Project Report

Pilot Project to Promote Organic Waste Utilization for Climate Change Mitigation in Battambang City, Cambodia: promoting organic waste separation at source for composting

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Institute for Global Environmental Strategies

Implementation team

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Executive summary

Intensive training course at Phitsanulok Municipality, Thailand

A 7-days training workshop was organized on 17-22 July 2012 at Phitsanulok Municipality, Thailand. At this workshop, 22 representatives from Battambang City were attended which included Provincial government, City government, Market committees, Residents, Waste collection company (CINTRI), COMPED's composting staff and COMPED. The workshop was divided into four parts: i) introduction to solid waste management of Phitsanulok Municipality, ii) field visits, iii) participatory training workshop on community based waste management (including brainstorming and group's exercise for project implementation in Battambang City, and iv) estimation of GHG emission from solid waste management.

Overall, participants were very active in participation of the whole program. This training is very new to them. During the training, participants express their interest, opinion and discussion with each other which significantly improve their relationship. The training does not provide only knowledge and experience to participants but also building good relationship among stakeholders from Battambang City and also creating good relationship between Phitsanulok Municipality of Thailand and Battambang City of Cambodia. After completion of the project, participants agree to implement a pilot project on source separation for composting at the three markets of Battambang City in order to avoidance methane emission from landfill and increase compost production for cultivation.

Participatory pilot project implementation

A participatory pilot project is implemented based on the result of group's discussion and brainstorming at the training workshop that carried out in Phitsanulok Municipality. After returning to Battambang, a working group was formulated by the trainees in August 2012. Members of the working group include representatives from the Battambang City, COMPED, CINTRI and market's committees. A local directive was formulated through dialogues and discussion among the working group's members and announced to the public to promote organic waste separation at source for composting. Numbers of awareness raising activities and stakeholder's consultation were carried out from time to time to facilitate the pilot project implementation. Activities of waste separation at source were carried out at three main markets in the city. Project monitoring and evaluation was carried out every two months to ensure the progress of project implementation. Regularly, challenges and problems occurred during the implementation is solved through stakeholder dialogues and negotiation, for example, based on dialogues, CINTRI reduces disposal fee for market that separated the organic waste as the cost for landfill operation is decreased, waste bin distribution for collection of organic waste upon request of the market, broom is provided by CINTRI to market cleaner as incentive for separated collection of waste that being separated, etc. All incentives that

given to the stakeholders were not designed by the project but it were from the dialogues between the working group and stakeholders. Many of items were given by local stakeholders considering benefits and sharing. This clearly illustrates that the local stakeholders feel their ownership to the project.

As of a result, around 30% of fruit and vegetable vendors at Phsar Thmey, 15% at Phsar Nat and 35% at Phsar Boeng Chhouk, have participated in the waste separation at source by putting separated waste in plastic bags or small containers. Markets cleanliness has improved. Organic waste delivered to the composting facilities has increased both in terms of quality and quantity. The quantity of waste to composting plant was increased from 25 tonnes (1% of total waste) in August 2012 to 139 tonnes (7% of total waste) in January 2013. Labour requirement for waste segregation at the composting site has decreased. The productivity of the composting plant has improved.

This project has significantly decrease greenhouse gas (GHG) emissions through composting. GHG emission reduction has gradually increased from 5.7 tCO2-eq per month in August 2012 to 31.5 tCO2-eq per month in January 2013. This reduction is mainly from avoided landfill of organic waste and not yet including the contribution from potential GHG saving from use of composting and replacement of chemical fertilizer for cultivation.

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I. Intensive training course at Phitsanulok Municipality, Thailand

1 Goals/objectives of the training workshop

The objectives of this training workshop are i) giving the overview of solid waste management in Phitsanulok (including waste separation, collection, transport, final disposal, recycling activities, composting, regulation implementation and waste collection fee etc.) and introducing community based waste management (CBM), ii) giving the overview about contributing of solid waste management of Phitsanulok Municipality in climate change mitigation and iii) using lessons learnt to strengthen actual implementation of climate friendly waste management practice in Battambang city.

2 Target group/participants and agenda

2.1 Target group/participants

There are 22 participants attended the training workshop: 2 from provincial administrative, 4 from city administrative, 2 from two commune administrative, 10 are market committees and vendors, 1 from waste collection company, 1 composting staff and 2 COMPED staff (See Table 1).

2.2 Agenda

Date	Time	Program
16 Jul	09:55	Departure from PNP to Suvannabhumi International Airport to Phitsanulok City
17 Jul	9:00 AM	Opening ceremony and introduction to municipal solid waste management in Phitsanulok Municipality
	Lunch	At Srasonghong community
	1:00 PM	Site visit and interview with Srasonghong community and Deein pattana community
	4:30 PM	Site visit at biogas reactor at the slaughterhouse of Municipality
	6:00 PM	Reception
18 Jul	8:15 AM	Departure from hotel

	9:00 Am	Visit landfill and MBT site
19 Jul	9:00 – 4:30 PM	Training workshop on community based waste management
20 Jul	9:00 – 4:30 PM	Training workshop on community based waste management
21 Jul	AM	Meeting on pilot project implementation in Battambang
	PM	• Waste management and climate change mitigation • Estimation of GHG emission • Group exercise • Closing ceremony
22 Jul	7:30 Am	Go to Bangkok by bus Visiting waste separation at source at Wat Phra Dhammakaya Departure from Bangkok to Phnom Penh

3 Summary of content of training workshop

3.1 Day 1, July 17th 2012 – Morning Session: Welcome and Introduction Session

Welcome cession:

The workshop began with a warm welcome by the vice governor of Phitsanulok province, the president of Dr. Walter Schoell Foundation and the Permanent Secretariat of Phitsanulok Municipality. The vice director of provincial administration of Battambang, **Mr. Peang Narith**, deliver his grateful speech and expectation from this workshop. He explained about the importance of training workshop for the Battambang city, because the city is going to participate in the Clean City Award and intent to promote composting.

Introduction of the objective of the training workshop by Dr. Janya Sang-Arun:

Providing a brief overview of solid waste management strategies in Phitsanulok which can significantly contribute to climate change mitigation:

- Source separation
- Composting or organic municipal solid waste
- Mechanical biological treatment

Briefing about solid waste management at Phitsanulok Municipality by Dr. Suthi Hantrakul, Deputy Mayor of Phitsanulok Municipality

Phitsanulok Municipality is located in northern Thailand which covers an area of 18.26 km^2. Registered population is about 78,000 people. Phitsanulok Municipality's policy on urban environmental management is Clean, Green and Conservative City. Solid waste management is responsible by the municipality including fee collection. Fee rate is arranged in the frame of national rate.

The key success in solid waste management of Phitsanulok Municipality is public participation. Therefore people need to understand about the issue of solid waste management and its impact on human health and environment and individual contribution to solve the problem. The city spent a lot of time, patience and energy to do this work. Additionally, it should start from a small scale and then scaling up once the pilot project is successful.

The municipality started with community based solid waste management - CBM in cooperation with GIZ in the year 1999. CBM is suitable for the Phitsanulok municipality because i) waste composition contains high organic and recyclable materials (40% compostable waste, 40% sellable waste and 20% other waste), and ii) scarcity of land for development of new disposal site.

Currently 58 communities operated the community based solid waste management and two of them have won the national awards in 2011 and 2012.

Figure 1: Picture during welcome session

3.2 Day 1, July 17th 2012 – Afternoon Session

3.2.1 Visit Srasonghong community

The important information/experiences at the community are:

i) Land used by the community is free, even though it belongs to the private,

ii) Community members are working for community centre on a voluntary basis,

iii) The community centre is the collection point of household compostable waste, trimming branches, grass and leaves for composting. The community buys recyclable waste for sale and receives hazardous waste for disposal. Hazardous wastes are collected regularly by the municipality and send to disposal at a licensed disposal facility.

iv) The community operates with their own income; therefore the community has many other activities, like selling local products, making products from recyclable waste, selling recyclable waste, cooking local food during public event or for visitor, etc.

Figure 2: Srasonghong Community

3.2.2 Visit Deein Pattana Community

The important information/experiences at the community are:

i) Land used by the community for free and it is belonging to the public,

ii) Community members are working for community centre on a voluntary basis and community leader is a woman,

v) The community centre is the collection point of household compostable waste, trimming branches, grass, and leaves which further process for composting. The community buys recyclable waste and receives hazardous waste. Hazardous wastes are collected regularly by the municipality and send to disposal at a licensed disposal facility. Moreover, vegetables and leftover foods are used for feeding duck.

iii) Community is providing also training how to grow vegetable and flower in a limited space of urban households,

vi) The community has many other activities such as providing social services to old people, organize public space for children and adult for exercise etc.

Figure 3: Deein Pattana Community

3.2.3 Visit biogas plant at the slaugtherhouse of Phitsanulok Municipality

The purposes of visiting anaerobic digester plant are:

- To see how to treat and utilize wastewater from the slaughter house. In this case, the biogas is used for electricity generation and the solid residue is used for soil amendment.

Figure 4: Anaerobic Digester utilize organic matter from pig slaughter house

3.3 Day 2, July 18th 2012 – Visit MBT Facilities

The site visit was separated in two parts:

(1) Presentation of Phitsanulok Municipality on MBT

Landfill in Phitsanulok has an area of 220 Rai (35.2 ha), which located 30 km from the city. It belongs to the municipality and operates by the municipality under supervision of a private company.

Mechanical-Biological Treatment – MBT is implemented to pre-treatment of fresh waste that collected from the municipal area. This process takes about 9 months using static pile composting technique. It can reduce the volume of waste by 50% and reduce leachate. Therefore, it can save landfill space and reducing cost for leachate treatment. The municipality has implemented this technique successfully and thus extend lifetime of the landfill.

(2) Visiting MBT facilities

Participants have seen

i) The part where waste is under biological process (composting),

ii) The part where waste is under mechanical process (mixing and homogenization) and

iii) The part which the city has tried to utilized plastic after MBT for liquid fuel production.

Figure 5: MBT Field

3.4 Day 3, July 19th 2012 - Morning Session: Expectation and Discussion

For this session we have had a facilitator from the Ministry of National Resources and Environment of Thailand. The facilitator asks participants to express their expectation from this workshop, their concerns about solid waste management problems, and their opinions on task need to take action.

(1) First Session - Expectation

Common expectations of participants are i) they want experiences about the best practice in the field of solid waste management in Phitsanulok, ii) Battambang is facing a lot of problem in landfill management, therefore the participants wish to experience about the way how to solve the problem in dealing with mixed waste disposal into the landfill, iii) the city Battambang is participating in clean city awards, therefore participants interested very much to experience about the successful way in community based solid waste management, iv) to know how people separate waste at household and how the sellable and compostable waste are managed and utilized and v) how waste bins are managed.

(2) Second Session - **Concerning/Problem about Waste Management**

Participants listed causes of failure of solid waste management in Battambang as follows:

i) Limited understanding of the people, due to lack of education including in school, public space, broadcast, TV or leaflet. Moreover people are not aware about the law and regulation relevant to solid waste management.

ii) Lack of participation of all stakeholders due to a) Limited understanding about problem of waste, b) people are not interested about the public health and environment, c) lack of comprehensive guidelines or regulation on solid waste management and if any exist it has lacked of enforcement, d) living condition is still a big problem and e) solid waste management concept is not clear.

iii) Management is poor due to a) human resource is limited, b) control mechanism is poor and c) the responsibility of each stakeholder is not clearly defined.

(3) Third Secession - **Tasks need take in action**

Participants vote to prioritise the following issues:

i) Start with the strengthening education is the priority,

ii) Promoting people participation, and

iii) Strengthening the management and monitoring.

Figure 6: Self-expression and brainstorming

3.5 Day 3 - July 19th 2012 Afternoon Session: Presentation on Community Based waste Management (CBM)

3.5.1 Recommendation to the group discussion

Before Md. Suthi started to present about principle of the community based solid waste management in his city, he recommend some points for successful solid waste management,

i) We have to make sure who responsible for making people aware about waste problems and participate in solving the problems.

ii) Politician must have clear policy and concept on solid waste management and it must be the interest of the people.

iii) Public awareness must be continuing.

iv) Not only tell what to do but also how to do.

3.5.2 Presentation on CBM

3.5.2.1 Some important background of solid waste management in the Phitsanulok Municipality

i) Twenty years ago, the Phitsanulok Municipality faced a lot of problems on solid waste management (waste was mixed; land for disposing waste was limited, etc). The major problems were (a) Lack of awareness about waste avoidance and separation of recyclable material at the household level, (b) High amount of organic materials disposed in the landfill produced methane gas and lachate making operation and maintenance of the landfill difficult, (c) Lack of technical know-how, (d) lack of cooperation between the

concerned local authorities and central government departments, (e) the subsidizing of waste management activities trough central funds often creates distortion, and (f) lack of responsibility for cost effectiveness.

ii) To improve solid waste management, the Municipality got support from GIZ in cooperation with the Ministry of Natural Resources and Environment. Under this project, the municipality introduced the community based waste management to minimize waste disposal to the collection system of the municipality and establish a mechanical biological system to minimize waste to landfill.

iii) At the beginning, the municipality prioritised public education to increasing awareness and seek for cooperation from residents. For this activity, university students and volunteers were involved for face-to-face discussion with residents.

iv) Private companies are an important player in solid waste management, because they have the resources (human and money). Hence, the municipality invited waste buyer shop to take part in promoting recyclable waste separation for sale.

v) Role sharing: (a) the Mayor and city councillors make decision, (b) The implementing staff of the municipality implements the project, and (c) the communities conduct CBM in their communities and households.

vi) Household waste components: 40% compostable waste, 40% sellable waste and 20% waste need to be sent to the landfill.

3.5.2.2 Community – based Solid Waste Management

i) People separate waste in three main categories (1) compostable waste, (2) sellable waste and (3) general waste which must be sent to the landfill.

ii) People have and use their own waste bins. The waste bin free road is introduced; all households keep their waste bin inside. Therefore, the road is clean and no litter.

iii) Community established storage points including waste bank. People can sell their waste to the community or to company. In case people want to save money from the sellable waste, community can organize a waste bank in the community. People can drop their compostable waste into the community centre for the case they do not have land for household composting. Some people conduct backyard composting or composting in small scale within 5 to 10 families together.

iv) Waste with the small amount such as hazardous waste people take it to community centre to store in a safe area and waiting for collection by the municipality.

v) Waste, which need to be disposed into the landfill, has to be collected by the municipality and transported to the MBT facility prior to landfill.

vi) People pay for collection and disposal fee.

