019)
Tourists	1,676,509 [3]
Key Features of MSW in KEP Municipality	
Volume of waste per day (average)	45 to 51 tons generated (PDoE, 2018); 25 tons disposed to landfill [4]
Volume of waste per day (peak tourist season)	55 tons [5]
Service provider	Poung Sokhim (operations startup 2015)
Operational start-up of the Public Works, Transportation, Hygiene, Environment, and Public Order Office	Established
Accountability line of service provider	• Contract with MA • Contract with PA and PDoEF
Service provider personnel	29 workers, 2 fee collectors, 1 General Manager
Service provision coverage	50%
Monthly fee collection	$2.45 (small house) - $30 (large hotel)
Landfill	Damnak Chang'aeur Village, Sangkat Prey Thom, Kep City, Kep Province
Distance to landfill:	11.5 km from city center

2 Consultative meeting in Kep in May 2019
3 Provincial Authority meeting in April 2019
4 Waste collection company meeting in April 2019
5 Consultative meeting in Kep in May 2019

Waste composition – Reliable waste composition data is not available for Kep as no detailed analysis has been undertaken recently. Phnom Penh provides the most complete reference for waste characterization inCambodia, with organic waste representing about 70% of total waste generated, followed by paper (5%), plastics (6%), and metals (2%). Estimates from other Cambodian municipalities put the rate of organic waste a bit lower, calculated at 54% in Siem Reap, and as high as 60% in Kampong Cham (Sang-Arun et al., 2011). In planning infrastructure and services required in addition to understanding the potential for recycling and reuse, updated data on the composition of waste is recommended.

3.1. Existing solid waste management systems and infrastructure

A detailed description of findings related to existing waste management systems and installed infrastructure in Kep follows. This section addresses each component as they are encountered in the four separate phases of waste management: collection, treatment, transport, and disposal.

Waste Collection – Waste collection in Kep is centered around the major generators of waste such as markets and the most visited tourist attractions. These operations are mainly commercial based activities, possessing the resources and fundamental business interests to demand and procure efficiency and reliability of waste removal. As in other Cambodian towns and cities, Kep is heavily reliant on a private waste operator whose primary focus is to respond to the needs of the large waste generators, with a secondary focus on ensuring waste removal in high-traffic public spaces like parks and temples (Min, 2016). Observations of the smaller commercial and household generators show a trend to less formalized and inaccessible service.[6] This was noted in discussions with district authorities in Damnak Chang'aeur, as well as during a talk with a representative of the local community and of smaller hotel and restaurant commercial operations on Rabbit Island. During a meeting with the private waste service provider in Kep, only a small proportion of households live along roads with direct access to collection services, leaving the majority of households managing waste using traditional methods such as burning waste. [7]

Waste treatment – The recovery of recyclable materials, or any other process focused on the reduction of waste volume prior to disposal, is not a formal part of waste management operations in Kep, and based on discussions with municipal officials, there are no immediate plans for inclusion of this missing waste management component. [8] However, the absence of a formal waste treatment system has to some extent been addressed by the informal sector, which is actively engaged in the collection of metals and plastics, materials which are in turn resold to intermediaries. As organic waste (food and garden waste) represents greater than 50% of all municipal waste generated, it is noted that a focus on treatment of this waste stream would also yield results, offering alternatives to landfill disposal (Sang-Arun et al., 2011). However, in discussion with city officials only passing interest was made towards this option.

6 Meeting with Damnak Chang'aeur district authorities in April 2019

7 Meeting with Rabbit Island business representatives in April 2019

8 Meeting with Kep Municipal authorities in April 2019

Waste disposal – All formally disposed waste in Kep is sent to the site in Damnak Chang'aeur Village, Sangkat Prey Thom, Kep City. Daily rates of disposal at this site were estimated at 25 tons a day. This site is typified by largely unmanaged and irregular placement of waste. Waste burning here is a common practice. Additionally, the site lacks any form of stormwater or leachate management systems. Waste is managed in a haphazard fashion with earth-moving equipment being used to excavate space for arriving waste. Additionally, the presence of informal waste workers picking waste around arriving trucks and earth-moving equipment poses obvious health and safety risks. The poor condition of the 3-kilometer dirt access road greatly limits access to the site and reduces efficiency by increasing the time it takes for transport trucks to reach the site and deposit waste. This results not only increased transport time but associated increases in fuel costs, staff time of drivers, and greater wear and tear on trucks and equipment. [9]

Default disposal methods – As described above, the lack of reliable formal collection leads waste generators to seek alternatives for disposal of the waste they generate. Based on estimates related to alternative waste disposal in urban Cambodia, burned or illegally disposed waste accounts for anywhere from 2.5% to 50% of all waste generated (Sour, 2017). Open burning is still common in rural and urban areas and encountered most frequently in areas without good access to collection services. Burning waste contributes significantly to air and climate pollution. Pollutants are highly variable depending upon the content of the waste being burned. When plastics are present, this burning results in highly toxic emissions that can have severe impacts, with especially pronounced impacts on health ofthe young and old (US EPA, 2003). Like waste burning, illegal dumping generally degrading the environment physically and aesthetically (Mazza et al., 2015).

Waste flow analysis – To better illustrate the existing dynamics of waste management, a visual representation is useful. The following visual illustrates the flow of waste most commonly encountered in Cambodia from point of generation to the final point of disposal (MoE, 2008 as cited in Sour, 2017). The specifics of the flows in Kep and other municipalities will have local variations, for example, the flow from waste recyclers to dumpsites was not observed in Kep. Informal waste recyclers in Damnak Chang'eaur district confirm that most remaining waste, largely composed of plastic bags, is burned. [10]

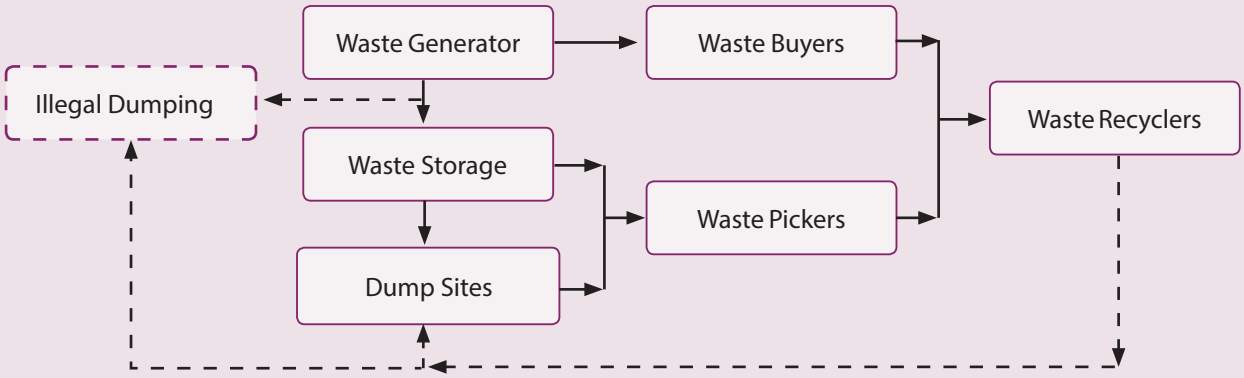

Figure 3 : MSW flow in Cambodia

9 Technical site visit to dumpsite in April 2019

10 Meeting with Damnak Chang'aeur district authorities in April 2019

3.2. Financial sustainability of waste operations

Based on discussions with Kep provincial and municipal officials as well as with the private operator managing collection and disposal, it is understood that the present system of fee-based service provision is reliant upon the operators' ability to collect fees from waste generators. Recourse for non-payment of service is limited with the only consequence being that of discontinued collection services. [11]

As information on operator revenue is not publicly accessible, it is unclear what the profit margins are of the current fee assessment system. It is the NCSD-the Foundation team's understanding that the current service provider is providing waste collection services via two contracts for collection service in Kep. The annual contract with Kep Municipality is $52,000 USD which is paid to the private provider via a budget allocation from the MoE. The source of these funds is the Sanitation Service Fund for Implementation of Urban Solid and Waste Management.[12] The other contract for waste services is between the private operator and the Provincial Authority. A final informal arrangement, with no governing contract, offers market stall operators disposal services and is based on direct payment to the private operator.

The existing contracts and the informal arrangements to collect market waste are summarized as follows:

- Contract 1 – Responsible agency: Provincial Authority. 16-year, fee-based service contract [13] – collection and disposal of waste and maintenance of landfill as well as access road to site
- Contract 2 – Responsible agency: Kep Municipality. Annual contract – waste collection from streets, parks, schools (also covers parking services)
- Informal collection arrangements – Counterpart: Market authorities. Fee-based services provided via an informal, no-contract arrangement for waste collection from main city markets (including the Crab Market).[14]

Fees charged to users for waste services vary by type of establishment with restaurants and hotels being charged in the range of $15 USD and $17 USD respectively a month (UNDP, 2019). A smaller bakery shop incurs a fee of $10 USD a month, the Crab Market around $500 USD monthly, while households pay $2.5 USD per month. [15]

An overview of existing worker staffing by category follows:

Table 2: Workers currently employed by private service provider in Kep

Worker Category	Number	Observations
Beach cleaning	9	Female workers
Street sweeping	9	Female workers
Collection truck drivers	2	Male workers – 8-ton truck
Collection workers	3	Male workers– 8-ton truck
Collection truck drivers	2	Male workers– 13-ton truck
Collection workers	4	Male workers– 13-ton truck
Fee collectors	2	
General manager	1	
Total Workers / employees	32	

11 Meeting with waste service provider in April 2019

12 Based on report on implementation of sanitation service fund by Kep Municipality (in Khmer language), in 2018 Kep municipality received 210 million riels (52,500 USD).

13 Based on Sub-decree No. 113, cleaning, collecting and/or transporting services and/or service of garbage and solid waste of municipalities and landfills shall not be for longer than for a 10-year period per contract. It appears that this contract is out of compliance based on the Foundation's understanding of existing legislation.

14 Consultative meeting in Kep in May 2019

15 Meeting with waste service provider in April 2019

On the expense side of operations, inputs include labor, equipment, maintenance, supplies, fuel, and other investments such as road works and landfill upgrades. While the team did not gain access to comprehensive cost information related to waste management operations in Kep, a model has been developed by UNDP to assist Cambodian municipalities to develop an estimate of operational and equipment costs based on three hypothetical levels of service – acceptable, better, and ideal. Using waste related activity data for a given city, cost estimates can be calculated using the model, and are based on default values developed with cost inputs from private sector waste operators. These values assist in determining staffing requirements and related costs, equipment needs, as well as transport and fuel input expenses. Capital costs for waste-hauling trucks are based upon the assumption of good-quality second-hand vehicles. Activity data inputs focus primarily on population, number of households, number of commercial generators, street sweeping requirements, green space, and distance to landfill.

Based on these default inputs and the relevant waste activity data inputs for Kep, and the selection of the basic service level (acceptable level), a set of cost and worker requirement estimates were generated – see Box1. UNDP is careful to note that the outputs of this model are estimated costs based on inputs and that there is no guarantee of the accuracy of the information (UNDP, 2018).

Labor / Workers

Waster collection/handling/cleaning workers:	**73** people
Adminstration workers:	**6** people

Costing

Total operations cost:	**$16,037** per month, of which:
Operations and maintenace cost:	**$1,987**
Personnel cost:	**$13,200**
Adminstration cost:	**$ 800**
Capital cost for fleet:	**$245,000** (one time investment)

Box 1: Estimated costs for 'acceptable' waste service level based on UNDP MSW management costing App

3.3. Role of women in managing solid waste

As noted in the above detail on the staffing of waste management services in Kep, women represent more than half of the total staff employed in the management of waste in Kep. While men are predominant in the operations of heavy equipment and the collection and disposal of waste, women represent the totality of cleaning and sweeping operations with 18 workers employed in this area of operations. It is clear from informal discussions and observations during the field visit that women also play a significant role in the informal collection and treatment of waste. An example of this is an informal discussion with a woman who described herself as a full-time cook, but was found supplementing her income by collecting plastic bottles along the beach, providing an additional source of revenue to boost her family's total monthly income.[16] Exploring further engagement with the informal collection market may represent a cost-saving opportunity to government services in the longer term and income generation for waste pickers and collectors.

An additional aspect of women's involvement in the management of waste in Kep was encountered during the visit to IWA Kep, a group focused on the transformation of recovered materials like plastic film and other packaging. These materials are cleaned, processed, and eventually

16 Observations and interactions on Kep beachfront in April 2019

Figure 4: Transforming waste at the International Women Association Kep (IWA Kep)

transformed into finished goods that include handbags, wallets, satchels, and shopping bags. While a small operation, the four women involved have been trained to transform the incoming materials into new value-added consumer products that are sold in Kep, Kampot, and Phnom Penh, with some exported for sale to Switzerland. This is a small-scale operation, but the organizing principal centered around the training of workers to transform waste into a value-added product is a powerful one. [17]

3.4. Solid waste management decentralization

Cambodian public administration is composed of both national and sub-national levels. The three sub-national levels include: (i) capital and provincial (CP) level, (ii) D/M level (Khan being used only for Phnom Penh Capital), and (iii) commune and Sankgat level (referring to urban communes). The Government officially began the process of decentralization reform in 2002, starting with local elections at the commune level. In 2008, the Government began to focus on decentralization at the district and municipal level, with the expectation that these levels of government would assume responsibility for the delivery of public services and any other additional services. Figure 5 below illustrates the expected oversight relationships between government entities (NCDD, 2017).