3.5.2.3 Composting

There are many composting methods to utilize organic waste which varied from small to large scale: household composting, community composting or central composting. However, the most important is the sustainability of the composting practice that should contribute to economic, environmental, and social development.

3.6 Day 4 - July 20th 2012 Group Discussion and group exercise

The participants were divided into 4 groups.

Group 1 Provincial and city administrative

Member of group 1 plan to have a city clean, attractive and good environment. They are going to promote zero waste at household and expecting no waste litter in the river, public space and on the road.

Group 2 Market and residents of Psa Beoung Chuk community

All group's members plan to have a good waste management system in the next 5 years. People should separate and sorting their waste into specific waste containers provided by the market. Therefore, they will educate people by providing

i) Information leaflet,
ii) Sitting together to find out the way how to separate waste,
iii) Workers at the market will follow the policy of the market and instruct people how and where to disposing waste,
iv) Organize infrastructure for area of food selling, vegetable and meat,
v) Instructing people to use their own waste bin, and
vi) Motivating people for taking responsible for their own waste.

Group 3 Market and residents of Psa Thmey 13 Makara community

Members of group 3 plan to have a clean community that has no garbage littering on the walkways around the market and community and to have enough waste bins along the road.

Group 4 Civil society and private company

To have city clean and green, this group suggests that all stakeholders have to participate in development of a city strategic plan for solid waste management including 3Rs principles in handling solid waste. Moreover, we have to work with full passion of 3 Hs (head, hearth and hand), 3Cs (clean air, clean land, clean water), and 3Rs (reduce, reuse, recycle). The optimism is one of the important factor to develop and implement the project.

Figure 7: Group activities

3.7 Additional presentation by a monk: Two important remarks from

i) Keep in mind not being the cause of the problem.

ii) In your life when you do something it can affect the whole world.

3.8 Day 5, 21st July 2012: Presentation on municipal solid waste management in Phitsanulok (continue)

3.8.1 Waste collection and transport

People in Thailand are aware of the environmental impacts. Therefore, the municipality confronted with landfill siting especially near the downtown. The municipality needed to change landfill site many times and currently it is located about 30 km from the central of the city.

In order to save transportation cost, the municipality has constructed a transfer station about 15 km from the central of the city.

3.8.2 MBT - Mechanical Biological waste Treatment

Landfill in Phitsanulok is about 220 Rai (35.2 ha), it belongs to the municipality and also operates by municipality under the private company consultation. The 35.2 ha of landfill is located at Buengkok sub-district, Bangrakam district, Phitsanulok province. This is the last piece of land that the municipality can secure for waste disposal. Therefore, it is very important to extend lifetime of the landfill as much as possible.

MBT is not only used for reducing the volume of waste to dispose into the landfill but also reducing landfill gas emissions and amount of lachate. Under the experimental period, after composting for 9 months, the volume of waste was reduced from 1,500 tons to 350 tons. Moreover, it is easier to manage the landfilling of inert waste.

After 7 – 9 moths, waste is sieved, plastic can be segregated and sent to RDF facility and the rest which look like compost will be used for cover MBT pile.

Figure 8: Presentation by Md. Suthi

3.9 Day 6, 22nd July 2012: Group discussion

Participants listed numbers of policy and strategies to create a clean Battambang city. Following issues that picked up by participants are listed as follows:

A) Waste

i) Zero waste,

ii) Control plastic waste littering

iii) Availability of waste bins

iv) Available space for storage of waste,

v) Landfill,

vi) Community based waste management,

vii) Clean street (no dirty water on the street)

viii) Wastewater treatment plant

B) Waste utilization, treatment and recycling

i) Reducing waste amount

ii) Public participation

iii) Education about waste management

iv) Composting

v) Waste recycling

vi) Reusing

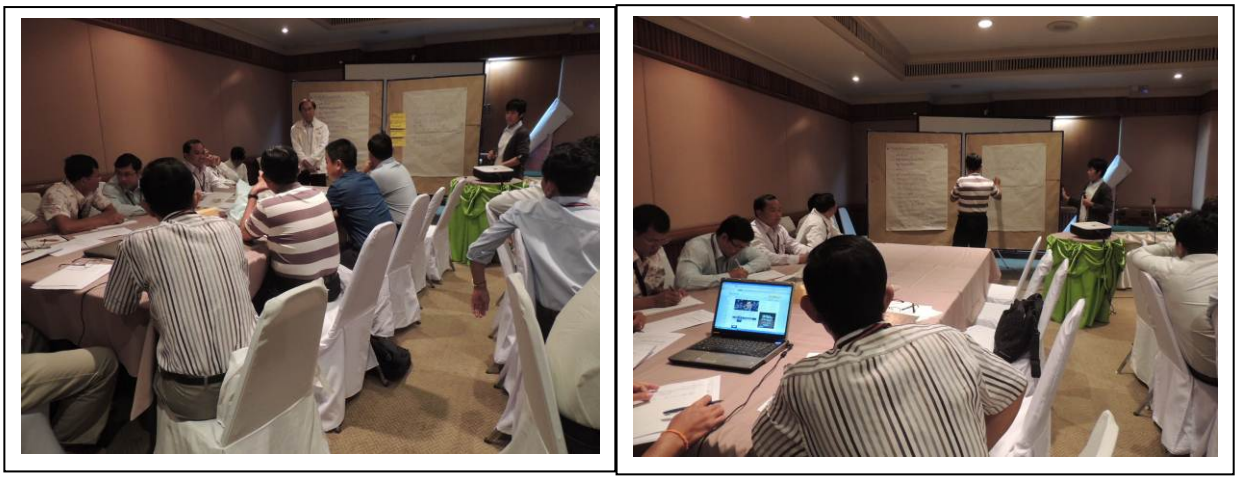


Figure 9: Group discussion

3.10 Day 6, 22nd July 2012: Project introduction by Mr. Chau Kim Heng

- Discussion how to promote source separation at market in Battambang City,
- Responsible of all stakeholders,
- Composting promotion.

3.11 Day 6, 22nd July 2012: Afternoon Secession: Calculation of GHG emission by Dr. Janya Sang-Arun

Dr. Janya explained impact of improper solid waste management on climate change. Furthermore, she taught how to estimate GHG emissions from waste collection, waste disposal and composting. Participants tried to estimate GHG emissions of Battambang City by filling data into the excel file that developed by IGES which making it easier for participants.

Figure 10: Estimation of GHG emissions from solid waste management

3.12 Certification

After completion of the training at Phitsanulok Municipality, the certification ceremony was organized to deliver a certificate to each participant.

Figure 11: Certification Ceremony

3.13 Day 7, 23rd July 2012: Visit Waste Management in Wat Phra Dhammakaya

On the way back to Airport by bus, the team got the opportunity to experience about waste management in Wat Phra Dhammakaya, the biggest temple in Thailand.

The generated solid waste in this temple is managed by volunteers working for the temple.

- Food waste is separated for producing EM – use for cleaning,
- Recyclable waste is sold, and
- General waste is disposed at the disposal site

Figure 12: Visit Waste Management in Wat Phra Dhammakaya

II. Participatory pilot project implementation

1 Background

In July 2012, COMPED and the Institute for Global Environmental Strategies (hereafter as IGES) (Japan) started a project to promote composting of organic waste for climate change mitigation in Battambang city with the cooperation of Phitsanulok Municipality (Thailand). One of the main activities of the project is to provide training and implement a pilot project for source separation of organic waste at and around the markets “Phsar Thmey”, “Phsar Nat”, and “Phsar Boeng Chhouk” since those markets emit a high amount and percentage of organic waste at one place and they are suitable for conducting a small scale project, which is at an initial stage. Other main activities are to conduct data collection of waste quantity sent to dumpsites and compost, and estimate GHG emission reduction under MRV (Monitoring, Reporting, and Verifying) perspective.

1.1 Prior situation of market solid waste management

All three markets are properties of the provincial administration. All those markets are operated either by provincial or city administratiions. The provincial administration entrusts the task to private investors. Phsar Thmey is operated by Lagn Ny, and Phsar Nat is operated by Lim Seng Hout, and Phsar Boeng Chhouk by Kim Hour Heng. In order to coordinate the cooperation among market investors, provincial and city administrations, the province together with the city administration established a market committee at each market.

To manage solid waste and keep the market clean, the market investor signed a contract to entrust the tasks to contractors as a market cleaner. Two contractors are involved, one for Phsar Thmey and Phsar Nat, and another for Phsar Boeng Chhouk. All market vendors must pay a rent fee, including a waste management/cleaning fee for market cleaners (200 Riel per day).

The municipal solid waste of Battambang City is collected by the private company CINTRI, except for the market solid waste from Phsar Boeng Chhouk, which is collected and transported to the disposal site for the final treatment by the market investor.

There is an existing composting center in Battambang city, located next to the disposal site. The center will be able to composting at least 10 ton/day of organic waste.

Moreover, according to sub-degree 36 of the government, the solid waste management is the responsibility of the local authority (province/city). Therefore, the local authority, market investor, market committee, market cleaners, waste collection company, COMPED, and market vendors as a target group of the project are involved to provide appropriate market solid waste management.

1.2 Challenges

- All three markets are operated by different private investors. Phsar Thmey is operated by Lagn Ny. Phsar Nat is operated by Lim Seng Hout. Phsar Boeng Chhouk is operated by Kim Hour Heng. All three market investors get the benefits from a market by renting sales stands/stalls. There are 750 sales stands at Phsar Thmey, 600 at Phsar Nat, and 1000 at Phsar Boeng Chhouk. Moreover, there are no storage spaces for the market wastes in Phsar Thmey and thus it is difficult to talk about using waste bins with market operators.
- In the opinion of residents around Phsar Thmey, it is not acceptable for all residents to install waste containers at public spaces. Also, people oppose the idea of waste bins since there is no space for waste containers at Phsar Nat and Boeng Chhouk.
- For solid market waste management, all market vendors are required to pay 200 Riel per day as a cleaning/waste management fee to a sub-contractor.
- The sub-contractor for Phsar Nat and Phsar Thmey does not hire enough staff for cleaning the market.
- Since most of the waste collection trucks, which belong to CINTRI, are compactor trucks, it is difficult to collect and transport only compostable waste, separately.
- There are no regulations or guidelines on solid waste separation at source.

1.3 Potential

- Battambang city has strongly decided to support source separation.
- The city is participating in a national clean city award.
- There is an existing composting center in Battambang city.
- COMPED has much experience in organic waste utilization.
- The main sources of compostable waste are the vegetable and fruit seller areas.
- The waste collection company agreed to collect compostable waste and other waste separately if it is stored separately.

2 Capacity building under collaboration with Phitsanulok Municipality

2.1 Selecting/Inviting 20 stakeholders for the training program/workshop program

After the contract for IGES MRV Capacity Building Project was signed on 8th June 2012, COMPED started to discuss with the provincial and city authorities on the goals of the project and selected 20 stakeholders (22 persons in total when including 2 COMPED staff) for the training program in Phitsanulok city, Thailand. The main interlocutors were H.E Uy Ry vice provincial governor and Mr. Oeum Sokhon city governor of Battambang.

The provincial and city administration of Battambang has an interest in promoting compost from urban organic waste. Therefore, since 2009, the city administrative has provided one ha of land to COMPED to utilize urban organic waste. The land is located next to the municipal dumpsite. The main proposes of composting are: to reduce organic waste to be disposed in a landfill, to extend landfill life, to reduce landfill gas emission, and to improve agriculture soil quality by compost application.

Moreover, municipal solid waste to be disposed in the landfill, is about 80 ton/day. The main source of organic waste is market waste, especially from Phsar Boeng Chhouk, Phsar Thmey, and Phsar Nat. All those markets are located in the central area of the city. The market solid waste and household solid waste around markets is managed by private investors. Therefore, the city and provincial administrative suggested that all markets such as Phsar Boeng Chhouk, Phsar Thmey, and Phsar Nat be used as pilot locations and inviting stakeholders of the three markets to participate in training program in Phitsanulok Municipality.

2.2 Training Workshop at Phitsanulok Municipality, Thailand.

Under support of Phitsanulok Municipal administration, COMPED organized a journey to Phitsanulok Municipality 17th – 21st July 2012 (see Section I). The participants of the training workshop in Phitsanulok were: two from provincial administrative and office, four from city administrative, two from commune council, two from market committee, one market investor, one from the composting center, one vice general director of waste collection company, seven were vendors and residents, and two COMPED staff.

3 Pilot project implementation for organic waste separation at source by public participation

After training at Phitsanulok Municipality between 17th – 21st July 2012, the city administration together with COMPED has set up the following plan to implement waste separation at source: select pilot project locations, establish working group, develop strategy/directive on waste separation at source, conduct public awareness raising campaign, and implement source separation at selected markets.

3.1 Selection of pilot project locations

The main objective of the project is to promote composting from organic waste for climate change mitigation in Battambang city. In the urban area of Battambang city, there are a lot of business activities especially at the traditional markets. Moreover, the market solid waste contains a lot of organic waste, 65-70%. Moreover, participants at the training workshop prefer to have pilot project in the three markets: “Phsar Boeng Chhouk”, “Phsar Thmey” and “Phsar Nat”.

3.2 Establishment of working group

In order to support and coordinate pilot project implementation, all participants of training at Phitsanulok Municipality made an agreement to establish a working group. Mr. Sieng Em Wounzy, vice governor of the city Battambang was appointed as the working group leader from the working group. The document of WG establishment was signed as declared on 12 August 2012 (See Annex II).

Role of the working group members

The tasks of the working group are to development strategy and to support the promotion of waste separation at source. Another task is to evaluate the project implementation with the city administration, expert team from IGES and Phitsanulok Municipality, and COMPED.

Moreover, all activities at the markets require administrative support from the local government, especially the City Administration.

In order to implement the project smoothly and keep communication with vendors and residents around markets, there were volunteers: Mr. Seun Sophap at Phsar Thmey and Mr.Tan Michel from Phsar Boeng Chhouk. There were no volunteers at "Phsar Nat", unfortunately.

3.3 Development of strategy/directive on source separation of solid market waste

In Cambodia, directives are usually developed without any public participation. The directive on waste separation at source in Battambang city has been developed with public participation through interviews and discussion with all stakeholders, such as vendors, residents, market committee, waste collection company, etc. All collected information on practical ways for how to separate market waste (compostable and non-compostable) at source has been integrated into the directive.

Moreover, the directive was developed and edited three times by working group meetings. Advice was provided by experts of Phitsanulok municipality (Thailand) and IGES (Japan). Through such a process, the directive was signed by the city governor on 8th September 2012. The directive has been shared among the provincial administration, provincial department of public work and transportation, provincial department of environment, city council, target communities, civil societies as developing partners, market committees, and waste collection companies. The main content of the directive is that waste must be separated into three categories (sellable waste, compostable waste, and other waste to dispose of in landfill) (See Annex III).

3.4 Public awareness campaign and advocacy for source separation

3.4.1 Preparation and distribution of information sheets

After the directive was signed by the city governor, 3,900 copies were printed and distributed. Waste separation at source is a new concept for waste management for most of the Cambodian people. Almost all of the stakeholders have never experienced waste separation at source. To avoid people's confusion, simple information materials have been developed and distributed. COMPED designed two kinds of information materials and printed them: 1000 A3 posters and 1500 A4 posters.

Table 1: Content on A3 posters and Sign Boards

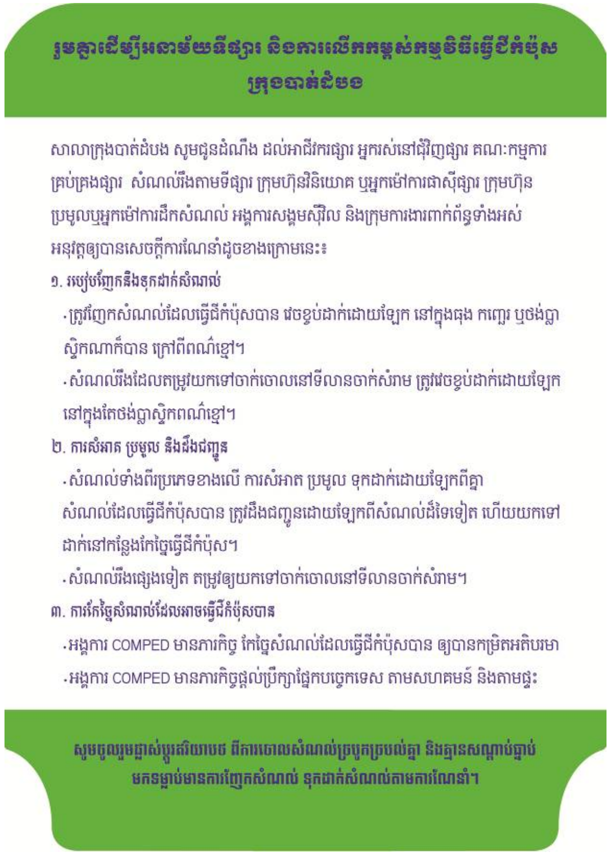
<table>
<tr><td rowspan="9">  </td><td>CITY BATTAMBANG</td><td colspan="2">DRECTIVE ON

solid market waste separation at source at markets in the Battambang city</td></tr>
<tr><td colspan="3">To improve the hygienic conditions, public health, environmental cleanliness, beauty of the City, and composting, as well as to achieve a national clean city award, the city administration instructs market vendors to separate waste into:</td></tr>
<tr><td>Sellable Waste</td><td>Compostable Waste</td><td>Other Waste</td></tr>
<tr><td>This can be sold for extra income.</td><td>This is vegetables, fruit, fish waste, grasses, meat waste, rice and soup waste, tea grounds, coffee grounds, coconut shells, coconut husks, bagasse, leaves, small tree branches, etc. It should be kept in any baskets or plastic bags, except black plastic bags, and collected and transported to a composting site.</td><td>This is small pieces of textiles, flannel, used cloths, old shoes, bottles, glasses, which are not sellable, etc.). It must be kept in black plastic bags and collected and transported to a disposal site.</td></tr>
<tr><td colspan="3">Meaning of Compost</td></tr>
<tr><td>Agriculture</td><td>Environment</td><td>Social Economic</td></tr>
<tr><td>• Improve quality of soil
• Hold water a long time
• Resist diseases
• Give high yields and good taste</td><td>• Reduce odor, and animals which transmit disease
• Extend landfill life
• Reduce GHG emission
• Protect ground and surface water quality</td><td>• Reduce amount of mineral fertilizer
• Create job opportunities for the poor.</td></tr>
<tr><td>IGES</td><td>COMPED</td><td>UNESCAP</td></tr>
</table>

Table 2: Content of A4 Poster Front Page

BATTAMBANGCITY	COMPED	IGES
DIRECTIVE on market solid waste separation at source, at markets in Battambang city		
Sellable Waste	Compostable Waste	Other Waste
This can be sold for extra income.	This is vegetables, fruit, fish waste, grasses, meat waste, rice and soup waste, tea grounds, coffee grounds, coconut shells, coconut husks, bagasse, leaves, small tree branches, etc. It should be kept in any baskets or plastic bags, except black plastic bags, and collected and transported to composting site.	This is small pieces of textile, flannel, used cloths, old shoes, bottles, glasses, which are not sellable, etc. It must be kept in black plastic bags, and collected and transported to a disposal site.
Participating in waste separation at source means protection of the environment and health. The City is clean and beautiful.		

Table 3: Content of A4 poster at back side

	To get together for a clean market and compost promotion Battambang city
	The city administrative instructs market investors, market committee, and contractors for collection of stall fee and cleaning fee, waste collection company, civil societies, involved authorities, vendors and residents living around the selected three markets in Battambang city, to join the following tasks and responsibilities:
	1. Waste separation at source and storage of waste: • Compostable waste should be kept in any baskets or plastic bags, except black plastic bag, to be collected and transported to a composting site. • Other waste must be kept in a black plastic bag to be collected and transported to a disposal site. 2. Cleaning, collection, and transport • Both waste types above must be collected and transported separately. Compostable waste should be transported to a composting site and • Other waste should be transported to a disposal site. 3. Utilization of compostable waste • COMPED organization should utilize compostable waste to the maximum amount. • COMPED organization should train the community and individuals on how to do composting.
	Please change your behavior and put waste into separate waste bins as instructed in the directive.

3.4.2 Introduction of directive to vendors of the selected markets

COMPED and the city administration organized three half-day workshops on the 17th, 18th, and 26th September 2012 with selected market vendors. The aims of the workshop are to introduce and explain about the content of the directive and the importance of waste separation at source. These selected market venders had to share the information of the directive with other vendors.

All participants agreed that the source separation promotion would be successful only when all stakeholders participate in source separation of organic waste and other wastes. The vendors from Phsar Thmey and Phsar Nat showed concern about the involvement of the market operators and market cleaners. The market operators did not provide enough staff for cleaning whole markets.

Unlike the other two markets, Phsar Boeng Chhouk is a wholesale market. As a result, large amounts of organic waste are produced at the end of sale. Therefore, vegetable vendors want to put organic waste on the ground, separately, since it is difficult to put all organic waste into a plastic bag.

Figure 13: Workshop with vendors of Phsar Nat

3.4.3 Workshop with school students

Date and Time: 20th December 2012 from 8:00 to 10:00 AM.

Participants: 54 students

Location: at city meeting hall

54 students from five secondary schools participated in the workshop. They have learned the following:

- What happens if organic solid waste is not managed properly,
- What is organic solid waste,
- Why do we need to separate waste at source,
- Why composting is important.
- Directive introduction and workshop

After two hours of presentation, all 54 students were divided in three groups. They spent about one hour at the three target markets and explained to market vendors about the importance of source separation.

Figure 14: Awareness raising on waste separation to the students and vendors

3.4.4 Promotion for Waste Separation

Continuous promotions of waste separation at source are implemented. Providing a T-shirt showing *"Let's Start Waste Separation Today. This Will Reduce, by about 70%, Organic Waste to Dumpsite, which is the Source of Pollution and Global Warming"* is one of trials (in Figure 15). T-shirts (500)

have been printed for awareness raising for source separation, and given to the participants, volunteers, market cleaners, and other active motivators at the three markets.

Figure 15: T-shirt design for awareness campaign

3.4.5 Facilitating equipment for implementation of waste separation at source

- Waste Bins: Based on the market requests, 40 waste bins have been provided to the three markets for storing waste, 5 bins to the city, and 5 bins for reservation at the compost plant. It is planned to place simple signs without regard to color (due to insufficiency of respective color bins) for easy understanding of the bin usage. The waste shall be separated at each storage area by type of waste and collected separately. The separated waste will be taken outside the market to the collection points (See Figure 16).
- Modification of Phsar Boeng Chhouk's truck: Upon the request from Phsar Boeng Chhouk for more efficient waste collection of both organic waste and other wastes, the truck, owned by Phsar Boeng Chhouk, has been modified with 2 separated chambers for storing and transporting the waste separately into organic waste and inorganic waste. The truck can dump the organic waste first at the composting centre and continuously transport and throw away inorganic waste from the back chamber (See Figure 17).

Figure 16: Waste bins located at the collection points and around the markets

Figure 17: Truck of Phsar Boeng Chhouk with two chambers for loading separated waste

4 Monitoring and evaluation of the pilot project

The project monitoring and evaluation have been conducted three times, on 26th -31st August 2012, 12th -16th November 2012, and 21st –25 January 2013. All project monitoring and evaluation were done by all stakeholders with international experts, such as city administration, local government, market committee, market investor/operator, market cleaner, waste generator/vendor and residents around market, waste collection company, civil society and experts from IGES and Phitsanulok Municipality. The objectives of project monitoring and evaluation were to review proceedings and

situation of waste separation at source, to identify the issues and challenges, and to discuss the potential solutions and feasibility.

4.1 The first project monitoring on 26th -31st August 2012

The first project monitoring was actually a consultation rather than a monitoring. The main objective was to develop strategy and a directive for waste separation at source together with all stakeholders including international experts. To achieve the objective, strategy and the directive for waste separation at source have been finalized through visiting three target markets, having a meeting with market operators and market committee to understand the situation, and also visiting a composting facility as well as a dump site, to make all stakeholders understand the situation clearly.

4.1.1 Working group meeting

The follow up (second) working group meeting was organized at Battambang city hall on 28th August 2012 to finalize strategy/directive on waste separation at source under the advice of the city governor, experts from IGES and Phitshanulok Municipality. The detailed result is shown in section 3.3.

After the working group meeting, the city administrative officers, experts from IGES and Phitsanulok Municipality visited the target markets and had intensive meetings with stakeholders of each market.

4.1.2 Site Visit

Phsar Thmey:

In Phsar Thmey, 250 stalls selling vegetables and fruits and 100 stalls selling meat and food are located at level 1. There are also 400 stalls selling other items such as clothes at level 2.

Market cleaners are in charge of cleaning a market two times a day and collecting and transporting market wastes to a waste collection point. The main problems of this cleaning work were not enough budget from collected cleaning fee to hire more personnel (only two workers). As a result, the market remained in dirty conditions.

The whole market area is divided into different many small spaces for renting. Free spaces are used for selling something by venders. Therefore, it is hard for the market operators and venders to accept using waste containers for storing waste.

There was one potential place for source separation in this market, an existing collection point next to the bus station. The collection company CINTRI also suggested putting a waste container at the collection point for compostable waste.

Even though Phsar Thmey was facing such a difficult situation, the market committee agreed to join the promotion activity of waste separation at source.

Figure 18: Overview of Phsar Thmey

Phsar Nat:

In Phsar Nat, 180 stalls selling vegetables and fruits are located at level 1 along the main road. There are 70 stalls selling meat and food inside the market at level 1 and 350 stalls selling other items at level 2.

The market sub-contractor (market cleaner) in Phsar Nat is the same as the one in Phsar Thmey. The market committee showed that there was not enough personnel (only two workers) for cleaning. The market operators and market cleaners were reluctant to follow the waste separation at source project.

There is no waste collection point. The waste from this market must be stored on the street around the market and the waste collection company (CINTRI) collects the waste twice a day at 6:00 AM and at 7:00 PM.

Main stalls for selling vegetables, fruits, and food are located along the main street and those venders block the traffic flow during daytime.

The provincial authority and city administration are interested in involving this market very much for improving the market solid waste management since this market is located in a tourist area and the dirtiness of the market is linked to its reputation for international tourism and the Clean City Awards.

Figure 19: Overview of Phsar Nat

Phsar Boeng Chhouk:

In Phsar Boeng Chhouk, 350 stalls selling vegetables and fruits are located at level 1. About 200 stalls selling meat and food are also located at level 1 and about 450 stalls selling other items are at level 2.

This market is different from the two markets mentioned already. The management system of the market is very simple since the market operator made a contract with one company for market cleaning and waste collection.

Since there is no waste collection space, the collected market waste is transported to a disposal site immediately. The waste collection schedule is two times, in the morning and afternoon. The market operator is also in charge of collecting waste from households around the market also.

Phsar Boeng Chhouk owns a truck to collect all waste from the market, and deliver it to a dumpsite.

Figure 20: Overview of Phsar Boeng Chhouk

4.1.3 Discussion with collection company, CINTRI

There is big concern for CINTRI on how to organize transport separately, when the amount of separated waste is not enough for one truck. CINTRI needs to collect all kinds of waste every day and deliver to a dumpsite due to the city government order.

CINTRI agreed to collect waste separately from both Phsar Thmey and Phsar Nat and send the truck with compostable waste to the composting site, in the case that waste is stored separately at the collection point.

4.1.4 Site visit- dumpsite and composting site

A site visit of the dumpsite and composting site was organized to show the working group members where the waste goes and is treated, and also to inform them of the importance of source separation for composting.