MSW management is one of the key functions expected to be transferred as part of this process. The following section discusses the key legal reform context behind the planned decentralization of waste management in Cambodia, with a specific focus on how it occurs in Kep.

3.4.1. Regulatory background

Sub-decree No. 113 on management of garbage and solid waste of municipalities and subsequent regulations

The main existing legal foundation for decentralized waste management in Cambodia is Sub-decree No. 113 on Management of Garbage and Solid Waste of Municipalities (RGC, 2015). Before the promulgation of Sub-decree No. 113 on Management of Garbage and Solid Waste of Municipalities (August 2015), waste management

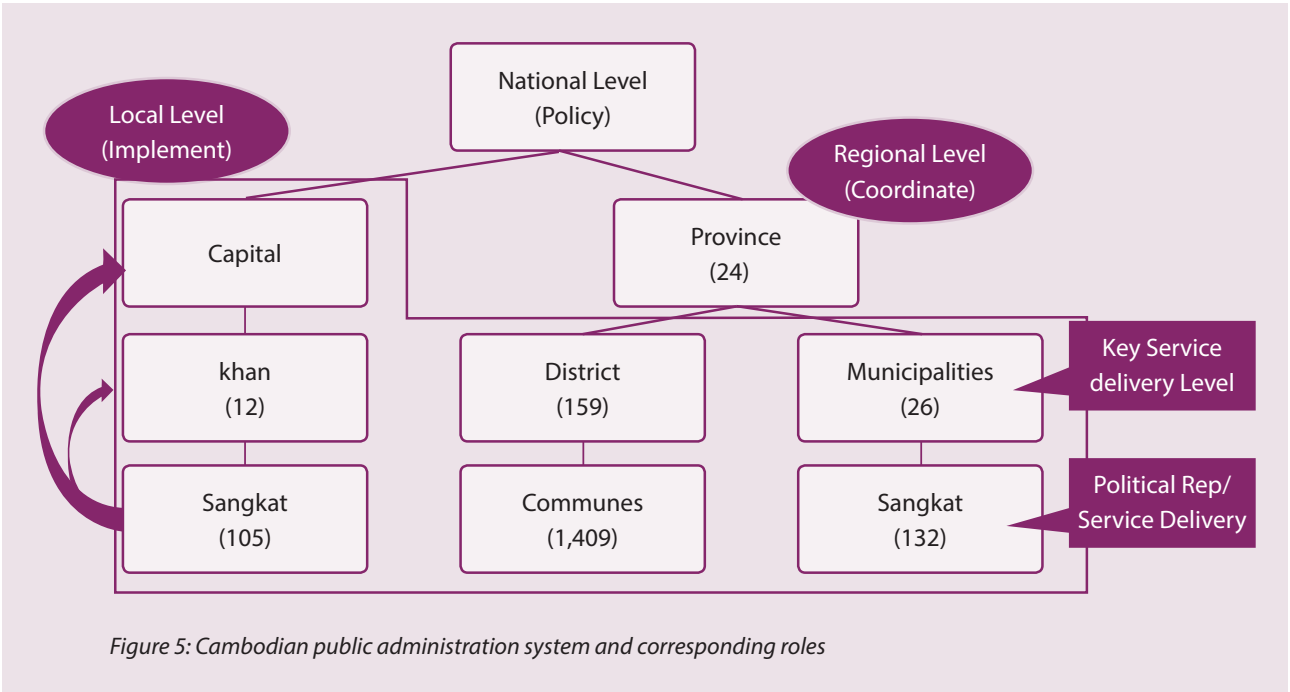

Figure 5: Cambodian public administration system and corresponding roles

17 Meeting with International Women's Association in April 2019

responsibility was conveyed to CP administration through Sub-decree No. 36 on Solid Waste Management (RGC, 1999). With the arrival of Sub-decree No. 113, all waste management authority flowed to the D/M administrative level. Several supporting regulations have been issued since 2015 to support the reinforced implementation of Sub-decree No. 113, as described in Box 2.

In accordance with the sub-decree and associated regulations, the following roles and responsibilities are stipulated for each level of government:

- ***National level*** – MoI, MoE, and Ministry of Economy and Finance (MEF) are jointly responsible for policy formulation, providing support to district and municipal levels of government, in addition to monitoring and evaluation of the implementation of these policies;
- ***Provincial level*** is expected to play more of a supporting role to the district and municipal level in the implementation of the transferred functions;
- ***D/M level*** is the primary level responsible for the management and implementation of waste management within their respective localities.

The role of the D/M government in this regard covers a wide range of waste management related activities, including:

- Planning, budgeting, and contracting service provisions, in addition to the transfer a portion of waste management functions to communes, Sangkat or community level;
- Adopting rules and measures to ensure effective waste collection;
- Identifying and establishing temporary waste storing and disposal locations;
- Setting waste collection fees (based on an inter-ministerial prakas and with approval from concerned councils);
- Collecting and managing collected fees (as primary source of revenue);
- Raising awareness about waste and waste management; and
- Putting in place temporary fines and penalty measures.

After the adoption of Sub-decree No. 113, on Management of Garbage and Solid Waste of Municipalities an inter-ministerial working group was created, with representatives from MoI, MoE, MEF, and NCDD-S. The aim of this group was to support the implementation of the sub-decree. As a result of their efforts, a number of key regulations have been issued, including:

- MoE and MoI Sarachor No. 1070 (November 2015) covering the implementation of Sub-decree no. 113;
- Technical guidelines on urban waste management;
- Inter-ministerial Prakas No. 1411 (December 2016) related to the implementation of solid waste activities;
- Workshops to disseminate key provisions of Sub-decree No. 113 and subsequent regulations;
- Inter-ministerial Prakas No. 195 outlining maximum fees for urban SWM services (MoI, 2019);
- Sub-decree No. 182 (December 2019) on functions and structure of municipal administrations;
- Sub-decree No. 183 (December 2019) on functions and structure of Khan administration of Phnom Penh;
- Sub-decree No. 184 (December 2019) on functions and structure of district administrations.

Regulatory documents describing procedures related to the management and use of revenue from fines, as provided for in Sub-decree No. 113, are being drafted and finalized by the Inter-Ministerial Working Group. As of May 2019, MoI was working to collect information on all existing contracts connected with SWM at the provincial and DM levels throughout the country, to inform the efforts of the Working Group and their on-going coordination, supporting necessary adjustments to contractual arrangements in ways that are more consistent with Sub-decree No. 113.

These on-going efforts carry the potential to clarify existing governance matters related to waste management, minimizing conflicting interpretations of those provisions, and more importantly, placing more explicit pressure on key actors to comply with the spirit of Sub-decree No. 113.

Box 2: Key regulations and recent progress relating to decentralized SWM in Cambodia

Inter-ministerial Prakas No. 073 on using sanitation service fund to implement function of managing solid waste and wastewater of municipalities of SNAs

Although adopted before the promulgation of Sub-decree No. 113 on Management of Garbage and Solid Waste of Municipalities, the Inter-ministerial prakas No. 073 on Using Sanitation Service Fund to Implement Function of Managing Solid Waste and Wastewater of Municipalities of SNAs (Feb 2015) also focuses on waste management at the sub-national level, specifically at the urban district level level (MoE, MoI, & MEF, 2015). This Prakas, which is not attached to sub-decree No. 113, seeks to transfer a portion of the national budget to municipal administrations – 26 of them in 24 provinces – with the inclusion of a requirement that a monitoring and evaluation component accompany this budget allocation. The fund is allocated using a formula permitting the targeting of municipal administrations in each budget year.

According to Article 9 of the Prakas, each municipal administration is required to:

- Prepare an activity plan relating to waste services;
- Propose revenue and expenditure plans based on the allocated budget from the national level for the implementation of waste management services;
- Manage the provision of waste services;
- Select partners for the provision of waste services in accordance with relevant district and DM financial management and procurement procedures;
- Prepare quarterly and annual report on spending and achieved results relating to waste services.

MoE is expected to play a monitoring role in the implementation and spending of the transferred budget, as well as provide technical guidance to the municipal administration receiving the funds. MoE is also given authority to request that MEF freeze the budget allocation to those municipal administrations whose actual implementation is deemed to not be in compliance with the Prakas.

Sub-decree No. 168 (October 2017) and the working group on plastic waste management

Also, of significance is the sub-decree No. 168 on Plastic Bag Management focused on the import, production, distribution, and use of plastic bags (RGC, 2017). The following ministries and agencies are mentioned as key actors in relation to plastic bag management, including: MoE, MoI, MEF, Ministry of Tourism, and SNAs. To ensure an effective coordination and implementation of the activities set forth in the sub-decree, a working group on the management of plastic waste was established in April 2019 under NCSD. The working group, which is composed of members from relevant departments under the MoE, is expected to report to the NCSD's chairman, who is the Minister of MoE. The working group held its first meeting on May 1, 2019 and was attended by representatives of UNDP, GGGI, and Cambodia Climate Change Alliance (CCCA) to discuss its pilot work-plan (covering a 6-month period). Discussions included a plan for resource mobilization and a clarification of roles and responsibilities of key actors. Meeting outcomes included a decision to consider revisions to sub-decree No. 113 in relation to the monitoring and evaluation of the role of SNAs in SWM and better collaboration with SNAs on plastic waste management (NCSD, 2019).

3.4.2. Implementation and challenges

The field visit to Kep focused on both implementation of Sub-decree No. 113 and the Inter-ministerial prakas No. 073. For both, based on an existing study (Min, 2016) and prior knowledge of the technical team, the challenges encountered in Kep were found to be similar to those observed in other places. This observation suggests that the challenges to well-functioning decentralized waste management in Cambodia are linked to the performance of the sub-national administrations, as well as how the national level has supported oversight of the performance at the subnational levels.

The following section covers the specific challenges identified. A discussion as to how they should be addressed follows in a subsequent section.

Sub-national level

Challenge #1: Both provincial authorities (PA) and D/M entering into contracts with private companies

The main root-causes of this challenge include:

- Persistent hierarchical relationship between PA and D/M in relation to the main responsibility on MSW. Although the sub-decree specifies that it is the D/M who has responsibility, in practice, PA, in some cases, still see their role as superior

- Although many D/M have the problem of conflicting roles with PA, they have not yet raised it as an issue
- Claims (some justified, others less so) about low capacity at the D/M level have been used as reasoning for PA to hold on to authority at the expense of D/M level authority. This claim of lagging capacity tends to be used without specifying what capacities are being referred to
- Lack of understanding and disagreement among key officials (and some experts) on how to implement Sub-degree No. 113, especially among PA, D/M, Provincial Department of Economy and Finance (PDoEF), and Provincial Department of Environment (PDoE)
- Perceived lack of clarity of required legal framework or guidelines for SWM implementation

Challenge #2: Non-compliance by PA/D/M on the spending and implementation of SNA Sanitation Service Fund as indicated in Prakas No. 073

The main root-causes of this challenge includes:

- Perceived and actual rigidity of the execution of the SNA Sanitation Budget, which pushes some D/Ms to spend in more expeditious ways that are less complicated and that better correspond to local needs. For instance, it is understood that spending budget resources via direct government provision of services requires a lengthy process and procedure, while the process of contracting out services to a private company is viewed as less complicated and more straightforward
- Lack of understanding or conflicting views among PA and D/M on how the SNA Sanitation Budget should be implemented. For instance, some object that this budget cannot be used by D/M to contract out services from a private company to provide that service, while the Prakas clearly states that this is not the case

Challenge #3: Limited enforcement and M&E by PA and/or D/M of contractual implementation

- The main root-causes of this challenge include: Limited focus, and in some instances lack of capacity, on M&E at the PA and D/M level to enforce and monitor contractual implementation of waste services by companies
- Potential areas of non-transparent dealings between PA/D/M and companies

Defining M&E in the SWM context

The M&E focus and its supporting system would look at different aspects of SWM at the sub-national level, including contracting arrangements, management of relevant budgets, key activities, and key implementation challenges. Technical performance M&E can be considered as the next step, given the complexity of the matter and the urgent need to get the operational activities up and running. Further adjustments can be considered in the future by using a 'learn by doing' approach. Developing a data set over time will help inform this process and is an option for the TWG to consider..

Box 3: Definition of M&E

National level

Challenge #1: No reliable data on the current situation of waste management contractual arrangements at PA and D/M level

The main root-causes of this challenge include:

- Lack of a clear mapping of the various contractual arrangements being carried out and enforced at PA and D/M, especially following issuance of Sub-decree No. 113

Challenge #2: Limited and un-coordinated M&E from the national level on SNA waste management

The main root-causes of this challenge include:

- Lack of a clear system and workplan on M&E, especially one that is jointly placed under the Technical Working Group (TWG) on SNA waste management
- The M&E that has happened so far has been irregular and without coordination among MoI-MoE-MEF
- The engagement of MEF is less clear/active

Challenges #3: Limited coverage of the Sub-decree No. 113 and Prakas No. 073 on marketplace waste management

The main root-causes of this challenge include:

- Currently, marketplace waste is still managed under MEF. Yet, when there is a problem, it is PDoE and D/M who are often blamed

4. PILOTING REFORMS – PROPOSED RECOMMENDATIONS AND PILOT ACTIVITIES

Building on a solid understanding of the system of waste management currently operational in Kep, a plan can be developed to target areas of needed reform and investment. This plan will address these areas of need comprehensively and will consist of several components focused on governance, technology and systems, partner engagement, and resources.

4.1. Waste system governance

Governance poses perhaps the biggest challenge to Kep as it seeks to create a more responsive and efficient waste management system. Governance is often understood as describing the framework of interaction and relationships existing between governmental authorities participating in waste management operations; however, in this instance it also applies to the relationship between government and private sector operators, given the outsized role that the private sector plays within this system. The following section considers different aspects of these critical interconnected relationships and the necessary balance required to achieve successful outcomes. Key considerations which are important to the development of sound waste management governance outcomes are described below:

Waste management planning – Decision-making related to waste management can be complex. Planning based on sound environmental management and operational approaches combined with good data inputs generally leads to good results, with the most consistent tool in this planning process being the concept of the waste management hierarchy. This globally recognized concept encourages the reuse recycling and reduction of materials as the preferred options (see Figure 6) (Hansen et al., 2002). These favored options are known as the principles of circular economy (Kyriakopoulos et al., 2019). Cambodia is moving towards to. With the waste hierarchy concept firmly in mind, it is important to now begin to assess needed improvements within current system operations and to also consider the impact of demographic trends in order to anticipate future needs. By having a clear picture of the current gaps as well as future needs (such as waste quantity and composition projections based on population and visitor numbers affected by tourism), a planning process can begin to address how to close existing gaps as well as to prepare for future demands.

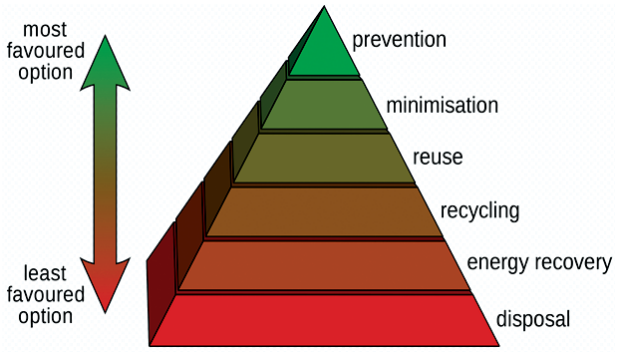

Figure 6: Waste hierarchy decision making framework

Using waste generation projections that include both existing operations and future scenarios, decision-makers can analyze how to bridge existing gaps and the costs and inputs required. Gaps may take the form of equipment (trucks, bins, road upgrades, waste handling, and disposal equipment), systems (improving efficiency of collection routes, landfill operations upgrades, the need for transfer stations) or human resource inputs (skilled landfill operators, equipment maintenance personnel, waste treatment site managers, financial management personnel, etc.). Once a complete picture of the inputs required to fill existing gaps has been developed, the costs associated with each input can be estimated and rolled up into a multi-year investment plan designed to address investment needs for the coming five to ten years (ETAGIW Consortium, 2012).

Demographic trends impacting waste management:

- Population growth
- Income growth
- Urbanization trends
- Historical waste disposal

Box 4: Demographic trends impacting waste management

Tendering, contract management, and M&E – When procuring services to support waste management activities, it is important for a municipality to first have a sound understanding of its needs. Using the inputs developed in the planning process described above, needed investments in waste collection, disposal, transport, and any additional investments and upgrades can be integrated into a medium and long-term procurement strategy that tracks with identified needs.

When contracting out waste services, the governments' chief responsibility is to oversee the work of the service provider, ensuring that work is performed as agreed and that quality and level of service meets performance criteria established in the contract. Selection of a service provider should be based on transparent and predetermined technical criteria and the provider's proven ability to meet these criteria. Following the selection of a provider, performance will be evaluated based upon these same criteria. When service levels fail to meet the set criteria, it is understood that some form of penalty may be imposed (Olukanni et al., 2019). This penalty could be a fine or a forgone payment. Mechanisms for incentivizing optimal performance can also be incorporated and may take the shape of a contract extension or a predetermined bonus payment. Opportunities for efficiencies in procurement should also be sought out. In an ideal scenario, one agency or government entity would oversee all waste services within given geographic boundaries. Overlapping agencies managing overlapping contracts providing services to waste generators located in a single jurisdiction makes it difficult to monitor the efficacy of service of a given provider. Having a single entity managing all services for a given area facilitates the coordination and analysis of information related to performance and service (NZ MfE, 2007).

Finally, the establishment of a good baseline understanding of operations and infrastructure provides an important marker by which all future activity can be measured. With this understanding, combined with the expectation of having solid data collection and reporting incorporated as an element of contractual obligation, authorities are well positioned to focus on their oversight role, providing monitoring and oversight of service provider performance as outlined in the agreed contracts.

Financial oversight and resource management – Ensuring sound financial management in waste operations supports stable and consistent operations for inhabitants. Revenue sources will vary by municipality and system. In the case of Kep, revenues come from two primary sources: fees paid by commercial and residential waste generators and those coming from direct government payments linked to contractual obligations.[18] As operational objectives grow and change in response to local demand, so too will the need for additional financial resources.

These additional resources may come from a variety of sources:

- Tax levied directly by the municipality;
- Penalties for non-compliance with waste laws;
- Fines for littering, enforced by local authorities;
- Tipping/gate fees at landfill;
- Sale of recyclable materials/compost;
- Ecotax/green growth taxation/tourist occupancy tax;
- Loans or grants from national or international financial institutions (Lohri et al., 2014).

It is also important that a management mechanism supporting financial stability and sustainability of waste management operations be configured. These mechanisms should also facilitate access to capital, via structures such as Hometown Investment Trusts, permitting needed investments in infrastructure, all measures that ensure decisions are taken with an eye to optimizing services while minimizing costs (Yoshino et al., 2018).

Environmental management & compliance – While waste management is in itself one important aspect of overall urban environmental management, the operations associated with waste management systems sometimes have negative environmental consequences that can impact other environmental resources, such as air, land, or water. Waste management operations in a town or city may take a variety of forms– city operated, private sector outsourced, or a combination of private and public operations. In each case, it is important to ensure compliance with existing environmental

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safeguards and ensure operational compliance with existing environmental norms and regulations. When waste services are entirely outsourced to a private entity, the presence of a strong governmental mechanism to ensure environmental compliance is especially important. This oversight will target each of the phases of waste management and will focus on the aspects of operations that pose the greatest risk (SALGA, & Department of Environmental Affairs of Republic of South Africa, 2015).

Figure 7: Landfill operations outside of Kep

These risks may be encountered in the following phases and include:

- Collection phase – oversight focus to include: proper management and cleanliness of collection points and bins, ensuring proper placement and collection of waste at preestablished times;
- Transportation phase – oversight focus to include: proper loading of transport trucks, ensuring no blowing debris or odor, loading only during preestablished times and proper offloading of waste at landfill;
- Treatment phase – oversight focus to include: mitigating the impact of sorting operations on neighbors, as well limiting truck and other vehicle collection and transport traffic to specific and pre-determined times;
- Disposal phase – oversight focus to include: mitigation of negative impacts including water and soil contamination associated with leachate and storm water, landfill fires resulting in air pollution and odors, and landfill gas generation posing safety hazards to waste workers taking the form of asphyxiation, fire, and in rare occasional explosions (Dri et al., 2018).

Data availability, collection & reporting – Data availability and reporting directly impact the ability to measure performance associated with each of the above management and governance topics. As discussed in the approach and methodology section, data availability in Cambodia related to waste management remains a challenge. While UNDP in partnership with the Cambodian MoE and other initiatives have made efforts to address these gaps (UNDP, 2019), the practice of incorporating considerations related to data collection into everyday waste management operations has yet to occur. This is due to several factors, including lack of resources and policy instruments, a lack of awareness about appropriate methodologies to calculate waste volumes, and a lack of mechanisms to encourage the uptake of practices that incorporate a methodological approach to data collection and management (Singh et al., 2018).

Given the resource limitations that currently impact every aspect of waste management in Kep, it is understandable that data collection and reporting have yet to be incorporated as a systemic component of the service providers' efforts. However, without the inclusion of data collection and reporting as an obligatory component of the service provider's work, measuring future performance and tracking service improvements will be a challenge. An effort should be made to identify readily available key performance indicators, such as number of collections completed, active duty workers, equipment availability, fuel consumption, and volumes of waste disposed, in order to begin to establish a performance baseline (Boldt et al., 2018). As investments are made and improvements incorporated, opportunities for creating systems capable of capturing additional information can be identified and the corresponding protocols for reporting this information to oversight officials established.

4.2. Technical and systemic approaches to address waste priorities

Building on the fundamentals of waste system governance and circular economy concept leads directly to a discussion on the priority areas for improvement of waste services in Kep, providing an opportunity to consider linkages to waste management themes often discussed in recent years in global waste circles. Those themes most relevant to Kep's current situation are described below and are accompanied by suggested approaches for addressing each:

Priority area: Boosting collection rates

It is understood that waste collection efforts in Cambodia only account for limited amounts of all waste generated (Sour, 2017). This can be attributed to several factors including limited accessibility to waste collection services, an adherence to traditional disposal methods such as open burning, or a lack of understanding or attention to the environmental impacts of illegal dumping of waste. The World Bank estimates that in low-income countries like Cambodia only about 48% of all waste generated is collected in cities, dropping to 26% in rural areas (Hoorweg et al., 2012). The unaccounted for but real costs of uncollected waste, such as health care costs associated with polluted drinking water, air pollution from waste burning, or reduced soil fertility impacted by the proximity to dump sites, are thought to be higher than the actual costs of collection and disposal (Engel et al., 2016). To boost collection rates, a concerted effort that includes incentives for behavioral change, awareness raising, and enforcement must be introduced and sustained over time.

Kep approach: Expand collection focus beyond concentration of commercial market and business establishments and set goals for progressive expansion of collection coverage to eventually achieve a full waste collection service coverage.

Priority area: Marine waste

Generally, marine waste is the result of uncollected and untreated waste resulting from low collection rates or poor disposal methods. Marine waste is commonly associated with lighter wastes, such as plastics, flowing via streams and rivers, finally entering the ocean and resulting in marine litter accumulation along beaches and in the sea (Marine Litter Solutions, 2019). An inspection of Kep's beaches demonstrates the most visible impacts of marine waste, requiring regular litter collection efforts involving additional cost and labor. Other less understood impacts relate to the effect of ocean plastics on fish and other marine life, threatening their livelihood and the fishing (Barboza et al., 2018). While plastic marine waste is an issue of global complexity, casual examination during visits to Kep's two inhabited islands demonstrate that at least a component of this waste is of Cambodian origin, with both Thai and Vietnamese labeled plastic waste also present. To determine origin of these plastics in a definitive way, a more formal study is required. [19]

Kep approach: Boosting collection rates and improving landfill operations will permit better control of litter preventing its eventual deposit in the sea and along beaches. Plastic bottle bans, or a refillable water container campaign are other strategies for consideration.

Priority area: Organic waste treatment

Organic waste represents a significant portion of overall MSW generation in Kep and offers a good starting point when considering opportunities for waste management interventions (Sang-Arun & Chau, 2011). Organic waste in landfills contributes to climate change via the emission of greenhouse gases, especially methane (US EPA, 2019; Zhang et al., 2019). One of the major strategies to mitigate landfill methane is to reduce the quantity of organic waste that is landfilled. The reduction of organic waste disposal is possible by different options, one of which is biological treatment (Bogner et al., 2007). Organic waste can be treated in a variety of ways, but the composting of this waste offers a straightforward and low-cost technique most often employed in developing economies (Ferronato & Torretta, 2019). Composting involves combining organic waste streams, generally garden and food waste, which are processed and placed in windrows (piles). Temperature and moisture are monitored and managed and the waste turned periodically. After a period of around 12 weeks, waste is stabilized and ready to be screened and prepared for commercial distribution for use in agriculture or forestry activities. Investments in this approach pay dividends by reducing total amounts of a waste disposed, waste that is heavy and costly to transport. Additionally, organic waste is often associated with odors and methane production, represents a significant environmental risk in terms of water and soil pollution, and affects population health (Ferronato et al., 2019). To be effectively implemented, organic waste treatment must be implemented in parallel with the development of a source separation initiative, involving training of food preparation staff on the techniques for proper separation of organic and non-organic waste at the source of generation.

Kep approach: As in other tropical zones, garden and food waste in Kep is in constant supply offering a good opportunity to divert waste that might otherwise be burned or dumped. The importance of high value agricultural exports, like pepper and mango, present

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a good opportunity for the offtake of compost in place of chemical fertilizers. Compost operations also present another opportunity for the incorporation of informal waste workers.

Priority area: Recovery of dry recyclables

Dry recyclables, such as plastic bottles, metals, cardboard, paper, represent another important and growing component of Kep's overall waste generation and one that should receive focus when considering opportunities for future investment. The recovery of dry recyclables, a form of waste treatment, serves several purposes: to remove resources that have value for reuse within other product value chains; to reduce volume, taking up less space in landfills; and to divert waste away from landfills, incineration, or illegal dumping. Kep's formal system of waste management does not at present include any recovery of dry recyclable material, forgoing a source of additional revenue through the resale of these materials. [20] Presently, only the informal sector is focused on the recovery of dry recyclables, serving as the only initiative engaged in the source separation of waste (see 'Partnership engagement' section). To fully benefit from dry recyclable recovery, a much more aggressive program of source separation must be undertaken and embraced by the local population.