Figure 21: Battambang Dumpsite and composting centre next to it

4.2 The second project consultation and monitoring on 12th -16th November 2012

4.2.1 Workshop for mid term evaluation

The evaluation workshop was conducted under the leadership of the city governor. The main goal of the workshop was to find out the progress, the difficulties of project implementation "waste separation at source", and the solutions. The workshop included visiting the dumpsite and composting site.

During the workshop, COMPED has introduced the results of a few months implementation including the awareness raising and the difficulties of waste separation at source, from October 2012.

Copies of the directive were distributed by COMPED together with city administration and market committees to explain content and provide posters as well as waste bins to the markets (upon requests) as a series of awareness campaigns toward waste separation at source.

The main reactions from many vendors are the following:

(a) Why should we be concerned about the waste since we pay the waste cleaning fee to the market operator?

(b) Since compost is for sale, the compost producers must separate waste by themselves.

(c) Some vendors have started to separate waste at source and store their waste a different way, in a different basket. They also store directly on the floor. Even though some venders participate in source separation, some venders have lost their motivation because market cleaners collect all wastes and mix them together.

(d) The original idea of providing bins was for store only compostable waste. In practice, however, all waste bins were used for all kinds of waste.

The progress of source separation was mainly discouraged by the cleaners. They did not collect the waste separately, and this fact reduces the motivation of the market venders.

Reactions from markets

- The awareness of people such as vendors, market operatorss or cleaners about source separation is still limited. Therefore, the awareness campaign must be continued.
- Market operators/investors are not able to provide enough cleaners to reach their obligation to clean and collect waste.

Recommendation from CINTRI

- All stakeholders must participate, since CINTRI tasks cannot be done alone.

Recommendations from the experts

- Source separation will be manageable if all stakeholders follow the designed system.
- In this case, it has been decided that all vendors use their own small baskets or plastic bags to store their own waste separately except for wholesale vendors. We will keep informed of errors and provide new activities.

Requests from students

- More awareness campaigns and education,
- Request strongly that the market committee support waste separation at source,
- The older generation must be good examples for the younger generation.

The City Governor

The city administration has set the environmental vision as “clean and green city”. To achieve this vision, solid waste management is one of the key areas. All stakeholders need to be involved and participate to achieve the vision. Moreover, all three markets are located in the heart of the city, and the most waste is generated in the market. The waste must be separated at source and collected on time to promote composting and appropriate landfill operation.

People must be more aware why we implement waste separation at source and composting. The city governor asked all stakeholders to continue to do awareness campaigns with support from IGES and Phitsanulok Municipality.

4.2.2 Site Visit

Phsar Thmey

Some market vendors have followed source separation guidelines by putting the organic waste separately from non-organic waste. However, at the collection point, all wastes are mixed together.

The main problem of source separation was created by market cleaners since the market operator did not provide enough cleaners and equipment to implement the tasks promised last time.


Figure 22: Waste is somehow separated by vendors. Market cleaners collect waste and put it all together.

Phsar Nat

The market operator was not ready to cooperate in source separation action. Waste bins, aiming to collect organic waste, were used for putting all kinds of waste.


Figure 23: Waste bin is supposed for only compostable waste

Phsar Boeng Chhouk

At Phsar Boeng Chhouk, the market operator made more effort to cooperate in waste separation at source. The stakeholders had a long discussion on how waste separation at source and transportation can be improved.

The market operator showed support in participating in source separation, but it is hard to invest in more equipment and staff for cleaning work. Moreover, the market operator needs to pay a high disposal fee of nearly 7 M Riel (1750USD)/month to CINTRI. The market operator asked COMPED, IGES, and the Battambang city to arbitrate with CINTRI for a discount in the disposal fee since through source separation, the waste amount from Phsar Boeng Chhouk is getting lower. With the extra money from the discount, they plan to purchase one more truck to transport only compostable waste to the composting site.

4.2.3 Compost facility

The composing site was expected to receive two trucks of organic waste at the beginning. One truck was from Phsar Thmey and Phsar Nat, and another truck was from Phsar Boeng Chhouk. Because of problems at Phsar Thmey and Phsar Nat, waste is still collected and mixed together. Therefore, the composting site can receive only one truck from Phsar Boeng Chhouk a day. The site received about two trucks a day in the case that the second truck from Phsar Boeng Chhouk contains a lot of compostable waste. The truck also contained non-compostable waste. However, quality has been improved through the source separation practices.

Figure 24: Waste quality in August (left) and November (right) at composting site

4.3 Third project consultation, monitoring, and evaluation on 21st - 25th January 2013

4.3.1 Site Visit

Phsar Thmey

After implementation of the pilot project, sign boards and posters for promoting waste separation have been installed in this market. As a result, some vendors participated in separating their waste in

their storage by following the instructions. However, the venders still observe each other and consider whether they should participate or not. In addition, the separated waste from the vendors was mixed up and transported to the collection point by the market cleaners. This discourages those who are participating in the waste separation, and encourages those who are not participating in the activities.

Even though, the market committee tried continuously to persuade more vendors to participate by organizing small group meetings, awareness of the cleanness, and waste separation of the market are still limited. However, the situation seems to be gradually moving forward. Through the awareness campaign, vender attitudes have been changed. More bins are required for the separated waste of whole markets. Also, cleaners expressed their willingness to make the market cleaner and collect the waste separately.

There is a still remaining issues in that the market cleaning contractor is not keen to work on waste separation activities since the contractor has his own contracts with the provincial administration. Therefore, it is very difficult to involve the market cleaners to implement waste separation properly. A positive result is that there is a commitment from the cleaning manager of the market to improve their cleaning quality. The cleaning manager has agreed to talk with his cleaners on that matter again.

CINTRI agreed to continue to support any kind of activities, leading to waste separation at source and to transport the waste separately.

Figure 25: Showing of promotional materials for waste separation and fact finding with the market committee of Phsar Thmey during the 3rd meeting and evaluation

Figure 26: Fact finding on a feasible mechanism for waste separation among practitioners

Phsar Boeng Chhouk

This market is the major source of organic waste in Battambang city. There is a scarcity of spaces for waste bins around the market due to too many wholesale vendors.

The organic wastes generally are put on the floor and some are put in the bins and plastic bags by setting them aside from other waste. The market cleaners are assigned to go around in the market and collect the inorganic waste at some places first. Then, the cleaners drive a truck slowly around the market to collect the organic waste from the floor and the bins. Therefore, waste bins and push carts are not required for the market cleaning.

In practice, the source separation was gradually proceeding, however, the waste is still put together on the same truck for the delivery due to a lack of cleaning strategies. The market owner agreed to modify the truck by having 2 compartments to store separately organic waste and inorganic waste. The owner agreed to try dumping the waste 2 times, once at the compost plant and once at the dumpsite. The truck is very practical for separately transporting waste according to the design (See Figure 5). However, there is still room for more awareness raising for improving the quality of waste separation.

Figure 27: The promotional poster at the parking place and surrounding selling atmosphere and waste disposal of the vendors

Phsar Nat

In this market, the cleaning contractor is the same as the one in Phsar Thmey. The cleaners need to rush to clean two markets. As a result the cleaning quality is not good. When market venders leave their stalls, they clean their wastes and accumulate the waste at the collection points in the market. The market cleaners collect and bring wastes into the bins and take it outside. Around the market is cleaned by CINTRI.

In this market, the key for waste separation is the attitude of the market cleaners and the market cleaning contractor. However, the market cleaning contractor does not cooperate in waste separation.

The market committee worked actively to have better market sanitation by supporting the pilot project for waste separation and continued to support the waste separation activity.

This market is the target of the City Cleanness Competition. The city will get a budget to improve sanitation and increase cleanness in the market. The city also will take action against this market cleaning contractor by reporting of any unusual activity to the provincial administration.

CINTRI is committed to make an effort to convince the market cleaning contractor and is also willing to support any kind of cooperation among the stakeholders.

Figure 28: Discussion with the market committees at Phsar Nat in waste separation

4.3.2 Visit composting facility

The composting facility has been improved for increasing the capacity of the plant in rainy and dry seasons. The quality of organic waste separation is much better with intensive labor. The delivered organic waste from markets is still mixed with some other waste, but the quality of the separation has been much improved.

The composting production takes about 5 months on average. It is recommended to make shorter the processing period, to 3 months, by adjusting the composting method.

After the compositing process, the compost and other residues such as plastic will be separated. The separated plastic used to be sold to a waste buyer, but nowadays no one will come to buy it. Therefore, residues such as plastic have no market demand now, so it is transported to a dumpsite for final disposal.

4.3.3 Wrap up meeting for the pilot project and planning for the future

- Stakeholders have actively implemented the waste separation at source and are pleased to continue the activity.
- COMPED and Battambang city will keep organizing awareness raising campaigns at the targeted markets, as required periodically.
- The project has successfully accomplished the waste separation approach with the technical support from all experts.

- The key outcome of this project was an MOU between the Phitsanulok Municipality and the Battambang City for technical support and cooperation for promoting welfare, livelihood of citizens, as well as community development.

5 Data collection of waste quantity and estimation of GHG emission reduction

5.1 Methodology and Results

Data collection has been conducted to quantify GHG emissions from composting and landfill as set in the template of the IGES Guidance. The data needed to be collected are waste composition, waste delivery to dumpsite, waste delivery to composting plant (food waste and garden waste), compost amount, fuel consumption for waste transportation, mixed waste for landfilling, and fuel consumption for landfill operation by machines.

Based on the reference template, daily forms for "Waste Delivery to Dumpsite" and "Waste Delivery for Composting", including more parameters, have been developed. Waste analysis has been studied to find out waste density and waste composition.

5.1.1 Waste Delivery to Dumpsite

For the daily Data Input of the waste delivery to dumpsite, we have acquired the following data on Date, Time, Truck Type (plus ID), Collection site, Waste Amount (or volume), Diesel Consumption for Waste Transportation, Diesel to Operate Landfill, and distance travelled of the respective truck .

Locations of waste collection areas were also identified such as Phsar Nat, National street No. 5, Phsar Leur, Phsar Chreng, Phsar Boeng Chhouk, Phsar Thmey, Phsar Anlong Vil, around city, Phsar Tuol Taék, Super market, Phsar Pothivong, Other small roads, Phsar Boeng Roluos, Phsar Rong Lkhoan, Phsar Prohok, and others.

The data collection of waste delivery to the dumpsite Battambang city was from 1 August 2012 to 31 January 2013. It has been estimated on the Total Waste Delivery to Dumpsite and composting from the 3 pilot project markets, Phsar Boeng Chhouk, Phsar Thmey and Phsar Nat.

Table 4: Basic information of waste trucks for transportation in Battambang

No	Waste trucks in Battambang	Number of trucks	CINTRI TRUCK ID	Weight of empty truck (Tonnes)	Waste storage capacity (m^3) Average Loading	Waste storage capacity (Tonnes) Average Loading
1	Compressed large truck)	1	201	8	-	7.5
2	Compressed medium truck	3	169, 170, 202, 232	5	-	4
3	Non- compressed truck)	2	178, 185	4.5	-	4.5
4	Truck Korea (Phsar Boeng Chhouk market)	1	700	2.5	10 (L:W:H=3.91: 1.97:1.25)	4.23

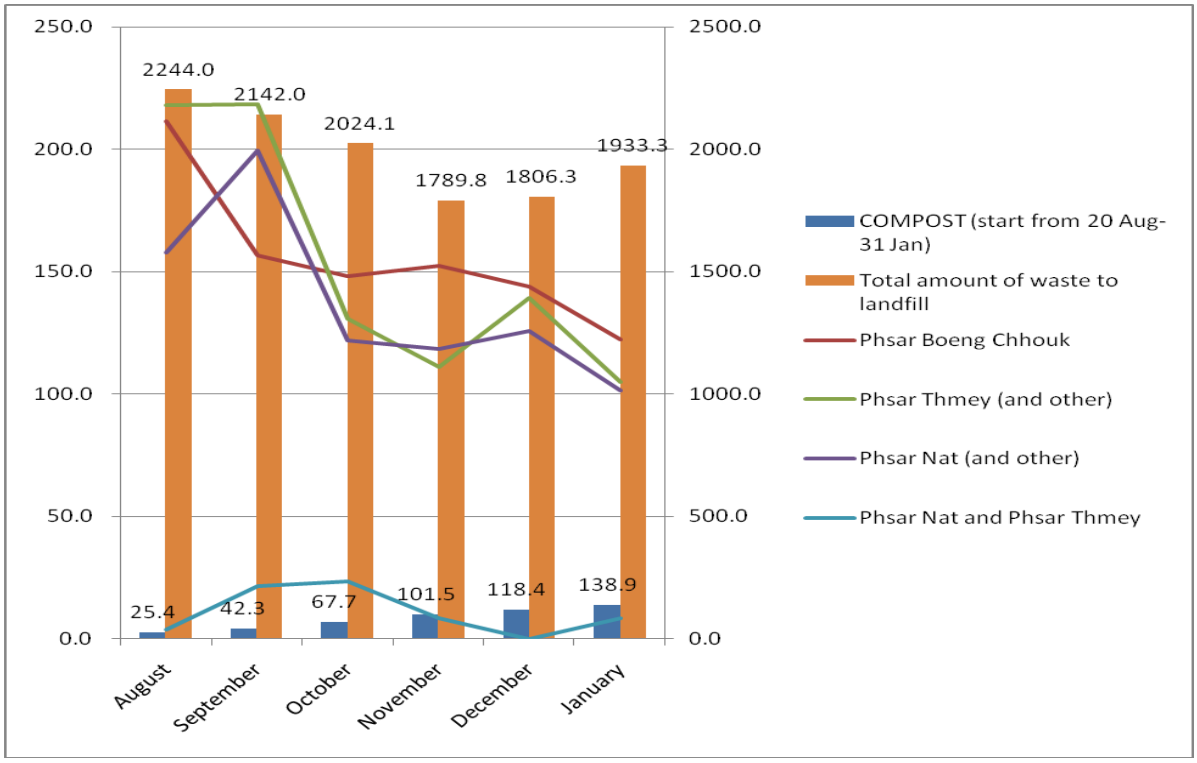


Figure 29: Comparison of waste delivery to composting, dumpsite, waste trends of the 3 pilot markets in Battambang city (Tonnes)

Figure 29 shows that the waste amount delivered to the dumpsite gradually decreased from about 2,244 tonnes per month in August 2012 to 1,789.8 tonnes per month in November and slightly increased to 1,806.3 tonnes per month in December 2012. In January 2013, the waste amount delivered to the dumpsite gradually increased to about 1,933.3 tonnes per month. In general, there are about 60-80 Tonnes/day or about 2,070.9 tonnes per month of waste generated and delivered to the dumpsite and composting plant in Battambang City, which consumed about 4,224.5 L/ month of diesel for the waste transportation and operating the dumpsite and composting process in Battambang city.

5.1.2 Waste Delivery for Composting

In the Waste Delivery to Composting Datasheet, following data were collected: Date, Time, Truck Type (plus ID), Location of Waste Source, Waste Amount (or volume), Diesel Consumption for Transportation of Waste to Composting site, Diesel for Operating the Composting Plant, and travelled distance of the respective truck . It is also indicates how many tonnes of compost production and how many tonnes were sold for agriculture. However, the quantity of compost has not been recorded because the facility did not sieve the compost yet.

The truck transported the waste for composting only from one market, Phsar Boeng Chhouk, with a loading capacity of about 4.23 T (Table 4). Every day, it transports the waste from the market, 2 times per day, either to the dumpsite or for composting.

The data collection of waste delivery to the composting plant was from 20 August 2012 to 31 January 2013. There is no composting activity between 1-19 August 2012.

The waste amount delivered to the composting plant in August 2012 was about 25.4 tonnes and gradually increased to 42.3 tonnes in September, 67.7 tonnes in October, 101.5 tonnes in November, 118.4 tonnes in December, and 138.9 tonnes in January 2013, as shown in Figure 29. On average, there are about 81.78 tonnes per month of waste delivered for composting. It provides about 75.81 tonnes of organic waste. An average fuel consumption of about 306.5 L/month was used for waste transportation to the composting plant and operating the compost plant, such as a machine to process composting and screening.

Figure 30 shows the trends of waste sent to the composting plant in 15 days intervals for better perception of the waste delivery to the plant. The waste delivery continuously increased from about 25 tonnes within the 2nd half of August 2012, slightly decreased in September, and gradually increased to about 80 tonnes within the second half of January 2013.

Figure 30: Waste flow trend to composting plant in 15-day intervals

5.1.3 Waste Composition Analysis

Originally, this analysis was planned for 7 days for both waste to disposal site and both to composting facility. Due to the time and budget constraints as well as the on-site staff perception, the analysis on waste composition and waste density was made for 2 days in January 2013 to analysis the municipal waste delivered to the dumpsite, and for 5 days in November 2012 for the market waste delivered to the composting plant.

The analysis focused on waste composition that was classified into: food, paper, plastic, iron, cloth, glass, recycled waste (aluminum can, plastic bottle, plastic cup.), wood (chopsticks), hazardous waste, and other (foam packaging, fruit packing nets). This category was made by local staff.

The waste density (kg/l) was calculated by measuring the waste weight, randomly taken from the newly dumped pile at the dumpsite or at the composting plant. The waste was pressed to compact in the 240 L bin. The weight was measured with a 100 kg scale to get the total waste weight. For the waste composition, a 5 kg scale was used to keep the accuracy for minimal weight.

Figure 31: measure waste density and waste composition

According to this analysis, it shows that the food waste in the municipal waste and market waste (as Phsar Boeng Chhouk) is about 62% and 89% respectively (Table 5). In addition, other compostable waste (paper and wood), was about 6.1% in the municipal waste and 3.7% in the market waste. Moreover, waste density was about 0.417 Kg/L for the municipal waste and 0.423 Kg/L for the market waste (as Phsar Boeng Chhouk).

Table 5: Waste composition analysis in Battambang city

Waste composition	Food	Paper	Plastic	Iron	Cloth	Glass	Recyclable waste	Wood	Hazardous waste	Other
Municipal waste	62.01 %	5.65 %	21.70 %	0.49 %	2.22 %	3.30 %	1.75 %	0.40 %	0.44 %	2.05 %
Phsar Boeng Chhouk's waste	88.62 %	3.08 %	4.35 %	0.14 %	1.39 %	0.34 %	0.50 %	0.62 %	0.08 %	0.89 %

5.1.4 Estimation of GHG emissions from the pilot composting project

GHG emission from organic waste composting in Battambang pilot project was estimated by using the simulation developed by IGES. Life cycle GHG emission from composting was estimated taking into account the amount of organic waste, the composition of waste (percentage of food waste and garden waste), the amount of diesel consumption for transportation and operation activities. GHG emission from organic waste transportation is 5.10 kg CO2-eq per tonne of waste as shown in Table 6.

Table 6: GHG emissions from organic waste transportation

Month	GHG emissions from transportation (kg CO2-eq/tonne)	GHG emission per month (kg CO2-eq/month)
August	5.1	129.44
September	5.1	215.73
October	5.1	345.17
November	5.1	496.18
December	5.1	604.04
January	5.1	711.91

According to the estimation, GHG emission per tonne of organic waste composting (waste degradation and consumption of diesel for operational activities) is amounted to 182.5 kg CO_2-eq (see Table 7). In addition, there is a possibility for avoidance of GHG by producing compost and thereby replacement of chemical fertilizer. However, in this pilot project, composting process takes a considerable period of time and therefore, the amount of marketable compost yet to be estimated. Due to this reason, it was unable to quantify the GHG avoidance from the production of compost and avoidance of chemical fertilizer usage. Also, GHG emissions can be avoided by terminating organic waste disposal at the landfill. The estimated GHG avoidance potential due to stopped organic waste landfilling is 425.6 kg CO_2-eq per tonne of organic waste. In order to understand the overall climate benefit or the impact from composting technology, net GHG estimated, and it is amounted to -243 kg CO_2-eq/tonne of organic waste. The resulted net negative GHG emission value indicates that the potential GHG savings from composting and possibility of using compost to act as a carbon sink. As shown in the Table 7, amount of organic waste utilization for composting is being increased and therefore, total contribution for GHG mitigation is drastically improved.

Furthermore, total contribution of this pilot composting project is calculated taking account GHG emissions from waste transportation and GHG savings from composting (Figure 32).

Table 7: GHG emissions, avoidance and net GHG emissions from pilot composting plant in Battambang

Month	Amount of organic waste use for composting (tonnes) (A)	GHG emissions (kg CO_2 eq)/tonne of organic waste (B)	GHG avoidance (kg CO_2 eq)/tonne of organic waste (C)	Net GHG emissions (kg CO_2 eq)/tonnes (C-B)	GHG emissions/savings (kg CO_2 eq) per month ((C-B)*A)
August	23.53	182.5	425.6	-243.1	-5720.1
September	39.21	182.5	425.6	-243.1	-9532.0
October	62.74	182.5	425.6	-243.1	-15252.1
November	90.19	182.5	425.6	-243.1	-21925.2
December	109.79	182.5	425.6	-243.1	-26690.0
January	129.40	182.5	425.6	-243.1	-31457.1

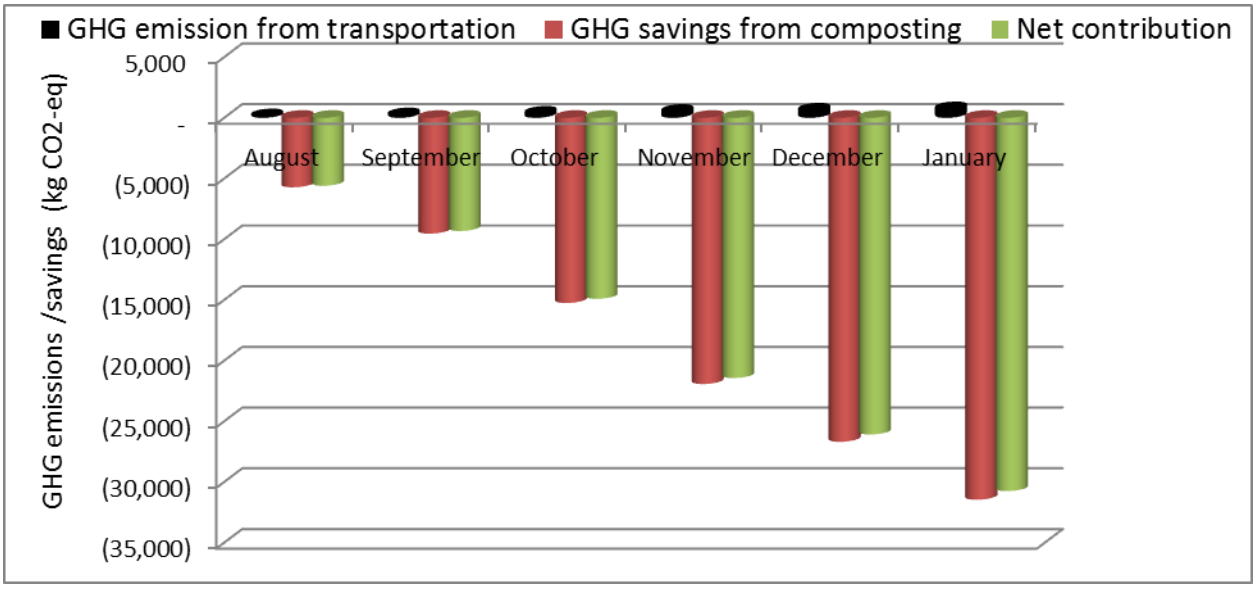


Figure 32: overall contribution of pilot composting project for GHG mitigation

GHG emissions from the landfill site

GHG emission from the current landfill is estimated using the same simulation. There are two major ways that current landfill could contribute for GHG emission namely: GHG emissions from transportation of waste, GHG emissions from waste degradation and operation activities in the landfill. Average GHG emissions from waste transportation have been varied 4.18-4.72 kg CO2-eq per tonne of waste transportation (Table 8). GHG emission from the landfill is estimated considering the waste composition and nature of the landfill. This landfill can be categorized as unmanaged shallow landfill (<5m depth). The estimated average GHG emission from the landfilling of mixed waste is 341.8 kg CO2-eq per tonne of waste. Furthermore, overall contribution from landfilling was estimated by adding GHG emissions from waste transportation and waste degradation (Table 8). According to the result, there is a trend of reducing the GHG emissions from the landfill as a result of composting of high fraction of separated organic waste. Further improvement of source separation of organic waste and utilization for compost production would significantly contribute for GHG mitigation from the existing landfilling practice.

Table 8: GHG emissions from waste transportation followed by landfilling

Month	Total amount of waste dispose at the landfill (A)	GHG emission from transportation		GHG emission from the landfill		Overall contribution (kg CO_2-eq/month) F=C+E
		GHG emissions from transportation (kg CO_2-eq/tonne) (B)	Monthly GHG emission (kg CO_2-eq) C=A*B	GHG emissions from landfill /tonne of waste D	Monthly GHG emission (kg CO_2-eq) E=A*D	
August 2012	2244	4.18	10,783.02	341.92	767259.22	778,042.24
September 2012	2142	4.55	9,742.70	341.76	732054.90	741,797.60
October 2012	2024	4.47	9,052.70	341.57	691329.07	700,381.77
November 2012	1794	4.65	8,338.58	341.75	613104.70	621,443.27
December 2012	1806	4.52	8168.79	341.78	617249.24	625,418.02
January 2013	1925	4.72	9,093.20	342.41	659133.68	668,226.88

5.2 Challenges and Solutions

During the data collection of the waste delivery to dumpsite and composting center and the waste composition analysis of the municipal waste and the market waste, we have encountered several issues as described in Table 9 and Table 10.

Table 9: Challenge and solution of data collection on waste delivery

	Challenges	Actions
Waste Delivery to Dumpsite and composting plant	• The data collection needs to be recorded every day	• Arranging a guard at the composting plant next to the dumpsite to notify when there is a waste delivery to the dumpsite (date, time) and then COMPED staff can check with him on the time of waste delivery and waste truck type (ID)
	• Difficulties to obtain the information of the number of trucks and waste truck type, collection location, capacity or volume of waste trucks, diesel consumption for waste transportation and operation of the dumpsite.	• Checked with CINTRI waste collection company
	• No weight scale at the dumpsite to measure the accurate waste amount loaded on the respective trucks	• Checked with CINTRI on the waste loaded trucks weight at the Phnom Penh dumpsite and referred to the average numbers
	• Misspelling of waste collection location and the truck number leading to wrong estimation of waste amount of the location	• Conducting overall checking and retype the whole datasheet again
	• Difficulty on keeping records the proper way due the lack of education for scientific study. At least, need to establish a system enabling double-checking with encoded data and raw data.	• Preparing hard copy of monitoring sheet for the waste deliver to landfill and composting center, keeping the record of raw data, enabling the double checking with the encoded data.
	• Difficulty in monitoring for the data collection due to the distance between the Battambang and Phnom Penh.	• Strengthening the data collection and checking weekly by headquarters for any mistakes, and intervening in time.

Table 10: Challenges and solutions of waste analysis

	Challenges	Actions
Waste analysis	• Very difficult to do the waste analysis at the dumpsite and compost plant when there is rain	• Conducting the waste analysis for 5 days in rainy season and 2 days in dry season
	• Waste composition classification is not followed from the IGES guidelines due to misunderstanding of the waste type classification, leading to inability to estimate the waste composition of metal, aluminum, and plastic.	• Accepted mainly the data on food waste and garden waste. It is essential to improve the skill of workers at the landfill and composting center.

5.3 Discussions and Recommendations

Since the pilot project started, the waste from Phsar Boeng Chhouk has been recorded and composted. It was estimated that the waste volume loaded on the truck is about 4.23 tonnes, which was estimated from the waste density of the market waste. It seemed to be relatively high compared to visual estimation. The accuracy of waste measured could be improved if a weighbridge is established and the compostable waste and/or the non-compostable waste is measured directly.

During the project period, there is no sieving of mature compost because the sieves are occupied. However, it is observed that the current composting technique takes a long time. A comparative pilot model to hasten the composting process is required to make the composting benefits visible for stakeholders.