Kep approach: An assessment of opportunities to incorporate the recovery of recyclables in Kep should be undertaken, even in a small decentralized format, as this form of waste treatment offers both an opportunity to divert waste from the landfill while offering the possibility for some revenue generation through the sale of recovered materials. The opportunity for a regional processing facility with Kampot province should be explored alongside other options.

Figure 8: Recycling depot in Kep

An amendment to the Basel Convention adopted in 2019 requires the tracking of shipments of plastic waste between countries, meaning that exporting countries must obtain consent from receiving countries to ship contaminated, mixed, or unrecyclable plastic waste (Holden, 2019). However, this advance does not directly impact the domestic generation of Cambodian plastic waste, where it is estimated that each urban resident disposes of 2000 plastic bags annually (Faulder, 2018). More than 80% of marine plastics are generated from Asian sources, entering the sea by way of streams and rivers (Faulder, 2018). Poorer costal populations are disproportionately impacted given their reliance on bottled drinking water and their lack of access to collection and disposal options, leaving their communities inundated by single-use plastics (Ellis-Petersen, 2018).

Box 5: Impacts of plastics on coastal Cambodia

Priority area: Decentralized waste management

Developing a practical solution to waste management challenges in Kep requires an approach that considers the constraints within which the existing system operates, including the limited availability of both financial resources and skilled workers. While large urban centers are increasingly moving to investments in highly centralized and costly infrastructure, such as waste-to-energy and centralized material recovery facilities, smaller municipalities are not well positioned to benefit from these approaches given their reduced volumes of waste, capital costs, and the technical challenges associated with the operation of these systems. Decentralized treatment of MSW can focus on achieving similar outcomes of larger more costly systems, such as waste diversion and volume reduction, while offering smaller communities with limited resources a low-cost investment model. At the same time, these models offer an opportunity to integrate local waste sector workers, both formal and informal, within these systems.

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Kep approach: Decentralized waste treatment operates on the principal that waste is best treated closest to the point of generation. Treatment options include small scale composting, anaerobic digestion of food and other organic waste, and separation and collection of dry recyclables for resale. With a strong commitment, Kep could benefit by engaging in better separation of materials, reducing total waste destined for disposal, and the costs associated with its transport. One important exception to this approach is the practice of small-scale waste incineration. A discussion of the hazards associated with this practice in China is described in Box 6.

The public has long been concerned about the unintentional formation and emission of toxic, persistent, and bio-accumulative dioxins and dioxin-like pollutants from large scale waste incinerators. Many of these concerns have been addressed through advanced techniques associated with combustion and air pollution control technologies. However, incinerators frequently employed in rural China tend to be small-scale and either have very simple air emissions controls, or none at all.

Monitoring and regulation of these small-scale plants is not regularly undertaken as is common in large-scale incineration operations. This means that it is possible that the occurrence of dioxins associated with small-scale incinerators is far higher than those associated with large scale incineration plants. A US EPA study determined that the emission of cancer-causing dioxins from the burning at a residential waste dump could be 2000-times higher than those associated with modern waste incineration (Yang et al., 2019).

Box 6: Hazards of small-scale waste incineration in China

Priority area: Landfill upgrades

The development of an environmentally compliant and sustainable system of waste disposal is essential to the proper functioning of any municipal waste management system. The existing landfill in Kep requires upgrades in order to incorporate environmental safeguards that protect land and water resources. Waste placement is haphazard, and no cover appears to be applied, leaving waste exposed and permitting rainwater to enter the waste mass that leads to additional leachate generation. While mechanisms should be established to discourage final disposal to land, it is essential that well operated landfills are available to receive waste not otherwise treated or diverted.

Kep approach: Remediation measures should be taken to ensure proper waste placement and the regular application of a cover material, steps that will mitigate leachate generation and the incidence of fire while discouraging pests. Storm water management measures should also be considered. As environmentally sound landfill operations are resource intensive, developing a regional landfill at an optimally sited location mid-way between Kep and Kampot offers one strategy to spread investment and operational costs across a larger population and tax base. This is a similar strategy to the one described above for dry recyclables recovery.

4.3. Decentralization

The process of decentralizing provision of municipal services is ongoing, with waste being a major focus of Cambodian officials at all levels. This section offers solutions to address the existing decentralization challenges faced in Kep.

Sub-national challenges

Number 1: Both provincial authorities (PA) and D/M entering into contracts with private companies

Proposed solutions and interventions for this challenge include the following:

- The three key ministries (MoE, MoI, MEF) should send a clear message to the provincial authorities that they need to follow Sub-decree No. 113 (see more below). This could be done through a joint meeting, an M&E report to confirm the cases of non-compliance, or other means of legal dissemination such as a short video made available online describing how decentralized waste management should be implemented
- More concrete recommendations related to capacity building needs at the D/M level in order to actually implement Sub-decree No. 113. This can be accomplished by developing a simple but implementation-oriented capacity building needs assessment accompanied by a detailed plan to meet those needs. The areas of needed focus include overall management, contracting, regulatory roles of D/M, awareness raising, and other waste related technical topics

- Production of a clear guideline as to how Sub-decree No. 113 and relevant regulations should be implemented. This will serve to minimize both intentional and unintentional misreading of regulations. Given the frequent utilization of social media in the country, the Guideline should be made into a short online video, one that simply but clearly explains how decentralized waste management should be implemented
- Engage more directly with PDoEF in order to bring them into the discussion. It is understood that PDoEF is an authority with oversight on matters relating to: (i) contractual arrangements with private service providers, (ii) utilization of municipal waste budgeting, and (iii) market operations and placement. Yet in Kep, PDoEF's role has received little mentioning and no direct discussions have yet taken place with PDoEF.

Number 2: PA and D/M are not compliant with the spending and implementation of SNA Sanitation Service Fund as indicated in Inter-ministerial Prakas No. 073

Proposed solutions and interventions related to this challenge include the following:

- Explore and document the execution challenges related to the budget as provided in Prakas No. 073
- Propose solutions, including possible amendments to reduce unnecessary rigidity in the budgeting process
- Produce a clear illustration or guideline on how the SNA Sanitation Budget (Prakas No. 073) should be implemented

Number 3: There is limited enforcement and oversight (M&E) by PA and/or D/M of contractual implementation

Proposed solutions and interventions for this challenge include the following:

- Support the establishment of an M&E system for the D/M that have contracts with private companies
- Provide technical support (at least in the early phase) that provides guidance on how to implement an M&E system.
- Use the results from this technical assistance process on M&E to inform the national level as to how to adjust the Prakas and related regulations.

National level challenges

Number 1: No reliable data describing the current status of waste management contractual arrangements at provincial and D/M levels

Proposed solutions and interventions for this challenge include:

- MoI (with MEF and MoE) should hold a mapping exercise with all PAs and D/Ms
- The mapping should also focus on contractual arrangements for marketplace waste management (see more below).

Number 2: Limited and un-coordinated M&E from the national level on the SNA waste management

Proposed solutions and interventions for this challenge include:

- Develop a joint M&E system to be placed under the TWG on SNA-SWM, with participation from NCDD-S (e.g. Monitoring, Evaluation and Information Division, and Policy Analysis and Development Division).
- Find ways to engage MEF more closely

Number 3: Limited coverage of Sub-decree No. 113 and Prakas No. 073 with respect to marketplace waste management

Proposed solutions and interventions for this challenge include:

- At a suitable time, a discussion should be held through the TWG on SNA waste management about the roles and responsibility of waste management in marketplaces.

4.4. Partnership engagement

Strong linkages between stakeholders charged with operations as well as those receiving waste services are essential in order to successfully address governance and priority waste management issues. These groups must both communicate effectively as well as work collaboratively towards common objectives in order to achieve desired outcomes. The key stakeholder groups in Kep that require engagement are described below.

4.4.1. Informal sector

As noted above, the informal sector plays an important role in the processing of recyclable materials that have value, materials such as metals, plastics, and cardboard. Informal systems of material recovery have developed based around the market demand for these materials. This was confirmed during a team visit to an intermediary material reseller operating in Kep. Informal workers have good first-hand knowledge of material pricing and have developed strategies for maximizing collection efforts in support of a materials recovery value chain (GIZ, 2018). Latin America has been at the forefront in developing partnerships between informal workers and formal systems and has developed good methodologies for approaching these partnerships. Government support for these existing value chains serves to reinforce vulnerable communities, helping to align them with existing systems of waste management (WRI, 2018).

Country experiences on waste banks and integration of informal sector into formal systems:

Building on a concept that integrates informal waste workers into a formal waste collection system, several models exist. A few examples from around the world follow:

Waste banks (Indonesia) – These entities operate based on a commercial banking concept- clients deposit material which is recorded in a passbook and at the end of the year monetary payments are made based upon the amount of material deposited (Salim, 2013).

Analysis of efforts to integrate informal workers into formal systems (Latin America) – This report looks at efforts in 12 Latin American cities focused on integration of informal workers (Economist Intelligence Unit, 2017).

Roadmap for integrating informal workers into MSW management efforts (Serbia) – This document developed by GIZ outlines the process and methods for addressing informal waste worker integration (GIZ, 2018).

Box 7: Waste collectives and waste banks

Kep linkage: Informal workers in Kep have developed a livelihood through the collection and resale of discarded recyclable materials. By supporting their efforts and assisting with the scale-up of waste separation and recovery, the government can facilitate the linkage of these efforts to the existing systems of formal waste management, offering a path to boost waste treatment while supporting vulnerable populations. This could be achieved via existing models such as the Indonesian waste banks, or via waste pickers' collectives (see Box 7 'Waste collectives and waste banks').

4.4.2. Private sector

The role of the private sector in Cambodian waste management is prevalent, particularly in urban centers where demand for reliable waste services is highest. The prevalence and reliance upon private operators in Cambodian cities differ from the experience of cities in many other developing countries where collection is often the domain of a publicly operated entity with other aspects of waste management being outsourced (Cointreau-Levine, 1994). Cambodia's reliance on private sector operators, accompanied by the low levels of citizen access to waste services, implies a need to rethink the relationship between private operators and waste management authorities. It is clear that to date private operators have responded to a pressing public need by offering expertise, flexibility, and resources in response to significant waste challenges, often at little direct expense to government (Kaza et al., 2018).

At the same time, this model brings with it a number of pitfalls, some of which include:

- Limitations on waste management knowledge and oversight capacity by government.
- Overreliance on private sector solutions to environmental and waste management challenges.
- Limited coordination between responsible governmental authorities, private operators, and the public waste generators who receive services, and the challenge of assigning responsibility for non-compliance.
- Multiple contracts by various levels of government to a single operator requiring a high degree of inter-governmental communication to ensure efficiency of operations.

- Complete outsourcing of waste services making enforcement of waste regulations challenging, as lines of authority become less clear, blurring judgements related to non-compliance or violations (Spoann et al., 2019).

Kep linkage: Following a mapping of existing waste services being provided by private operators, identify gaps in service and define strategies for addressing these gaps though consolidated and expanded contracting and increased operational oversight from government.

4.4.3. Community engagement

Connecting local communities and organizations to waste reduction and recycling activities via education and awareness raising initiatives is a strong strategy to encourage wider understanding of the importance of sound waste management. Strong community partnerships can be used to recruit 'champions,' individuals and organizations supporting waste management system reform. This support is essential to create a culture that integrates consciousness of waste management with respect for the environment. Community engagement can take several forms, it may simply involve existing community organizations such as groups focused on education or cultural activities, and could extend to socially focused organizations, religious groups, environmental organizations, or others. The make-up of these groups will depend largely upon the range and interests of groups actively involved in a given community.

Kep linkage: By identifying local community organizations with interests related to areas of waste management and environmental protection, a dialogue can be developed to identify areas of common focus, as well as opportunities for specific partnership development. This may include beach clean-up or educational awareness raising activities.

4.4.4. Sustainable tourism

Kep is a seaside destination for travelers seeking water and nature-based activities. Kep is also a food destination sought out for local crab dishes flavored with locally grown pepper. All of these assets depend on clean water and litter free seas, tidy beaches, and an overall thriving and supportive natural environment. The ecosystem supporting sea life and biodiversity is fragile and, without adequate safeguards, will break down. Competition for tourist dollars internationally and particularly in Southeast Asia is fierce (OBG, 2017). It is also well understood that tourism impacts local waste generation and resource consumption. To address these impacts, tour operators, hotel and restaurant owners, and other service providers must commit to coordinated efforts to engage visitors by encouraging the adoption of more sustainable hospitality operations to ultimately reduce overall resource consumption and waste generation. An example of this model is provided by Siem Reap where over the past four years a refillable water bottle campaign has sought to reduce the number of plastic water bottles consumed by tourists. The estimates for Cambodian plastic bottle waste generation associated with international visitors is thought to be just over 10 million bottles a month (Refill Asia, 2019).

Kep linkage: As in other tourism-based economies, Kep has multiple opportunities to influence positive environmental outcomes and raise awareness by encouraging efforts, such as a refillable water bottle initiative or regular community beach cleaning activities and incorporating a message of sustainability and environmental protection into an overall community identity.

4.5. Taking action through pilot activities

The efforts of the NCSD-the Foundation task force group are focused on highlighting waste management challenges in Kep and also designing solutions to resolve these challenges. Concrete policy recommendations based on ongoing dialogue and informed by focused discussions with local stakeholders in Kep are also being integrated into this exercise. In anticipation of these outputs, an intermediary step involves the development of a proposal for a series of pilot activities focused on Kep, grounded in the understanding developed by the team during the three days of discussions and meetings, as well as the supporting process used to gather and synthesize information at different stages of the research.

To understand the steps required to improve the functionality of existing waste management systems in Kep, it is important to first identify the objectives for improvement. This process will assist decision-makers to define not only the steps involved in making improvements but also to understand the resources required to make the transformation. In addition to providing a roadmap, this process will demonstrate a commitment to action and will serve to catalyze the participation of national and international partners.

The following table outlines some of the medium and long-term steps required to address specific challenges identified in Kep.

Table 3: Medium and long-term steps required to address waste challenges in Kep

Waste Challenge	Goal	Medium-term Steps to Achieve	Long-term Steps
Incomplete collection coverage	A full waste collection service coverage	- Map areas with poor access to collection services - Identify waste composition - Identify human and equipment resources needed to expand service - Develop roadmap for service expansion - Develop strategy for securing resources to move forward	- Mobilize resources to target service gaps - Integrate human and equipment resources as needed - Implement the roadmap - Initiate on-going M&E program to ensure progress tracking and improvement
Illegal dumping / open burning	Eliminate incidence of dumping / burning	- Initiate efforts to achieve a full waste collection service coverage - Develop and launch awareness raising campaign - Analyze ban/enforcement options	- On-going awareness efforts that support a full waste collection service coverage - Operationalize ban/ enforcement efforts - Zero-tolerance in urban areas
Final disposal – uncontrolled landfill	Controlled/ operational landfill	- Assess current practices / develop roadmap for remediation - Implement low-cost easy to implement operational changes - Identify opportunities to integrate informal sector - Examine opportunities for regional landfill with Kampot	- Implementation of roadmap steps to reform/remediation - Establish initiative to train and develop worker capacity - Secure stable revenue to support landfill operations
Minimal treatment of waste prior to disposal	Source separation of recyclables & organic waste prior to disposal	- Establish dialogue with residents and businesses to develop economic incentive schemes for waste segregation at source for recycling purposes - Establish dialogue with large generators (markets) on organic waste mgt. - Initiate partnerships to develop small scale treatment of organics - Identify opportunities to partner with informal sector on dry recyclables recovery	- Identify resources and technical assistance to operationalize incentives schemes for waste segregation at source, treatment of organic waste and collection of dry recyclables - Implement partnership mechanisms with informal sector to drive process

Waste Challenge	Goal	Medium-term Steps to Achieve	Long-term Steps
Marine plastics in sea & on beach front	Reduction of plastics in sea and on beach	- Boost collection efforts in hotel/restaurant sectors - Initiate plans for reduction of single-use plastics (refill stations and refillable bottles) - Launch community clean-up/ awareness activities	- Discuss options for plastic bag bans and incentives for reusable bottles and refill options - Drive a full waste collection service coverage efforts to increase coverage - Create brand-identity integrating culture of environmental protection and waste reduction
Low public awareness of waste issues & public's role in managing waste	Recognition of public's role in sound waste management	- Launch consultation with local community groups focused on waste awareness - Develop targeted activities focused on waste - Adopt and enforce regulations on fines - Make use of traditional and social media to raise awareness about SWM and tourism brand	- Establish mechanism that incorporates awareness activities into local events / institutional activities - Create campaign linking culture, environmental protection and waste - Systematic use of internet outreach to raise awareness and promote Kep
Unclear lines of authority for waste management in Kep	Clear oversight for waste in conformance with regulations	- Clarify and boost understanding of roles of different actors at SNA level - Create dialogue between governmental partners involved in present day waste management - Map opportunities to create efficiencies in existing operations	- Pursue objective of establishing Municipal authority as primary service delivery provider for SWM
Limited support and M&E from the national level	More systematic coordination from the national level on SWM policy	- Set up an M&E system at the national and sub-national levels - Strengthen Inter-Ministerial TWG	- Make necessary policy adjustments, resource allocations, M&E and other support mechanisms at national level in support of SNA

The above proposed transformative goals, as well as the medium and long-terms steps, are aligned with the goals and the priority projects proposed in the draft Sustainable City Strategic Plan 2019-2030 to address waste management issues in Kep City (NCSD, MoI, & GGGI, 2019) and with Kep's 3-Year Rolling Public Investment Program 2019-2021 (Kep Provincial Administration, 2019).

Having now developed a good general understanding of the challenges requiring action, as well as having identified some of the intermediary steps required to address each, it is now possible to begin to discuss options for implementing pilot activities and the resources required to take this next important step.

Based on the waste challenges outlined in Table 3 above, it is possible to define a series of pilot activities in response to each. Any of these concepts could on their own form the basis for a strong pilot activity, a combined focus on several fronts will support strong action, and action taken in each of the five areas will represent a truly holistic approach designed to address the essential components required to move Kep towards SWM solutions.

Overview of five pilot concepts developed in response to specific waste management challenges identified during the Kep field visit:

1. Governance – This approach is designed to address challenges posed by an incomplete decentralization process where overlaps in government authority and oversight may contribute to an inefficient SWM system. This concept will incorporate a focus on M&E for management and operational improvement.
2. Decentralized technology and systems – This approach is based on a theory of waste management that advocates for treatment of waste using small-scale, low-tech, and low-cost treatment approaches close to the point of generation. This concept is readily applicable to decentralized use at a neighborhood or district level.
3. A full waste collection service coverage and landfill improvement – This approach focuses on a targeted effort to expand waste collection coverage by mapping unserved or underserved waste collection areas and identifying steps for expansion, accompanied by implementation of environmental safeguards at the Kep landfill.
4. Role of informal sector – This approach is designed to initiate dialogue between the municipal authorities and informal waste workers. Through ongoing discussions and agreements, the municipal authorities can support the informal waste workers to work towards solutions that will benefit the whole community, including better separation and recovery of recyclable materials.
5. Education and awareness – This approach focuses on the development of awareness campaigns adapted to a Cambodian context, seeking engagement with different levels and segments of society. This activity also focuses on the development of educational messages centered around themes that reflect local values, history, and culture, and connects them to SWM.

Plans for moving forward with this effort will require input from multiple stakeholders and the strong supporting coordination of NCSD and the Foundation. A proposed multi-step approach for moving these concepts into action follows. Adjustments to activities and a detailed timeline to accompany them will be further elaborated following consultation with taskforce team members.

The proposed phases of pilot implementation include: [21]

- Release the NCSD-the Foundation Scoping Study Report and policy recommendations
- Convene stakeholder groups for consultative meetings and pilot planning
- Launch 'Kep Pilot Partnerships for Waste Management Innovation'
- Convene technical working group(s) and development of workplan(s)
- Initiate workstreams in accordance with agreed pilot focus thematic areas
- Pilot implementation period– combined with integrated reporting on progress toward milestones
- Mid-term evaluation
- Stocktaking – summary of progress and lessons learned
- Pilot activity conclusion

4.6. Pilot activity inputs, resources, and collaboration

In order to initiate the process of developing proposed pilot activities, a list was created outlining the required stakeholder involvement, mechanisms of implementation, expected outputs, and required resources and data inputs.

Basic informational inputs are provided in the table 4, providing further detail for the proposed approaches to each of the five pilot activities described in the preceding section 'Overview of five pilot concepts.'

21 These proposed phases assume the integration of internal discussions and decision making related to the development of this Scoping Study Report and Pilot activities.

Table 4: Elements of five conceptual pilot activities proposed for Kep

Focus	Aspects	Participants	Objectives	Mechanism/ Solutions + Outputs	Financial/ Economic Considerations	Resources required
1. Governance	- Current MSW management does not correspond to vision described in Sub-decree No. 113, Prakas No. 073 and other related regulations - Limited support and M&E from national level	- District/ municipality, provincial authority (including PDoEF and PDoE) - National government (through TWG)	- Clear oversight for waste in conformance with regulations - More systematic and coordinated coordination from the national level	- Map existing waste oversight with vision established in Sub-decree No. 113 and Prakas No. 073 - Establish M&E system at both national and sub-national level in relation to SWM OUTPUTS: Governance reform roadmap and action plan	Costs: short term expenses of bringing system into compliance Benefits: medium and long-term efficiency gains	- Designated participants from each authority - Technical assistance to support transition - Mechanism/ formal relation between development partners and official state mechanism (e.g. the TWG)
2. Decentralized technology and systems	Direct resources and knowledge to underserved residential areas with low collection rates	District/ municipality, provincial govts, and private operator	Implement small-scale, community-based waste management activity	Identify defined area suited to development of feasibility analysis for small-scale treatment linked to good understanding of collection issues and implement pilot based on findings OUTPUTS: Pilot for neighborhood management of organic and dry recyclable waste	Costs: capital and training costs to implement systems Benefits: low-cost alternative to centralized systems	- Defined area for focus - Technical assistance for analysis/ feasibility - Resources for pilot implementation
3. A full waste collection service coverage and landfill improvement	Re-orient existing waste service contracts taking into account lessons learned	District/ municipality, provincial govts, and private operator	Establish pilot methodology that addresses low rates of waste collection and landfill and focus on easy-to-implement site improvement opportunities	Identify discrete area having poor access to collection services and work with authorities, waste collection service provider, and population to establish more responsive collection strategies/ Identify easy-to-implement landfill improvements OUTPUTS: Activity incorporating implementation of revised collection strategies and landfill improvement	Costs: implementation costs of service expansion and site improvement Benefits: reduced environmental and health costs for authorities and inhabitants	- Defined areas for focus - Technical assistance for analysis/ feasibility - Resources for pilot implementation

Focus	Aspects	Participants	Objectives	Mechanism/ Solutions + Outputs	Financial/ Economic Considerations	Resources required
4. Role of informal sector	To date, sector governance includes only minor consideration for social impacts of managing waste	District/ municipality, provincial and national govts, facilitating organizations, informal sector	Establish forum for dialogue on collaboration model between formal and informal sectors	Facilitated discussions aimed at identification of mutually beneficial areas of cooperation leading to improved social and environmental outcomes OUTPUTS: Consultations drawing on international experiences with informal sector, leading to roadmap	Costs: implementation costs of launching programmatic approach to informal engagement Benefits: some opportunities for revenue sharing from recovered materials and improved livelihoods for marginalized population	- Governmental support for dialogue and action - Resources for facilitated dialogue - International informal sector expert support
5. Education and awareness	Government reliance on private operator services affords little opportunity for awareness and education outreach	District/ municipality, provincial govts, private operators, community stakeholder organizations, facilitating organization	Develop model to create waste awareness within targeted population groups	Survey to establish baseline understanding of awareness, followed by workplan development for pilot activities - Adopt and enforce regulation on fines - Make more use of multi-media and social media that raise awareness not only about SWM in Kep but also its tourism - Incentive-based programs - clean-up events OUTPUTS: Series of activities, materials and training modules focused on waste awareness	Costs: implementation costs of launching programmatic approach to educational engagement Benefits: returns on investment over medium and long-term from improved behaviors of population	- Governmental support for community dialogue - Resources for activity and material development

During the implementation phase of this pilot effort, the combined coordination of implementation partners will be especially important. This coordination will serve to facilitate the repositioning of the existing waste management system with the ultimate objective of establishing more sustainable and efficient operations, leading to better waste management outcomes in the medium and long terms. A description of each of the participants and their role in the pilot implementation activity follows.

- NCSD– Partner in MOU implementation with the Foundation. The national body responsible for mainstreaming sustainability into all aspects of national economic activity

Role in Pilot – Activity coordination with the Foundation, providing human and financial resource inputs required for pilot implementation

- MoE/Department of Solid Waste Management – Responsible for regulatory oversight of national waste management activities

  Role in Pilot – Support in responding to questions related to reforms dealing with waste management technology and systems as well as overall waste system governance. Provide human resource inputs required for pilot implementation

- MEF – Lead government institution dealing with questions of fiscal and budget oversight

  Role in Pilot – Lead on questions related to financial oversight, fee recovery, and budgeting for waste management. Provide human resource inputs required for pilot implementation

- MoI/NCDD-S– Lead government institution dealing with questions of decentralization, overseeing inner-workings and coordination between governmental entities

  Role in Pilot – Lead on questions related to governance, specifically on questions requiring clarity for further reform and improved oversight of waste management. Provide human resource inputs required for pilot implementation

- Kep Province – Authority overseeing affairs of the Province of Kep, with significant existing role in waste management in Kep Municipality

  Role in Pilot – Participate and contribute to discussions, playing constructive role in resolving questions where waste oversight responsibilities are currently ambiguous. Provide human resource inputs required for pilot implementation

- Kep Municipality – Authority overseeing affairs of Kep Municipality

  Role in Pilot – Participate and contribute to discussions, playing constructive role in resolving questions where waste oversight responsibilities are currently ambiguous. Provide human resource inputs required for pilot implementation

- The Foundation – Partner in MOU implementation with NCSD and lead coordination of Task Force activities

  Role in Pilot – Facilitate dialogue and decision-making in support of streamlined implementation of pilot activities. Provide human resource inputs and technical assistance support required for pilot implementation

Table 5 below outlines key inputs required from each of the six institutional partners to contribute to the implementation of agreed upon pilot activities.