Since the project started in August 2012, the quantity of waste delivered to the composting plant has increased and thus it can be estimated that the compost production has also increased. Furthermore, it is observed that the quality of waste delivered from the market has improved. The contamination of non-compostable waste has decreased and the sorting is much easier as the waste has been preliminarily sorted by the market vendors.

At the end of the project, the idea of a two chamber truck for loading organic and in-organic waste separately was suggested and supported by all stakeholders. The truck has to dump the waste 2 times, once at the compost plant and the other at the dumpsite. This practice can increase the visibility of market vendors that waste is being treated separately, and thus it can motivate them to

be active on waste separation, as well as increase organic waste delivery to the composting plant. Furthermore, it is expected that the labor input for waste sorting will also be decreased. Nevertheless, more waste reduction to the dumpsite can be achieved. This is a good example of participatory monitoring and evaluation, so that all stakeholders can show initiatives to solve the problem effectively based on local contexts.

5.3.1 Recommendation for data collection of waste delivery

- It is recommended to have a weight scale for a truck at the dumpsite, which is the only means to get the exact waste amount delivered to the dumpsite and the composting center. Furthermore, the quantity of waste to be composted should be measured.
- It is necessary to keep records of the raw data of waste delivered to the composting center and landfill in hard copy and keep encoded data in electronic files carefully to avoid mistakes. This practice can enable double checking.
- A competent skilled person with a science background is needed for the data collection at a local site to understand the objectives of the pilot project, for estimating GHG emission. Data analysis can be done by the central office in Phnom Penh. However, intensive capacity building and training is required to ensure accuracy of data collection.
- It is recommended to have closer relationships with the staff of CINTRI waste collection company and the staff of the three markets, such as Phsar Boeng Chhouk, in order to get more precise data as required.

5.3.2 Recomendation for waste analysis

- The waste analysis should be done on 7 consecutive days in the dry season and in the wet season. It is important to conduct the waste analysis with skilled staff in order to check whether appropriate monitoring is done.
- Before the waste analysis, the workers should be trained on the methodology and the analysis by the experts in order to implement appropriate data collection.
- It is necessary to follow the standards of classification of waste composition to compare the other cases of waste composition.

6 Overall outcomes of the pilot project implementation for 6 months

The waste separation promotion at the three markets in Battambang city has been started at the same time with the same method of the promotion campaign. In addition, intensive awareness raising activities were allocated for vendors that sell vegetables and fruits who discard a lot of compostable waste.

The outcomes of pilot project implementation of the three markets were different. There is much progress at the Phsar Boeng Chhouk (privately owned market) because the owner has fully committed to the project. Furthermore, he has experience of hygienic conditions in Europe.

There is an obstacle at the two markets that needs to be handled by the government. This is because there is one stakeholder that has not cooperated with the project, the market cleaning company. This company is not interested in the project because it does not see the benefits for its business operation, and its contract is going to expire next year. Therefore, there is no waste from these markets delivered to the composting plant because waste that was separated, was mixed together by the market cleaners.

Additionally, it is observed that the awareness raising campaign is effective, to some extent. Some vendors began to separate the waste and keep their space clean. Some complain that the project should also take care of plastic waste, which is a good sign of public awareness on environment and sanitation issues.

Vendors:

It is estimated that around 30% of fruit and vegetable vendors at Phsar Thmey, 15% at Phsar Nat and 35% at Phsar Boeng Chhouk, have participated in the waste separation at source by putting separated waste in plastic bags or small containers. If the waste amount is too large, the venders will pile the waste on the ground.

Figure 33: Waste separation at Phsar Thmey (Left) and Phsar Boeng Chhouk (Right)

Figure 34: Non-organic waste separation at Phsar Nat

Market cleaners

- Phsar Thmey and Phsar Nat:
  The market cleaner company is not willing to participate in this project. Therefore, waste that was separated by vendors was mixed together before delivery to the collection system of CINTRI.
- Phsar Boeng Chhouk:
  The market operator is in-charge of market cleaning. Therefore, the project implementation in this market has more progress than the other markets. The waste from this market is being collected and transported twice a day. The waste in the morning contained a high amount of organic waste (65%). The second delivery in the afternoon contained about 82-93% of organic waste.

Waste Collection Company

CINTRI, as the waste collection company in the city, is in charge to collect waste from Phsar Thmey, Phsar Nat, and households around the market. In the current situation, it was hard for CINTRI to collect the organic waste and non-organic waste separately, due to the mixed waste at collection points at Phsar Thmey and Phsar Nat.

Composting Facility

COMPED, as the operator of the composting facility, is expected to receive compostable waste from all target markets. However, COMPED has received the organic waste only from Phsar Boeng Chhouk. The organic waste received at the composting center has gradually increased. As a result, averages of 3.92-7.84 tonnes of organic waste per day were delivered to the composting center. Factors of problems are shown below:

- **Time and awareness:**
  The project timeframe was only 7 months, from July 2012 to January 2013. The first two months was for capacity building and stakeholder meetings. The actual pilot project implementation was begun in October. Awareness raising campaigns have been implemented at the same time with source separation. It is quite difficult for people to understand the benefits of the project in that short a period of time. Especially, since it is a pioneer project for Cambodia.
- **Stakeholder Participatory**:
  Generators of organic waste as vegetable and fruit vendors, market cleaners, market committee, and waste collection company play important roles in waste separation at source. Without all members' participation, the waste separation at source cannot be achieved. For the case of Phsar Nat and Phsar Thmey, the market cleaners and the market cleaning contractor were not willing to participate in the project and thus it has resulted in less progress. However, the leader of the market cleaners at Phsar Thmey agrees to make separate collection for organic waste. However, there is no progress with Phsar Nat.
- **Role Sharing and the Responsibility:**
  According to the sub-degree 36 on solid waste management, the local authority (provincial or city) is in charge for solid waste management. In the case of Battambang city, however, the provincial administration signed a contract for market operation with market investors, and the market cleaning with a waste collection company. The role of the city administration is to implement waste management in the city. Therefore, the responsibility is not clear among the provincial and city levels. As a result, even though there is strong initiative from the city administration, there is a chance for market investors and market cleaners to not participate in the directive on waste separation at source from the city level.
- **Equipment for the implementation of waste separation at source:**
  Waste containers for all three waste categories must exist at least along with the source separation strategy. There were some difficulties to install the three different types of waste containers due to the lack of space in each market.

Dissemination workshop

On 30th Jan, 2013, Battambang City organized a workshop in response to a request from the Kampot Province Administration to learn about the pilot project. The participants include: the Kampot City Governor and deputy governor; Health Provincial Department Director; Inter-sectoral Department of Kampot province; Kampot City Council; Offices of Education, Environment, and Public Works; GAEA Waste Collection Company; Sangkat Chief; and Konrad-Adenauer-Stiftung (KAS) (German Foundation).

The main topic of the workshop was about Solid Waste Management in Battambang City, by focussing on Waste Separation at Source at the Markets and Composting. Battambang city also

organized a field visit to the three target markets of the pilot projects and composting facility at the Social Waste Management Centre of COMPED.

The delegation from Kampot has learned a lot from the workshop. The delegates showed an interest to apply the same model, to implement the source separation, to improve the waste management by reducing organic waste to dumpsite and making compost for agriculture, for a sustainable tourism city.

Figure 35: Dissemination workshop and site visit at composting plant

7 Overall Recommendations for the next step

In General

- Awareness raising campaigns for the three levels of stakeholders (policy makers, market operators, including market cleaners, waste collectors, and market venders as waste generators) must be continued. Furthermore, participatory monitoring and evaluation should be carried on from time to time to learn from each other.
- The TOR of renewal contract for market operator, market cleaners, and waste collection company should be clearly indicated about their responsibility, and aligned with the directive for the source separation.
- If the space is available, waste collection points should be established and they should be divided into the appropriate waste categories, and the waste should be separated at each storage location and transported to the municipal collection points. More containers may be required to avoid putting waste on the ground, which is difficult to clean. Contractors who are in charge of cleaning of the market should provide enough laborers and equipment for proper cleaning.
- A public participatory approach should be continued to push forward the implementation of waste separation at source, even after the project ends.

For Phsar Nat

The city government needs to take a main role implementing the following three steps to promote waste separation at source with all related stakeholders

- For the first step, to keep market always clean as a fundamental strategy,
- For the second step, to separate organic waste from non-organic waste at source by market venders and also to promote market venders about the concept of "waste should not be on the floor", to collect organic and inorganic waste separately and store them appropriately outside the market. The market cleaning contractors and market cleaners should take the main role on the collection of separated waste with delivery to the storage area.
- For the third step, CINTRI needs to collect two types of wastes separately. The organic waste should be delivered to the composting center and the other inorganic waste should be transferred to a dumpsite.

For Phsar Thmey

Similar to Phsar Nat, the following strategy can be considered by the strong initiative of Battambang city. The advantage of Phsar Thmey is the existing waste storage area.

- For the first step, to keep the market always clean as a fundamental strategy,
- For the second step, to separate organic waste from non-organic waste at source by market venders and also to promote market venders about the concept of "waste should not be on the floor", to collect organic and inorganic waste separately and store them appropriately outside the market. The market cleaning contractors and market cleaners should take the main role on the collection of separated waste with delivery to the storage area.
- For the third step, CINTRI needs to collect two types of wastes separately. The organic waste should be delivered to the composting center and the other inorganic waste should be transferred to a dumpsite.

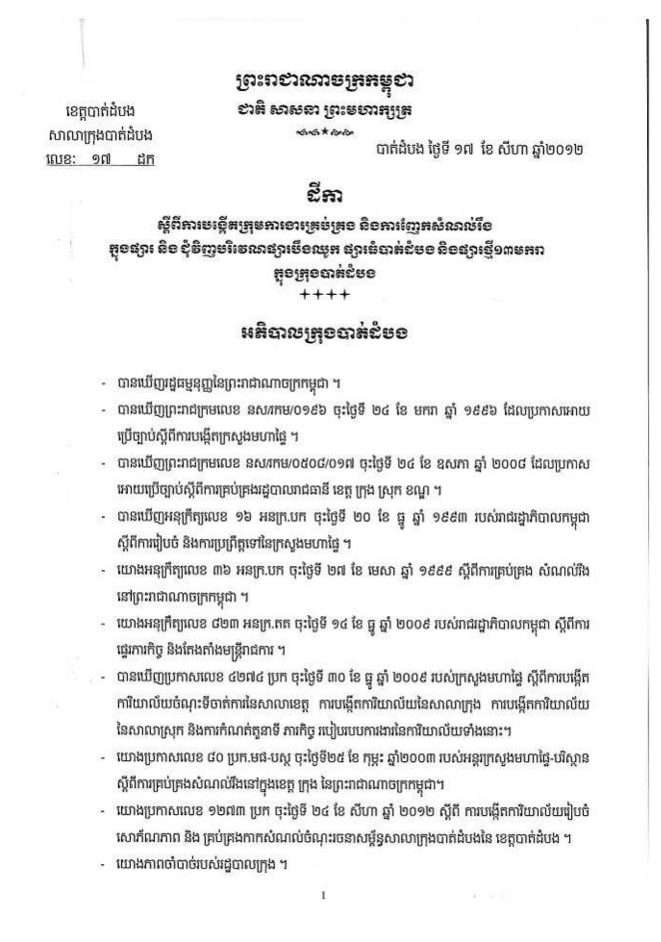
For Phsar Boeng Chhouk

Because of the strong commitment of market investors and the market cleaners, waste separation at source can be improved by the following:

- To modify the truck with two compartments for separate collection of organic and non-organic waste.
- To provide three kinds of waste bins for three different wastes such as compostable waste, non-compostable waste, and sellable waste for promoting further steps of source separation , and
- To arrange a space for storing separated wastes. But practically, the space should be used by only market cleaners.

Annex

Annex I: Declaration of the city administration "Establishing Working Group" in Khmer



ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ខេត្តបាត់ដំបង
សាលាក្រុងបាត់ដំបង
លេខ: ១៧ ដក

បាត់ដំបង ថ្ងៃទី ១៧ ខែ សីហា ឆ្នាំ២០១២

ដីកា

ស្តីពីការបង្កើតក្រុមការងារគ្រប់គ្រង និងការញែកសំណល់រឹង ក្នុងផ្សារ និង ជុំវិញបរិវេណផ្សារបឹងឈូក ផ្សារធំបាត់ដំបង និងផ្សារថ្មី១៣មករា ក្នុងក្រុងបាត់ដំបង

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អភិបាលក្រុងបាត់ដំបង

- បានឃើញរដ្ឋធម្មនុញ្ញនៃព្រះរាជាណាចក្រកម្ពុជា ។
- បានឃើញព្រះរាជក្រមលេខ នស/រកម/០១៩៦ ចុះថ្ងៃទី ២៤ ខែ មករា ឆ្នាំ ១៩៩៦ ដែលប្រកាសអោយប្រើច្បាប់ស្តីពីការបង្កើតក្រសួងមហាផ្ទៃ ។
- បានឃើញព្រះរាជក្រមលេខ នស/រកម/០៥០៨/០១៧ ចុះថ្ងៃទី ២៤ ខែ ឧសភា ឆ្នាំ ២០០៨ ដែលប្រកាសអោយប្រើច្បាប់ស្តីពីការគ្រប់គ្រងរដ្ឋបាលរាជធានី ខេត្ត ក្រុង ស្រុក ខណ្ឌ ។
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- យោងអនុក្រឹត្យលេខ ៨២៣ អនក្រ.តត ចុះថ្ងៃទី ១៤ ខែ ធ្នូ ឆ្នាំ ២០០៩ របស់រាជរដ្ឋាភិបាលកម្ពុជា ស្តីពីការផ្ទេរភារកិច្ច និងតែងតាំងមន្ត្រីរាជការ ។
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- យោងភាពចាំបាច់របស់រដ្ឋបាលក្រុង ។