Table 5: Key inputs required from partners in each of the five proposed pilot activities

Institutional Partners	Governance	Technology / Systems	A full waste collection service coverage / Disposal Site	Informal Sector	Education / Awareness
NCSD				✓	✓
MoE / Solid Waste Management Dept.	✓	✓	✓		
MoI/NCDD-S	✓			✓	✓
Kep Province			✓	✓	✓
Kep Municipality		✓	✓	✓	✓
The Foundation	✓	✓	✓	✓	✓

5. POLICY REFORM FOCUS

Following and in parallel with the aims of the proposed pilot activities is a series of linked policy recommendations. These recommendations are designed to address the primary waste management challenges identified in Kep and will be modified and refined based upon the results of each of the pilot activities. This series of recommendations seeks to address multiple objectives simultaneously, but are centered around several basic concepts, including green growth, environmental sustainability, circular economy, improved livelihoods, and cost effectiveness.

A description of the policy recommendations follows with an identification of the linked Pilot Activity connected with each:

1. **Strengthen Public Works, Transportation, Hygiene, Environment, and Public Order Office within Kep Municipal Administration:** This action serves to reinforce municipal accountability for waste management at the local level while permitting the development of municipal personnel's understanding of duties and SWM operations. This act is also a focus on ensuring a successful transition of oversight for waste management services to Kep Municipal authorities, especially the newly established office with enough personnel and budget.

   Pilot activity under: Governance

2. **Institutionalize M&E that supports ongoing decentralization and operational improvements via focused data management:** To ensure operational efficiency and strong system performance, an enhanced focus on M&E must be adopted. This focus should be applied to both management and operations in the form of financial and administrative performance of the Public Works, Transportation, Hygiene, Environment, and Public Order Office, in coordination with national and provincial oversight, as well as linked to monitoring of operational performance of local SWM operations. Comprehensive understanding of waste composition and quantity is vital for operational and investment planning and decision making in waste management, especially in the determination of the appropriate handling and management of different waste streams.

   Pilot activity under: Governance

3. **Identify resources required to meet SWM goals and develop revenue enhancement strategies responsive to those needs:** In parallel with the strong focus on M&E, Kep provincial and municipal authorities must ensure that resources are sufficient to support SWM objectives through local partnerships. This will require analysis of alternative funding mechanisms to support MSW operations. At present, operations in Kep rely on a fee collection scheme managed by a private operator, resulting in service most focused on the needs of large commercial generators. To adequately address waste management at a community level, funding for waste operations must be expanded and diversified.

   Pilot activity under: Governance

4. **Pilot a public-private partnership model, which includes economic incentives, in order to promote waste separation at source as a part of circular economy:** Well-designed economic incentive schemes have been found effective in promoting awareness of waste recycling and increasing participation in separation waste at source. Kep Municipal Administration could achieve this by testing an existing model of a Waste Bank. Residents are paid based on the amount of dry recyclable materials (plastics, metal, aluminum) they deposited. Another model could be an integration of informal waste workers into the existing waste management system. Collection efforts of both formal and informal workers can significantly reduce disposal rates to landfill while supporting improved livelihoods for vulnerable populations. Kep Municipal Administration should establish dry recyclable collection points and work with informal waste workers to create a collaborative approach for collection and sale of recyclables for conversion into new products and sources of energy. Partnerships with recycling depots and/or private sector should be a part of these two models to channel the materials to the recycling facilities.

   Pilot activity under: Education and awareness and role of informal sector

5. **Launch partnership to pilot the integration of anaerobic digestion of biowaste from Kep's markets, permitting diversion of organic waste from final disposal site, and conduct a feasibility study on possible on-site composting:** Markets and other institutional food service and food processing operations produce large quantities of organic waste. Organic waste serves as a feedstock to the bio-digestion process, a process which simultaneously reduces waste volumes while producing biogas. Markets in Kep offer an opportunity to pilot a partnership with the National Biodigester Program in support of the sustainable treatment of Kep MSW. Organic waste also provides another opportunity for producing compost for agriculture. Kep Municipal Administration should conduct a feasibility analysis for on-site composting in the areas with poor access to waste collection service.

   Pilot activity under: Decentralized technology and systems

6. **Create roadmap for achieving a full waste collection service coverage in Kep:** Establishing a full waste collection service coverage is essential to addressing the waste management challenges faced in Kep. The effort for a fully expanded collection coverage will assist Kep Provincial Administration to address open burning and marine plastics. Establishing clear milestones and the steps needed to reach them offers a path to successfully achieving this goal.

   Pilot activity under: A full waste collection service coverage and landfill improvement

7. **Endorse action plan to secure landfill and implement low-cost operational improvement practices designed to reduce environmental impacts:** Kep should direct attention to an upgrade of operations at the landfill. Kep Municipal Administration should improve site access. Operational changes, such as reducing waste burning, ensuring consistent waste placement, and regular application of cover material, should be made to mitigate environmental impacts.

   Pilot activity under: A full waste collection service coverage and landfill improvement

8. **Support targeted awareness initiative to educate inhabitants on the importance of proper waste disposal, the health and environmental hazards of open burning, penalties for improper disposal:** Only through the support and engagement of local inhabitants can real progress towards improved waste management be accomplished. Strong signals from local leaders will convey this message by demonstrating a commitment to action. This may involve be beach clean-up events led by local officials, events linked to waste separation, reduced use of plastic, or commitments to anti-burning and illegal dumping.

   Pilot activity under: Education and awareness

4. CONCLUSION

Demographics, upwards trends in economic growth, and increased tourism play a significant role in anticipating future waste management needs in Kep. The existent gap in meeting today's waste sector needs presents an already significant challenge.

While many questions remain, it is clear that one of the biggest challenges to improving waste management in Kep is not technological, but rather related to the sector's overall governance. This overlying governance challenge permeates, resulting in unclear lines of budgetary and management authority, as well as a duplication of efforts and confusing signals as to which level of authority (national, provincial, and/or municipal) is aligned with existing legislation, or if in fact authority is based simply upon a respect for past practices.

Some of the key areas for focus required in order to resolve these governance issues include:

- A focus on complete decentralization and full compliance with Sub-decree 113 on 'Management of Garbage and Solid Waste of Municipalities';
- A strong emphasis on building capacity of local officials to give them the tools needed to effectively embrace their waste management responsibilities;
- Support to the development of mechanisms that ensure resources flow to needed investments in the sector;
- Creation of strong frameworks that permit the tracking of performance, including M&E measures as well as sound data collection.

The unique strength of this initiative lies in bringing together diverse points of view, including multiple governmental institutions, each contributing in different ways to the functioning of SWM systems across Cambodia. It also draws on the participation of the three levels of government- municipal, provincial and national- combined with the support of an international NGO, The Asia Foundation.

The analysis contained within this report offers a starting point for discussion to address the SWM challenges identified faced in Kep, including governance challenges, and suggests several paths forward that can potentially be scaled to cities in Cambodia.

ANNEX 1 – PRE-FIELD VISIT DESK STUDY

Project: Municipal Solid Waste Policy and Planning for Kep City

March 2019

Partners: Cambodian National Council for Sustainable Development; Cambodian Ministry of Environment; Cambodian National Committee for Sub-National Democratic Development Secretariat

Supported by: The Asia Foundation

Prepared by: Christopher Godlove, THINKCities

Pre-Field Visit Desk Study

1. Introduction

The Asia Foundation is partnering with the National Council for Sustainable Development (NCSD) with the Ministry of Environment (MoE) of Cambodia on a study focused on the management of MSW in the Municipality of Kep. This study is designed to address the challenges of improving urban SWM practices and systems in Cambodia in small and medium sized municipalities like Kep. Two national consultants and one international consultant will work with a small team of Royal Government of Cambodia and the Foundation's representatives to conduct the study.

This document, the 'Pre-Field visit desk study,' is designed to facilitate understanding of the policy, governance, infrastructure, resources, planning, capacity and regulatory context that will impact waste management in Kep now and in the future. During a second stage the team will conduct a field visit to Kep providing an opportunity to see first-hand waste management practices and conditions and to gather additional information on local waste management.

1.1. Background

Discussions with NCSD and MoE have focused on building upon the Kep experience with waste management to create a Green City model and to support a Secondary City Strategic planning effort undertaken by the Global Green Growth Institute (GGGI) There is a strong interest to build on Kep's recognition by ASEAN in 2017 as an Environmentally Sustainable City, and to use Kep's experience as a reference for other secondary cities as they assess waste management strategies going forward.

Figure 1: Source separation awareness campaign (Heng, 2017)

Several key aspects for focus were mentioned by authorities:

- Recycling/material recovery
- Behavior changes
- Engagement with business and tourism sector
- Waste collection agencies
- Composting
- Landfill integration
- Special focus waste management in markets and industrial zones.

A final but critical aspect is to assess the implications that decentralization has upon waste management in Kep and communities like it, and to build waste management models that support holistic approaches while addressing weaknesses in existing systems.

1.2. Framing objectives

The immediate objective of this activity is to develop an understanding of waste management practices and future needs in the municipality of Kep. These objectives are designed to enhance understanding of both project partners as well as Kep municipal officials and community stakeholders. Discussions will engage a variety of stakeholders ranging from officials at all levels, the private sector, and business and informal sector waste workers.

Specific objectives include:

- Develop an understanding of the patterns of waste generation in the focus area of Kep, to include waste disposed as well as illegally dumped waste and waste that is burned;
- Improve understanding of the patterns and efficiency of trash collection;
- Understand factors shaping local household and business behavior relating to waste disposal;
- Explore significance of gender roles in waste management;
- Develop understanding of measures (policies and/or regulations and/or provincial initiatives and measures) that worked/ did not work, and past efforts made to improve the situation.

An additional relevant focus is to develop understanding as to how the various authorities and actors involved in waste management work together, and to identify areas where roles and relationships should be strengthened in order to ensure system improvements. The information and analysis completed following this desk study and the field visit will be used as inputs for the development of a policy brief, designed to highlight strategies that can be extrapolated at a national level in support of improvements across the waste management sector.

1.3. Decentralization and waste management

The process of decentralization reform began in Cambodia in the early 2000s, reworking relations between national, provincial, and local authorities, and impacting service delivery across a range of urban service sectors. In the waste sector, decentralization has resulted in the outsourcing of the collection and disposal of waste to mostly private firms, with CINTRI, Phnom Penh's waste system operator, being the most prominent. While this waste management strategy relies heavily on private sector know-how and flexibility, it has left significant gaps in service coverage and environmental performance, which government regulators have been reluctant or unable to address to date. Many of the gaps are the result of poorly resourced systems and lack of capacity, but weaknesses are also due to a lack of clearly defined responsibilities and oversight, resulting in inaction and reliance on the default systems in place.

1.4. Desk study approach/methodology

To achieve the objectives described above, the following parameters and methodology have been established to guide information, data collection, and analysis.

a) Geographic/administrative focus of study – The administrative boundary for this effort is defined as being the Province of Kep to include the Kep Municipality. Waste disposal sites (landfill and/ or dumpsites) forming part of the town's waste management system will also be included as an important part of the focus, as will the islands of Koh Pho and Koh Tonsay (Rabbit Island).

b) Holistic approach to waste management – Given the Government's interest to develop a replicable model, the focus in Kep will consider a holistic approach to waste management, one that integrates

concepts of integrated SWM (collection, transport, recycling, treatment and disposal) in addition to a focus on the environmental sustainability of such systems. Other considerations to be incorporated include social aspects related to both gender and informal waste collectors and the economic and technical contributions made by both groups to waste management in Kep.

c) Secondary data sources – Secondary sources of data have been identified during the desk study phase and will be expanded upon as new resources are found. A research and literature review have been conducted by the Foundation and additional resources are being added to enhance understanding of Kep Municipality. Effort is also being made to gather information on representative municipalities with conditions and populations similar to Kep—rates of growth, economic profiles, geography, etc. This data will be used to supplement missing data not available in Kep, serving as proxy inputs. An effort has also been made to catalogue existing regulations and decrees that impact waste management in Kep.

d) Primary data sources - The field study phase will place emphasis upon gathering additional insights, information, and data from primary sources via key person interviews to include waste management and government representatives, Civil Society Organizations/NGOs, private sector, donor agencies, academia, as well as local inhabitants (shop owners, market business people, residential occupants, hotels/ restaurant sector, schools, etc.).

e) Additional inputs – Pictures will be taken during the field visit portion of the activity in order to document waste management practices as well as to capture conditions of streets, coastline, public spaces, and other facilities. Special note will be taken of the role that women play in waste collection as well as the role of the informal sector. The Foundation has already begun to populate a matrix document that seeks to orient thinking around study objectives. This document will serve as a basis for work going forward.

1.5. 'Green city' models

To facilitate comparison and the process of determining how to best adapt outside models to a Cambodian context, a sampling of 'green city' references has been compiled. These are cities that have demonstrated a new approach to managing waste in a way that has been successful and that can be supported by existing resources and technical capacity. A brief description of each follows with a short description of the aspects making them unique and successful.

A sampling of Asian cities that have implemented innovative approaches to waste management include:

- *Alapuzzha Municipality* (Kerala, India - population: 174,000) – The city adopted a "Clean Home Clean City" campaign focused on segregating waste at its source. A small pilot was launched in one of the city's 52 wards in 2012, 11 more wards followed. Compost and biogas plants were set up in households with government subsidies available, with composting units costing Rs.150 ($2 USD) and biogas plants at Rs.3375 ($50 USD). Small-scale composting centers were built in neighborhoods for households that don't have units on site (Venugopal, n.d.).

Figure 2: Recycling depot in Kep

- *Panaji City* (Goa, India – population: 40,000) - Panaji is divided into 12 waste management zones, each under a supervisor. Households must segregate waste into five fractions: wet waste, plastic, paper and cardboard, metal and glass, and non-recyclables. Wet waste is sent to a composting unit, dry waste to a sorting station. Two challenges include management of odor at wet waste processing sites and the increasing volumes of waste. The city charges an annual fee of 365INR ($5 USD) from households and 300-10,000INR ($4 to $144 USD) for hotels. It sells segregated waste to dealers and cement companies (Agarwal, 2017).
- *Mysuru City* (Karnataka, India – population: 920,000) - The city was selected for its multi-layered waste management processes, decentralized community-based composting, and maximum segregation of waste at source. The city is aiming for zero-waste goals and budgeted $36,000 USD to complete the plan (Aravind, 2014).

- *Surabaya* (East Java, Indonesia – population:3.5 million) – The City of Surabaya implemented community based SWM following the unplanned closure of a major landfill, leaving waste piled in city streets. Citizen and NGO involvement supported by the Japanese City of Kitakyushu led to an expansion of the program and the development of composting centers, temporary collection stations, and better engagement with inhabitants. Waste Banks also greatly facilitated recycling efforts by effectively engaging citizens to sort waste at the source (Global Covenant of Mayors for Climate & Energy, 2019).

Analysis of the Surabaya example identified the following factors as critical for replication:

- Capacity building – all stakeholders have undertaken training to improve skills and increase knowledge
- Public-private partnership – city government encourages investment in waste management facilities
- National level support – national government policies and guidelines have further strengthened and assisted efforts

Box 1: Analysis of the Surabaya example

2. Overview of waste management in Kep Municipality

Kep Municipality is a small coastal community, but locally important tourism sector base with expectations for future growth. Kep has a population of 20,000 and is the largest center of population in Kep province, a province measuring 336 km^2 with a total population of 80,208 inhabitants. Administratively, Kep Municipality also incorporates two islands - Koh Tonsay (Rabbit Island) and Koh Pho.

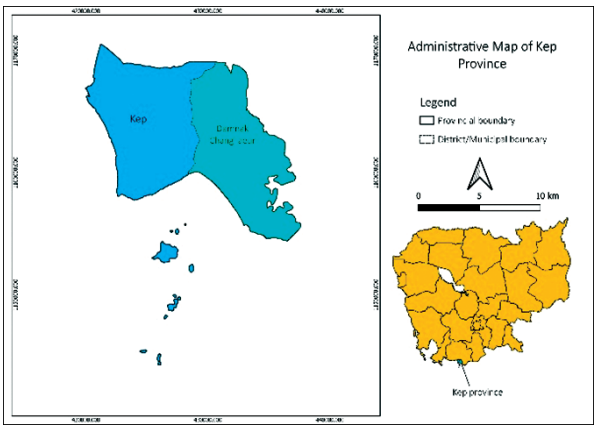

Figure 3: Administrative map of Kep province

2.1. Key economic activity

Kep is a relatively undeveloped region with excellent potential for increased tourism given its access to the sea and abundance of natural park and forests land. The eco-tourism segment is especially attractive given the natural beauty and pristine state of the coast and landscape. Other economic activity is largely agriculturally focused—mainly fruit, pepper, and fisheries.

2.2. Waste management practices common in secondary Cambodian cities

As is common elsewhere in Asia, waste management is a mixture of formal and informal systems largely concentrated in urban areas where collection rates are low. In nearby Kampot Municipality, only 36% of households have waste collected on a regular basis (Economic and Social Commission for Asia and the Pacific, 2017). This lack of collection results in inhabitants seeking out other sources of dealing with piles of waste, leading to illegal dumping and burning of waste, both of which result in environmental and health impacts to land, air, and water resources.

Dumpsites are the most common disposal option for waste that is collected. Treatment of waste is largely limited to materials sorted by households and sold to intermediaries (Min, 2016). The informal sector also plays a significant role in collecting materials having value, like PET bottles, metals, and aluminum.

Organic waste is a significant component of waste in all Cambodian cities, but is rarely processed, ending up in dumpsites producing methane and generating leachate runoff to ground and surface water.

2.3. MSW data for Kep and other secondary cities

Data related to MSW management in Cambodia is lacking due to the under-resourced nature of waste management in the country and the lack of a common set of metrics and tools to measure performance of collection and disposal. At a very basic level, equipment like weighing scales for measuring incoming waste at a landfill are required to accurately measure waste disposal, something that requires financial resources and trained operators.

Given this reality, but to provide a framework for analysis and decision making, several existing data points relevant to the waste sector in Cambodia will be used to construct a framework for the study in Kep.

Waste characterization – Existing data from other cities can be used to approximate waste characteristics in Kep, in the absence of performing a waste analysis for Kep. This approach is not a reliable method for the development a feasibility analysis for a landfill or composting facility, but is acceptable for the kind of basic analysis currently being conducted. Figure 4 details the composition of waste in Phnom Penh, demonstrating a high organic content of waste followed by dry recyclables – plastics (20%), paper (10%), wood (2.3%) and glass (1.6%) (Hul et al., 2015).

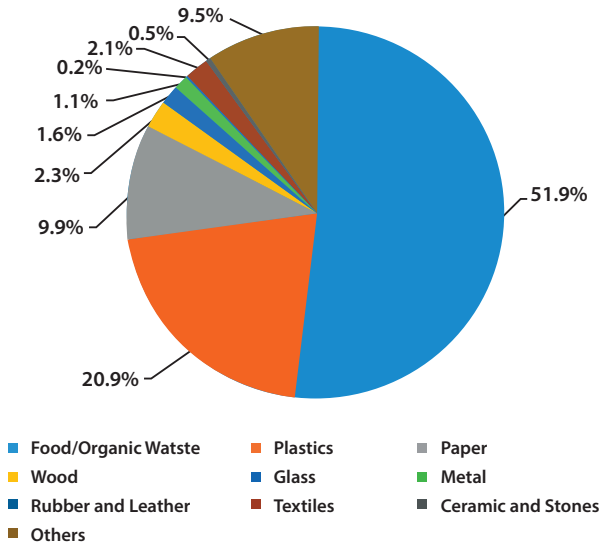

Figure 4: Waste composition Phnom Penh in 2015

Food and organic waste streams in other secondary Cambodian cities range from 63% in Siem Reap to as high as 80% in Kampong Chhnang. Plastics and metals will already be targeted to some extent via both home separation and other informal recovery efforts given the value of these materials (Sour, 2017).

Waste collection – Some estimates calculate that 99% of original municipal waste is disposed in dump sites, leaving only around 1% of recyclable material being collected by informal workers (Heng, 2017). In Kep Municipality, waste generation is reported at 8.5 tons/day, with only 57% percent of waste generated actually reaching the landfill, implying that the remainder is either burned or illegally dumped (Sour, 2017).

Table 1: Demographic background, and solid waste data in Kep

Demographic Background in Kep	
Number of communes/sangkats	5
Population	40,763
# households	8.917
# restaurants, hotels and other entertainment facilities	72 hotels + 6 Koh Tonsay (78 total) 56 restaurants (tripadvisor) See list of hotels in Kep: https://www.kep-cambodia.com/mainpages/kep-hotels.html
# national tourists	TO BE DEFINED
# international tourists	TO BE DEFINED
Key Features of SWM in Kep	
Volume of waste per day	TO BE DEFINED
Service provider	TO BE DEFINED
Waste Management Unit operational start-up	TO BE DEFINED
Recognition of Waste Management Unit by MoI	TO BE DEFINED
Accountability line of Waste Management Unit	TO BE DEFINED
# Public civil service personnel of Waste Management Unit	TO BE DEFINED
# Contract personnel of municipal Waste Management Unit	TO BE DEFINED
Service provision coverage	TO BE DEFINED
Monthly fee collection	TO BE DEFINED
Landfill	TO BE DEFINED
Distance to landfill	TO BE DEFINED

Organic waste – As described above, organic waste, consisting mainly of food and garden waste, is the largest single component of the waste fraction in countries globally. In developed economies organic waste is typically in the range of 40-50%, while in developing economies, especially in some parts of South Asia, this can range as high as 80%. As Cambodia progresses economically, so too is the percentage of organic waste

as a component of total waste generated. Mid-sized cities like Siem Reap and Battambang recorded organic waste percentages of 60 to 70% in the mid-2000's. Phnom Penh too was at 63% in 2005 and today that number is estimated at 51%. Food waste provides perhaps the most immediate opportunity to mitigate environmental impacts such as water pollution and GHG emissions and to turn that waste into beneficial products that can in turn be directed into productive use in agriculture, gardening and parks, forestry, enriching soils, and hedging against erosion and soil loss.

Markets and other food related commercial operations – One report puts the percentage of organic waste generated by the Samaki market in Kampot at 80%, demonstrating the opportunity to source concentrated streams of relatively clean organic waste from sources like markets, schools, hotels, and restaurants. In Kep, there are also several potential opportunities to target these waste streams.

Final disposal - According to a 2017 report, there are 72 dump sites serving small and medium sized cities across the country. These sites are typically unsecured open dumps, that lack basic management systems related to environmental, health, safety, or access. All of this poses serious risk to formal and informal waste management workers, as well as neighboring populations impacted by a degraded and at times insecure environment. Waste that does not reach these sites may be illegally dumped, often along roadsides or in waterways. A 2004 JICA study estimated illegal dumping in Phnom Penh at 2.5% of total waste volumes in the center city, and as high as 15% on the outskirts. Rates of waste burning were even higher at 15 percent in the center and 50 percent in suburban areas (Sour, 2017).

Per capita waste generation – To develop a clearer picture of future waste generation scenarios in Kep, it is first important to have a reasonable estimate of per capita waste generation for populations comparable to those in Kep. Per capita generation ranges from 0.73 kg in Phnom Penh in 2015 (PPCA, IGES, Nexus, UN Environment, & CCCA, 2018) to 0.58 kg in Battambang in 2016 (CCAC, 2016). Given that both Battambang and Kep are considered secondary cities with similar economic and demographic profiles it seems reasonable to use the Battambang 0.58 kg number for Kep until more study of this topic is undertaken.

2.4. Data collection tools

Various national and international initiatives supporting MSW training and capacity building efforts have developed tools and resources to support decision-making around MSW management. Having a common set of MSW information and data for a given city is important to ensure a common point of reference. The (CCAC) and the World Bank have developed a tool – City Rapid Assessment Tool – designed to facilitate collection and verification of this information.

3. Regulatory context

To better understand the roles and responsibilities of Cambodian municipalities with respect to MSW management, it is helpful to review the laws and regulations governing this sector.

3.1. Existing decrees/Prakas –There are three key pieces of legislation that govern waste management in Cambodia:

- Sub-Decree No. 36 – first dealt with questions of SWM, enacted in 1990s.
- SWM for the Province/Municipality No. 80 (Prakas) - promulgated by the Ministries of Interior and Environment, covers many aspects of local management of waste – collection, cleaning, storage, transport, recycling and disposal. Kep was called out specifically for reference within this Prakas. Responsibilities defined include: waste container provision, public awareness, provision for disposal, etc.
- Sub decree No. 113- better clarifies roles and responsibilities of government and local entities, becoming effective in 2015 (Min, 2016). Other impacts of the Sub decree 113 include: better defining the key role that ministries and sub-national administration are required to play with regard to waste management oversight and support, clear assignment of SWM responsibilities to town and district administration, identifying responsibility for raising public awareness, and participation in local SWM.

Based upon the framework provided by Prakas No. 80, Kep Municipality has adopted legal instruments providing for further clarity on waste management locally (Min, 2016). Sub-decree 113 has been implemented but has yet to be fully enforced by government (PPCA et al., 2018).

3.2. Defining roles – It is unclear if an Office of Environment exists within Kep Municipality. It is understood that in the absence of an Office of Environment, that the Offices of Administration and Finance would carry responsibility for decision-making related to waste management and/or the Office of Commune Support and Planning. Some of the other roles and responsibilities related to MSW decision-making are described in Table 2 (Min, 2016).