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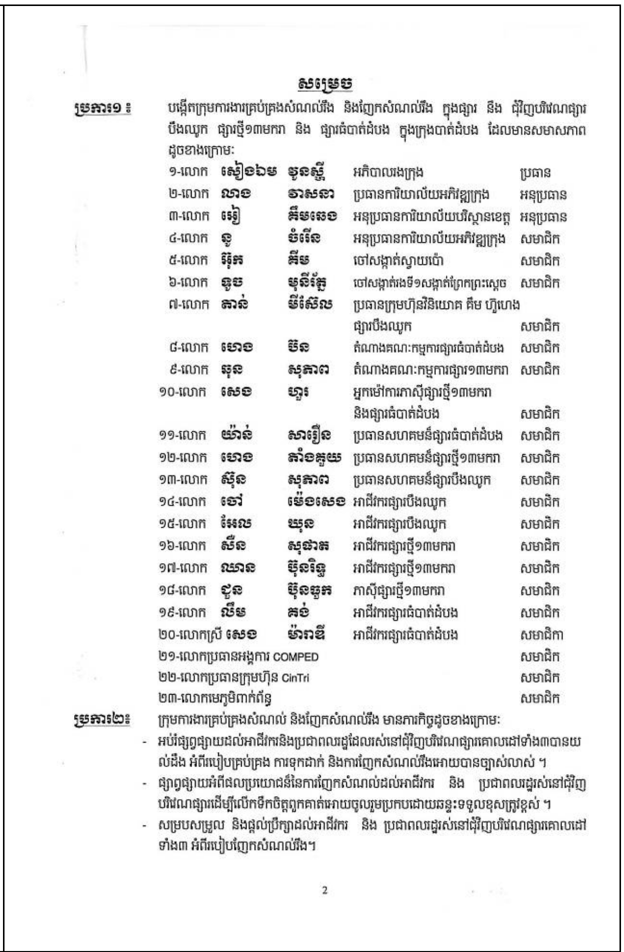

សម្រេច

ប្រការ១ ៖ បង្កើតក្រុមការងារគ្រប់គ្រងសំណល់រឹង និងញែកសំណល់រឹង ក្នុងផ្សារ នឹង ជុំវិញបរិវេណផ្សារបឹងឈូក ផ្សារថ្មី១៣មករា និង ផ្សារធំបាត់ដំបង ក្នុងក្រុងបាត់ដំបង ដែលមានសមាសភាពដូចខាងក្រោម:

១-លោក	សៀងឯម	មុនស្នី	អភិបាលរងក្រុង	ប្រធាន
២-លោក	លាង	វាសនា	ប្រធានការិយាល័យអភិវឌ្ឍក្រុង	អនុប្រធាន
៣-លោក	អៀ	គីមឆេង	អនុប្រធានការិយាល័យបរិស្ថានខេត្ត	អនុប្រធាន
៤-លោក	ទូ	ចំរើន	អនុប្រធានការិយាល័យអភិវឌ្ឍក្រុង	សមាជិក
៥-លោក	អ៊ុក	គីម	ចៅសង្កាត់ស្វាយប៉ោ	សមាជិក
៦-លោក	ទូច	មុនីរ័ត្ន	ចៅសង្កាត់រងទី១សង្កាត់ព្រែកព្រះស្តេច	សមាជិក
៧-លោក	តាន់	មីសេល	ប្រធានក្រុមហ៊ុនវិនិយោគ គីម ហ៊ួហេង ផ្សារបឹងឈូក	សមាជិក
៨-លោក	ហេង	ប៊ិន	តំណាងគណៈកម្មការផ្សារធំបាត់ដំបង	សមាជិក
៩-លោក	ឆុន	សុភាព	តំណាងគណៈកម្មការផ្សារ១៣មករា	សមាជិក
១០-លោក	សេង	ហួរ	អ្នកម៉ៅការភាស៊ីផ្សារថ្មី១៣មករា និងផ្សារធំបាត់ដំបង	សមាជិក
១១-លោក	យ៉ាន់	សារឿន	ប្រធានសហគមន៍ផ្សារធំបាត់ដំបង	សមាជិក
១២-លោក	ហេង	តាំងគួយ	ប្រធានសហគមន៍ផ្សារថ្មី១៣មករា	សមាជិក
១៣-លោក	ស៊ិន	សុភាព	ប្រធានសហគមន៍ផ្សារបឹងឈូក	សមាជិក
១៤-លោក	ចៅ	ម៉េងសេង	អាជីវករផ្សារបឹងឈូក	សមាជិក
១៥-លោក	អែល	ឃុន	អាជីវករផ្សារបឹងឈូក	សមាជិក
១៦-លោក	សីន	សុផាត	អាជីវករផ្សារថ្មី១៣មករា	សមាជិក
១៧-លោក	ឈាន	ម៉ុនរិទ្ធ	អាជីវករផ្សារថ្មី១៣មករា	សមាជិក
១៨-លោក	ជួន	ម៉ុនធូក	ភាស៊ីផ្សារថ្មី១៣មករា	សមាជិក
១៩-លោក	លឹម	គង់	អាជីវករផ្សារធំបាត់ដំបង	សមាជិក
២០-លោកស្រី	សេង	ម៉ារាឌី	អាជីវករផ្សារធំបាត់ដំបង	សមាជិកា
២១-លោកប្រធានអង្គការ COMPED				សមាជិក
២២-លោកប្រធានក្រុមហ៊ុន CinTri				សមាជិក
២៣-លោកមេភូមិពាក់ព័ន្ធ				សមាជិក

ប្រការ២៖ ក្រុមការងារគ្រប់គ្រងសំណល់ និងញែកសំណល់រឹង មានភារកិច្ចដូចខាងក្រោម:

- អប់រំផ្សព្វផ្សាយដល់អាជីវករនិងប្រជាពលរដ្ឋដែលរស់នៅជុំវិញបរិវេណផ្សារគោលដៅទាំង៣បានយល់ដឹង អំពីរបៀបគ្រប់គ្រង ការទុកដាក់ និងការញែកសំណល់រឹងអោយបានច្បាស់លាស់ ។
- ផ្សព្វផ្សាយអំពីផលប្រយោជន៍នៃការញែកសំណល់ដល់អាជីវករ និង ប្រជាពលរដ្ឋរស់នៅជុំវិញបរិវេណផ្សារដើម្បីលើកទឹកចិត្តពួកគាត់អោយចូលរួមប្រកបដោយឆន្ទៈទទួលខុសត្រូវខ្ពស់ ។
- សម្របសម្រួល និងផ្តល់ប្រឹក្សាដល់អាជីវករ និង ប្រជាពលរដ្ឋរស់នៅជុំវិញបរិវេណផ្សារគោលដៅទាំង៣ អំពីរបៀបញែកសំណល់រឹង។

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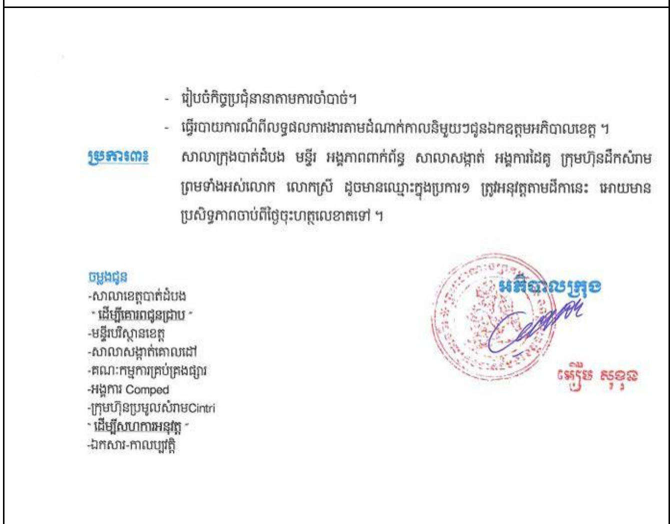

- រៀបចំកិច្ចប្រជុំនានាតាមការចាំបាច់។
- ធ្វើរបាយការណ៍ពីលទ្ធផលការងារតាមដំណាក់កាលនិមួយៗជូនឯកឧត្តមអភិបាលខេត្ត ។

ប្រការ៣៖ សាលាក្រុងបាត់ដំបង មន្ទីរ អង្គភាពពាក់ព័ន្ធ សាលាសង្កាត់ អង្គការដៃគូ ក្រុមហ៊ុនដឹកសំរាម ព្រមទាំងអស់លោក លោកស្រី ដូចមានឈ្មោះក្នុងប្រការ១ ត្រូវអនុវត្តតាមដីកានេះ អោយមានប្រសិទ្ធភាពចាប់ពីថ្ងៃចុះហត្ថលេខាតទៅ ។

ចម្លងជូន
-សាលាខេត្តបាត់ដំបង
"ដើម្បីគោរពជូនជ្រាប"
-មន្ទីរបរិស្ថានខេត្ត
-សាលាសង្កាត់គោលដៅ
-គណៈកម្មការគ្រប់គ្រងផ្សារ
-អង្គការ Comped
-ក្រុមហ៊ុនប្រមូលសំរាមCintri
"ដើម្បីសហការអនុវត្ត"
-ឯកសារ-កាលប្បវត្តិ

អភិបាលក្រុង

អ៊ឹម សុខុន

Annex II: Translated list of working group members

No	Name	Function	Position	Institution
1	Mr. Sieng Em Wounzy	Leader	Vice Governor	City Administration
2	Mr. Leang Veasna	Vice leader	Officer of City Development	City Administration
3	Mr. Ear Kim Cheng	Vice leader	Officer of City Development	City Administration
4	Mr. Nou Chamroeun	Member	In-Charge of Solid Waste Management	City Administration
5	Mr. Ouk Kim	Member	Commune Leader	Commune Svay Pau
6	Mr. Touch Monyroth	Member	Vice Commune Leader	Commune Preak Prah Sdach
7	Mr.Tan Michel	Member	Director of the Market Invester Company of Phsar Boeng Chhouk, Kim Hour Heng	Phsar Boeng Chhouk
8	Mr. Heng Born	Member	Representative of Market Committee Nat	Phsar Nat
9	Mr. Chhon Sopheap	Member	Representative of Market Committee Thmey	Market Preak Prah Sdach
10	Mr. Seng Hour	Member	Sub-contractor in charge of market cleaning Nat and Thmey	Markets Nat and Thmey
11	Mr. Yan Saroeun	Member	Representative of market association	Market Thom Battamabang
12	Mr. Heng Taing Kuoy	Member	Representative of market association	Phsar Thmey
13	Mr. Seun Sophap	Member	Representative of market association	Phsar Boeng Chhouk

No	Name	Function	Position	Institution
14	Mr. Chim Kong	Member	Resident/Vendor	Phsar Nat
15	Ms. Seng Marady	Member	Resident/Vendor	Phsar Nat
16	Mr. Chao Meng Seng	Member	Resident/Vendor	Phsar Boeng Chhouk
17	Choun Bunthouk	Member	Resident/Vendor	Phsar Thmey
18	Mr. Chhon Buntha	Member	In-Charge of Market Waste	Phsar Thmey
19	Mr. Chhean Bunarith	Member	Resident/Vendor	Phsar Thmey
20	Mr. Seun Sophat	Member	Resident/Vendor	Phsar Thmey
21	Mr. Seng Chamroeun	Member	Vice General Director	Waste Collection Company
22	Mr. Chau Kim Heng	Member	Director	COMPED
23	Other stakeholder	Member		

Annex III: Signed directive in Khmer and translation

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

ខេត្តបាត់ដំបង

សាលាក្រុងបាត់ដំបង

លេខ : ០៩ សណន

បាត់ដំបង ថ្ងៃទី ០៥ ខែ កញ្ញា ឆ្នាំ២០១២

សេចក្តីណែនាំ

ស្តីពីការអនុវត្តការគ្រប់គ្រង និងការញែកសំណល់រឹង ក្នុងផ្សារ និង ជុំវិញបរិវេណ ផ្សារបឹងឈូក ផ្សារធំបាត់ដំបង និងផ្សារថ្មី១៣មករា ក្នុងក្រុងបាត់ដំបង

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អភិបាលក្រុងបាត់ដំបង

- យោងអនុក្រឹត្យលេខ ៣៦ អនក្រ.បក ចុះថ្ងៃទី ២៧ ខែ មេសា ឆ្នាំ ១៩៩៩ ស្តីពីការគ្រប់គ្រង សំណល់រឹង នៅព្រះរាជាណាចក្រកម្ពុជា ។
- យោងប្រកាសលេខ ៨០ ប្រក.មផ-បស្ថ ចុះថ្ងៃទី២៥ ខែ កុម្ភៈ ឆ្នាំ ២០០៣ របស់អន្តរក្រសួង មហាផ្ទៃ-បរិស្ថាន ស្តីពីការគ្រប់គ្រងសំណល់រឹងនៅក្នុងខេត្ត ក្រុង នៃព្រះរាជាណាចក្រកម្ពុជា។
- យោងប្រកាសលេខ ១២៧៣ ប្រក ចុះថ្ងៃទី ២៤ ខែ សីហា ឆ្នាំ ២០១២ ស្តីពីបង្កើតការិយាល័យរៀបចំ សោភ័ណភាព និង គ្រប់គ្រងកាកសំណល់ចំណុះរចនាសម្ព័ន្ធសាលា ក្រុងបាត់ដំបងនៃ ខេត្តបាត់ដំបង ។
- យោងសេចក្តីណែនាំអនុវត្តលេខ ០៧ សណន របស់សាលាខេត្តបាត់ដំបង ស្តីពីកិច្ចសហប្រតិបត្តិការអនុវត្ត សំណុំប្លង់ផ្កាថិទ្ធអប្សរា និង ជាបឋមដើម្បីប្រឡងប្រណាំងទីក្រុងស្អាត ។
- យោងដីកាលេខ ១០៩ ចុះថ្ងៃទី ២៧ ខែ ឧសភា ឆ្នាំ ២០១១ របស់សាលាខេត្តបាត់ដំបង ស្តីពីការបង្កើត គណៈកម្មាធិការខេត្តដឹកនាំចលនាប្រឡងប្រណាំងទីក្រុងស្អាត រមណីយដ្ឋាន ស្អាត សោភ័ណ ។
- យោងដីកាលេខ ១៧ ដក ចុះថ្ងៃទី ១៧ ខែ សីហា ឆ្នាំ ២០១២ របស់សាលាក្រុងបាត់ដំបង ស្តីពីការបង្កើត ក្រុមការងារគ្រប់គ្រងសំណល់ និងញែកសំណល់រឹង ក្នុងផ្សារ និង ជុំវិញបរិវេណផ្សារបឹងឈូក ផ្សារធំបាត់ដំបង និង ផ្សារថ្មី១៣មករា ។
- យោងភាពចាំបាច់របស់រដ្ឋបាលក្រុង ។