Table 2: Roles and Responsibilities of different waste management actors

SUB-function	Council	BoG	DoEnv	DEF	Private	Others
Planning				×		
Dumpsite Identification		×	×			
Budgeting				××	×××	
Contracting		×		××	×××	
Implementation		×	×	××	×××	
Fee tariff setting & collection		×		××	×××	
Support & coordination		××	××	×××		
Monitoring & Oversight		×	×	×××		
Evaluation		×	×	×××		
Education		××	××			

XXX: Heavy Involvement

XX: Some Involvement

X: Little Involvement

4. Financing solid waste management

SWM in Cambodia is largely supported by user fees based on a cost recovery concept. Fees are assessed based upon the activity of a given waste generator and the size and operations of the establishment. Private operators managing collection via contracts are responsible for fee collection and service provision. Non-payment is a common occurrence and poses significant challenges to a firm's financial and operation viability, often resulting in operations that are unpredictable and subject to change based on financial realities. User fees are not calculated based on the volume of waste produced, but rather on the type and size of the operation. In a 2016 survey, waste fees ranged from between USD $0.8 to USD $30 per month (Min, 2016). An alternative Cambodian mechanism for funding the provision of waste collection services, is centered around the waste generated by municipal markets. These financial and management models appear to have evolved organically, starting out via contracts being established between collection firms and market operators, slowly evolving to the provision of service to surrounding residential and commercial generators as the demand arises.

Given Kep's special status as a popular tourism destination for both Cambodian and international visitors, team members have inquired about the applicability of a fee-based assessment linked to an aspect of local tourism that would generate revenue while not adversely impacting local residents, such as a fee levied on hotel occupancy or ferry passage to one of the local islands. Initial research identified one such model in Indonesia where this approach has been applied with some success (see Box 2: Gili Trawanga Eco Tax).

Gili Trawanga Eco Tax - Indonesia

To address financing of waste management in this popular tourist destination, a local NGO and the waste management authority joined forces to address this issue. The Gili Eco Trust (GET) a grouping of tourism service providers and dive shops, implemented an Eco Tax paid by tourists upon provision of services. Funds were then used to subsidize waste management efforts on the island. This helped the waste authorityto offset spending and avoid deficits (Willmott et al., 2012).

Box 2: Gili Trawanga Eco Tax – Indonesia

5. Management and incentive models for improving MSW

Several other management models exist that can serve as references when considering planning in Kep.

These include:

- Integrated resource recovery centers (IRRC) - IRRC is a decentralized, small-scale waste recovery facility that processes between 2 to 20 tons of waste per day, receiving segregated or non-segregated municipal waste and employing low-cost techniques to recover resources from waste. An IRRC is designed based upon local needs and is responsive to the quantities and quality of local waste (Economic and Social Commission for Asia and the Pacific, 2017).
- Clean City Program – A Cambodian initiative designed to recognize MSW management efforts of exemplarily municipalities. Several municipalities have so far coordinated worker efforts to collect waste from the streets under a "Clean City Contest" project or a 'Clean City Program.' This program is on-going:
- Preah Sihanouk Municipality – This Cambodian municipality works every weekend with its five Sangkats to conduct cleaning campaigns in one of them. Once a cleaning site is proposed and decided upon by the respective Sangkat Council, the Municipal Administration organizes this physical cleaning event by inviting between 40 to 60 officials, youth, NGOs, as well as tourist agency association representatives to participate.
- Stueng Treng Municipality- Is one of a very few municipalities in Cambodia that manages solid waste directly through its own established waste management unit and not through private service providers (i.e. contracting modality with a waste collection company or market fee collector). It should be noted that prior to the establishment of the Municipal Waste Management Unit in early 2011, recognized by MoI in 2013, solid waste collection in Stueng Treng Town was contracted with a private contractor (Min, 2016).
- Social waste management center in Battambang- The SAB is an integrated project with social and organic waste recycling center (composting and biogas plant) components. Its main objective is to improve quality of life and working conditions of waste-pickers. Improvements include:
  - Break room, cooking facilities, showers, toilets, clean water, etc.
  - Frequent presentations on security and hygiene measures given to the workers by COMPED staff.
  - More than 30 children of the waste—picker families living around the dump site are encouraged to go to school and to take advantage of extra tutoring.
  - Access to a playground and playroom.
  - Biogas generated is used for cooking and lighting and the compost is sold for extra income (COMPED, 2013).
- Waste Banks (Indonesia) – These independent entities operate based upon a commercial banking concept, where recyclable material is the currency. Clients deposit material which is recorded in a passbook. At the end of the year, around the feast time, monetary payments are made based upon the amount of material transferred. These entities typically operate with support from private sector consumer goods manufacturers (Salim, 2013).

6. Informal sector and gender in waste management

Increasingly there is recognition globally of the important linkage between specific communities that derive their livelihood, often by informal work, from waste management and material recovery activities. Rather than ignore this reality, successful approaches have directly engaged with these communities, seeking to integrate them into new waste management models in ways that respect their knowledge and experience with the sector while also providing improved health and safety protections in addition to compensation for work.

A Cambodian example from Kampot offers insights into the existing compensation for these workers. The informal sector is particularly active in waste management in Kampot, with more than 30 waste pickers operating in the town, many of whom are female and earning between $2–$3.50 USD per day (Community Sanitation and Recycling Organization, n.d).

Other observations offering insights into the Cambodian context include:

- 51% of waste pickers active in Phnom Penh are children (less than 18 years of age), while 35% are aged under 15 years of age. Ages of those surveyed ranged from 8 years to 77 years.
- Most waste pickers come from large households of greater than 5 members. The average waste picker household has 5.42 persons.
- 34% of the waste picker households are female-headed households, while the majority of waste pickers in Phnom Penh are male (62%).
- Of those people active in waste picking, the vast majority are ethnically Khmer 68%, while 26% are ethnically Vietnamese (Community Sanitation and Recycling Organization, n.d.).

7. Current global MSW management and environment topics

7.1. Waste hierarchy – The waste hierarchy is a decision-making framework methodology used to guide holistic decision-making related to management, collection, material and energy recovery, and final disposal of waste (see figure 5). The 3Rs – reduce, reuse, recycle – are components of this hierarchy.

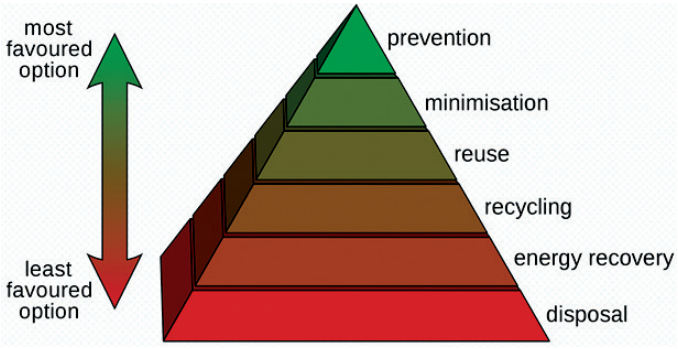

Figure 5: Waste hierarchy decision making framework

7.2. Circular economy - A circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital (Ellen MacArthur Foundation, 2017).

7.3. Zero Waste - The conservation of all resources by means of responsible production, consumption, reuse, and recovery of all products, packaging, and materials, without burning them, and without discharges to land, water, or air that threaten the environment or human health (Zero Waste International Alliance, 2018.

7.4. Reducing use of plastics –The Ellen MacArthur Foundation estimates that 8 million tons of plastics enter the ocean each year (Ellen MacArthur Foundation, 2017). To protect our oceans and our food chain from further plastic contamination, measures have been created aimed at reducing single use plastics, boosting recycling efforts, and improving waste management and disposal.

7.5. Food waste – MSW globally contains high percentages of organic waste, waste that naturally degrades, and a high percentage of this waste is linked to food preparation or food scraps. International efforts have focused attention on reducing the discarding of edible food, and redirecting it to hunger alleviation, animal feed, and the production of compost and other soil enhancing products that can be used to replace chemical fertilizers. By removing this waste from landfill and dumpsites, GHG emissions associated with methane gas production is reduced, also reducing environmental and health risks associated with air and water contamination.

7.6. Decentralized MSW treatment – Reducing the volume of waste prior to disposal reduces the need for landfill space, as well as the impacts associated with the landfilling of waste. To have meaningful impacts on waste volume, the useful components of waste must be separated and collected. Several models of district and neighborhood level separation and treatment have been developed that involve the removal of dry recyclables and the composting

and digestion of organic wastes such as food waste to produce compost, soil enhancement products, and when combined with digesters, biogas for cooking and heating.

7.7. Climate and air quality co-benefits – Current waste management practices have significant impacts on both the climate and environment, contributing to climate change from GHG emissions, largely methane, and impacting air, land, and water resources linked to various pollutants including leachate, landfill gas, a combination of methane, CO_2, and other trace components. By developing comprehensive strategies to reduce waste disposal, many of these impacts can be significantly reduced.

8. Mapping MSW initiatives in support of a Kep focus

During the course of conducting research for the present desk study, a number of initiatives have pointed to support for improved waste management in Kep. A number of other nationally focused initiatives were also identified. A summary of these follows:

- Ministry of Tourism and ADB are in discussions for a $30million USD loan to fund infrastructure in coastal provinces that would support tourism development. The loan is reported to include a waste management focus in Kep (Chea, 2018).
- Other organizations that focus on waste management in Kep: GGGI, the United Nations Environment Programme (UNEP)/the United Nations Economic and Social Commission for Asia and the Pacific, Embassy of Sweden, and the United Nations Development Programme.
- The 2018 publication 'Phnom Penh Waste Management Strategy and Action Plan 2018-2035' contains a comprehensive overview of international and regional donors engaged in supporting improved waste management in Cambodia, included in the annex 'Potential sources of waste management funding'.

9. Summary and next steps

A field visit to Kep by team members will be conducted during the first week of April 2019. This visit will provide an opportunity to consolidate understanding of current waste management practices in Kep via first hand interaction with key persons and technical visits to waste generation and disposal sites. Follow-on work will focus on the development of a policy brief that will build on analysis conducted post field-visit.

It is envisioned that the policy brief will address several bigger picture objectives that may include:

- Development of a set of **policy recommendations** designed to support sustainable waste management while considering environmental and social impacts relevant to Cambodia
- Creation of a **conceptual model** tailored to Cambodian conditions built around tested system and infrastructure approaches to waste management
- Opportunity to **leverage resources both financial and knowledge based** to support efforts in Cambodia
- **Social and gender considerations**

Other specific topics for consideration will include:

- Technology, systems, and infrastructure
- Financial and management-based incentive models
- Pilot project development
- Partnership engagement

ANNEX 2 – FROM PILOT CONCEPTS TO A DRAFT 3-YEAR-ACTION PLAN

Phase I																				
Objectives & Key Activities		Y1												Y2						Estimated Cost (Technical Assistance only)
Goal: Improved Functioning of Waste Management in Kep		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	
I. Governance and Decentralization																				
Objective 1: A clear and strong oversight for SWM in Kep																				
1.1	Disseminate and further facilitate the implementation of Sub-decree No. 113 and relevant legal framework																			30,000
1.2	Establish M&E system at municipal level to monitor performance of service provider																			20,000
1.3	Establish M&E system at national level to monitor the implementation of Sub-decree No.113																			20,000
II. Expand Waste Collection Service Coverage																				
Objective 2: Expand waste collection coverage																				
2.1	Map areas with poor access to collection services and study waste composition																			20,000
2.2	Develop roadmap for service expansion																			10,000
III. Education, Awareness, and Participation																				
Objective 3: Eliminated incidence of dumping and burning																				
3.1	Consider the possibility of implementing a social accountability model on SWM services at municipal level																			50,000
3.2	Survey to establish baseline understanding of awareness																			20,000
3.3	Design and implement programs that raise awareness not only about SWM in Kep but also its tourism																			10,000

Phase I																				
Objectives & Key Activities		Y1												Y2						Estimated Cost (Technical Assistance only)
Goal: Improved Functioning of Waste Management in Kep		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	
IV. Decentralized Technology and Systems, and Role of Informal Sector																				
Objective 4: Set up waste treatment																				
4.1	Feasibility study on small scale composting in areas with poor access to collection services																			150,000
4.2	Pilot small-scale composting																			30,000
V. Landfill Improvement																				
Objective 5: Controlled landfill / improved landfill operation																				
5.1	Assess current landfill operation and management practices																			20,000
5.2	Develop roadmap for remediation, including identification of low-cost, easy to implement operational changes																			10,000

Phase II																					Estimated Budget (Technical Assistance only)
Objectives & Key Activities		Y2						Y3													
Goal: Improved Functioning of Waste Management in Kep		M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12		
I. Governance and Decentralization																					
Objective 1: A clear and strong oversight for SWM in Kep																					
1.1	Provide technical advice on the implementation of M&E systems at both sub-national and national levels			■			■			■			■			■			■		10,000
II. Expand Waste Collection Service Coverage																					
Objective 2: Expand waste collection coverage																					
2.1	Provide technical advice to the expansion of the service			■			■			■			■			■			■		10,000
III. Education, Awareness, and Participation																					
Objective 3: Eliminated incidence of dumping and burning																					
3.1	Refine and implement awareness raising programs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		100,000
3.2	Analyze, adopt, and disseminate local regulations	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		25,000
3.3	Conduct post-survey on awareness																■	■	■		20,000
IV. Decentralized Technology and Systems, and Role of Informal Sector																					
Objective 4: Set up waste treatment																					
4.1	Monitor and provide technical advice to the implementation of small-scale composting			■			■			■			■			■			■		20,000
4.2	Pilot integration of anaerobic digestion of biowaste from Kep's market	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		50,000
4.3	Develop upcycling plastic waste framework	■	■	■	■	■	■														15,000
4.4	Implement upcycling plastic waste framework							■	■	■	■	■	■	■	■	■	■	■	■		300,000

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