សូមជូនដំណឹង

ដល់ក្រុមហ៊ុនវិនិយោគផ្សារបឹងឈូក គណៈកម្មការផ្សារ និងអ្នកម៉ៅការភាស៊ី (ផ្សារធំបាត់ដំបង ផ្សារថ្មី១៣មករា) ក្រុមហ៊ុនប្រមូលសំរាម (CINTRI) អង្គការសង្គមស៊ីវិល អាជ្ញាធរពាក់ព័ន្ធ អាជីវករ និងប្រជាពលរដ្ឋរស់នៅជុំវិញបរិវេណផ្សារ គោលដៅទាំង៣ ស្ថិតក្នុងក្រុងបាត់ដំបងមេត្តាជ្រាបថា: រដ្ឋបាលក្រុងបាត់ដំបង សូមធ្វើការណែនាំស្តីពីការគ្រប់គ្រង ការញែក ទុកដាក់ និងការកែច្នៃសំណល់រឹង (សំណល់ដែលអាចធ្វើជីកំប៉ុសបានយកទៅធ្វើជីកំប៉ុស) ដើម្បីកាត់បន្ថយបរិមាណសំណល់ រឹងនៅទីលានចាក់សំរាម រួមចំណែកទប់ស្កាត់ការប្រែប្រួលអាកាសធាតុ តាមរយៈការកាត់បន្ថយបរិមាណសាយភាយឧស្ម័នផ្ទះ កញ្ចក់ ថែរក្សាអនាម័យ សុខមាលភាពសាធារណៈ ថែរក្សាបរិស្ថាន សោភ័ណភាពទីក្រុង និងដើម្បីចូលរួមក្នុងការ ប្រលងប្រណាំងទីក្រុងស្អាតដូចខាងក្រោម:

ក-អាជីវករ និងប្រជាពលរដ្ឋរស់នៅជុំវិញបរិវេណផ្សារគោលដៅទាំង៣ត្រូវ ៖

- រៀបចំទុកដាក់សំណល់រឹង តាមផ្ទះក្រមទាំងមុខផ្ទះ និងមុខតូបរៀងៗខ្លួនអោយបានត្រឹមត្រូវ ។
- សំណល់រឹងត្រូវបានបែងចែកជា៣ប្រភេទគឺ:
  - សំណល់រឹងប្រភេទទី១ (សំណល់ដែលអាចលក់បាន) : ដូចជា ក្រដាស កំប៉ុងដែក កំប៉ុងអាលុយមីញ៉ូម ប្លាស្ទិចគ្រប់ប្រភេទ ដែក ។ល។ ជាសំណល់ដែលអាជីវករ ឬ ម្ចាស់ផ្ទះអាចទុកដាក់សំរាប់លក់បាន ។
  - សំណល់រឹងប្រភេទទី២ (សំណល់ធ្វើជីកំប៉ុស) : ដូចជាសំណល់បន្លែ ផ្លែឈើ ត្រី ស្មៅ សាច់ កាកបាយ កាកតែ កាកសម្ល កាកកាហ្វេ សំបកដូង កាកដូង កាកអំពៅ ស្លឹកឈើ មែកឈើ ។ល។ សំណល់រឹង ដែលមាន ទឹកត្រូវតែចាយត្រងយកទឹកចេញសិន ។
  - សំណល់រឹងប្រភេទទី៣ (សំណល់ផ្សេងៗទៀត) : ដូចជាសំណល់កន្ទប កម្ទេចក្រណាត់ សំលៀកបំពាក់ និង ស្បែកជើងចាស់ៗ ជប កែវ កញ្ចក់ ចាន ដែលមិនអាចលក់បាន។ល។
- អាជីវករ និង ម្ចាស់ផ្ទះនីមួយៗត្រូវវេចខ្ចប់ និងទុកដាក់សំណល់រឹងប្រភេទទី២ និងប្រភេទទី៣ អោយបានត្រឹមត្រូវ (ឧបសម្ព័ន្ធទី១) ។
- សំណល់ដែលបានញែក និងវេចខ្ចប់រួចហើយ ត្រូវទុកដាក់ដោយឡែកពីគ្នានៅតាមមុខតូប និងមុខផ្ទះរៀងៗខ្លួនតាម កាលវិភាគប្រមូល របស់ក្រុមហ៊ុន និង ក្រុមហ៊ុនប្រមូលសំណល់ អោយបានត្រឹមត្រូវ (ឧបសម្ព័ន្ធទី៣) ។
- អាជីវករក្នុងផ្សារ និង ប្រជាពលរដ្ឋដែលរស់នៅជុំវិញបរិវេណផ្សារ ត្រូវមានស្មារតីចូលរួមក្នុងការ ញែកសំណល់រឹង ទាំងអស់គ្នា ។
- ត្រូវទទួលខុសត្រូវក្នុងការញែក និងវេចខ្ចប់សំណល់រឹង តាមតូប និងតាមផ្ទះរៀងៗខ្លួន ជៀសវាងដាច់ខាតការយក សំណល់ទៅចាក់ចោលនៅទីសាធារណៈ។ ក្នុងករណីមានសំណល់នៅរាយប៉ាយនៅមុខតូប និងមុខផ្ទះ ដោយសារ ចង្រៃហក ឬសំណល់នោះ វាបើ ឬខ្លាតមកពីកន្លែងផ្សេង ម្ចាស់តូប ឬ ម្ចាស់ផ្ទះនីមួយៗ ត្រូវទទួលខុសត្រូវចូលរួម បោសសំអាត និង វេចខ្ចប់ដាក់ក្នុងថង់ប្រភេទសំណល់ទីបីអោយបានត្រឹមត្រូវ ។
- សំណល់ដែលបានញែករួចហើយត្រូវយកមកទុកនៅមុខតូប ឬ មុខផ្ទះអោយបានទាន់ពេលវេលាដែលបាន កំណត់ ។ ក្នុងករណីមានការយឺតយ៉ាវ អាជីវករ ឬ ម្ចាស់ផ្ទះត្រូវរក្សាសំណល់ ទាំងនោះ នៅក្នុងតូប ឬ ក្នុងផ្ទះជា បណ្តោះអាសន្នសិន មិនត្រូវយកមកទុកនៅមុខតូប ឬ មុខផ្ទះ ឡើយ (ឧបសម្ព័ន្ធទី៣) ។

ខ-គណៈកម្មការគ្រប់គ្រងផ្សារ ៖

- ផ្សព្វផ្សាយ ណែនាំដល់អាជីវករ និងប្រជាពលរដ្ឋរស់នៅជុំវិញបរិវេណផ្សារ អោយចូលរួមអនុវត្តក្នុងការញែកសំណល់ រឹងទាំងអស់គ្នា។
- តាមដាន និង ត្រួតពិនិត្យជាប្រចាំ តាមតូបនីមួយៗនិងត្រូវធ្វើកិច្ចសន្យាជាមួយអាជីវករណាដែលមិនចូលរួមអនុវត្ត ក្នុងការញែកសំណល់ អោយគាត់ចាប់ផ្តើមចូលរួម ។

គ-ក្រុមហ៊ុនវិនិយោគផ្សារ / អ្នកម៉ៅការភាស៊ីផ្សារ ៖

- រៀបចំកន្លែងទុកដាក់សំណល់រឹងដែលបានញែករួចហើយ តាមតូប ផ្ទះ និងស្តង់នីមួយៗ អោយបានត្រឹមត្រូវ ងាយ ស្រួលប្រមូលចេញមកក្រៅផ្សារ និងដឹកជញ្ជូនពីផ្សារទាន់ពេលវេលា ។
- ត្រូវកំណត់ពេលវេលានៃការយកសំណល់ដែលញែករួចហើយមករក្សាទុកនៅមុខតូប និងមុខផ្ទះនីមួយៗអោយបាន ច្បាស់លាស់ (ឧបសម្ព័ន្ធទី៣) ។
- ត្រូវកំណត់ទីតាំងស្តុកសំណល់ខាងក្រៅផ្សារអោយបានច្បាស់លាស់ ដើម្បីងាយស្រួលដល់ក្រុមហ៊ុនប្រមូលសំរាម ដឹកជញ្ជូនសំណល់ចេញពីផ្សារបានទាន់ពេលវេលា (ឧបសម្ព័ន្ធទី២) ។
- ណែនាំដល់អាជីវករ និង ប្រជាពលរដ្ឋរស់នៅជុំវិញបរិវេណផ្សារ អោយគោរព និងអនុវត្តតាមសេចក្តីណែនាំរបស់ រដ្ឋបាលក្រុង។
- ណែនាំដល់អ្នកបោសសំអាតសំណល់ក្នុងផ្សារ បានយល់ដឹងអំពីការញែកសំណល់ ការទុកដាក់សំណល់ និង ដឹកជញ្ជូនសំណល់ចេញមកស្តុកទុកខាងក្រៅផ្សារតាមប្រភេទសំណល់អោយបានត្រឹមត្រូវ ។
- ទទួលខុសត្រូវក្នុងការដឹកជញ្ជូនសំណល់ចេញពីក្នុងផ្សារគោលដៅទាំង៣ តាមប្រភេទសំណល់ អោយបានទាន់ពេល វេលា និង ចំគោលដៅទីតាំងក្រៅផ្សារ ដែលបានកំណត់ដោយគណៈកម្មការ ផ្សារ និងរដ្ឋបាលក្រុង ។

ឃ-ក្រុមហ៊ុនប្រមូលសំរាម រឺ ក្រុមហ៊ុនដឹកសំរាម ៖

- ត្រូវកំណត់កម្មវិធីប្រមូលសំណល់តាមប្រភេទសំណល់ខាងលើតាមពេលវេលាច្បាស់លាស់ (ឧបសម្ព័ន្ធទី៣)។
- ត្រូវទទួលខុសត្រូវក្នុងការដឹកជញ្ជូនសំណល់មកកាន់ទីលានស្តុក និង ចាក់ចោលតាមកាលវិភាគដែលបានកំណត់ សំរាប់សំណល់ប្រភេទទី២ និងប្រភេទសំណល់ទី៣ (ឧបសម្ព័ន្ធទី៤)។
- សំណល់ដែលអាចធ្វើជីកំប៉ុសបាន ត្រូវដឹកជញ្ជូនទៅកាន់កន្លែងធ្វើជីកំប៉ុសជាប្រចាំ និង ដឹកជញ្ជូនសំណល់ផ្សេងទៀតដែលមិនអាចយកទៅកែច្នៃបានទៅចាក់ចោលនៅទីលានចាក់សំរាម តាមពេល និង តាមការកំណត់របស់រដ្ឋបាលក្រុង (ឧបសម្ព័ន្ធទី៣)។

ង-អង្គការសង្គមស៊ីវិលដៃគូអភិវឌ្ឍន៍ ៖

- រៀបចំកម្មវិធី ឯកសារ ព័ត៌មានផ្សេងៗ ស្របតាមខ្លឹមសារនៃសេចក្តីណែនាំ ដើម្បីផ្សព្វផ្សាយ អំពីសារៈប្រយោជន៍នៃការញែកសំណល់ដល់អាជីវករ និងប្រជាពលរដ្ឋរស់នៅក្បែរបរិវេណផ្សារអោយបានយល់កាន់តែច្បាស់ និង ណែនាំអោយគាត់ចូលរួមដោយមានទំនួលខុសត្រូវ ។
- ផ្តល់ប្រឹក្សាបច្ចេកទេសក្នុងការកែច្នៃសំណល់ធ្វើជីកំប៉ុសតាមសហគមន៍ និងតាមផ្ទះ ។
- អង្គការ COMPED ជាអ្នកទទួលបន្ទុកកែច្នៃធ្វើជីកំប៉ុស ។

ច-ក្រុមការងារក្រុង ៖

- ជំរុញការផ្សព្វផ្សាយ ការជូនដំណឹង តាមដានត្រួតពិនិត្យ និងវាយតម្លៃ ក្នុងការអនុវត្តសេចក្តីណែនាំ ។
- សម្របសម្រួលដល់អ្នកពាក់ព័ន្ធ ដើម្បីអោយការអនុវត្តសេចក្តីណែនាំមានដំណើរការទៅដោយរលូន។
- ធ្វើរបាយការណ៍អំពីលទ្ធផលការងារដែលអនុវត្តបានតាមដំណាក់កាលនីមួយៗជូនឯកឧត្តមអភិបាលក្រុង។

សេចក្តីណែនាំនេះ នឹងចាប់ផ្តើមអនុវត្តសាកល្បងក្នុងរយៈពេលពីរសប្តាហ៍ ក្រោយថ្ងៃចុះហត្ថលេខា និងចាប់ផ្តើមអនុវត្តជាផ្លូវការរយៈពេលបីសប្តាហ៍ក្រោយពីថ្ងៃចុះហត្ថលេខា ។

រដ្ឋបាលក្រុងបាត់ដំបង សង្ឃឹមថា លោក លោកស្រី អនុវត្តតាមសេចក្តីណែនាំខាងលើនេះ អោយទទួលបានជោគជ័យ និងដោយស្មារតីទទួលខុសត្រូវខ្ពស់ ។

អភិបាលក្រុង

ស៊ឹង សុខុន

ចម្លងជូន
-សាលាខេត្តបាត់ដំបង
-មន្ទីរសាធារណការ និងដឹកជញ្ជូនខេត្ត
-មន្ទីរបរិស្ថានខេត្ត
-ក្រុមប្រឹក្សាក្រុងបាត់ដំបង
"ដើម្បីជាពត៌មានជ្រាប"
-សាលាសង្កាត់ស្វាយប៉ោ
-អង្គការដៃគូអភិវឌ្ឍន៍
-គណៈកម្មការគ្រប់គ្រងផ្សារ
-ក្រុមហ៊ុនប្រមូលសំរាមCintri
"ដើម្បីអនុវត្ត"
-ឯកសារ-កាលប្បវត្តិ

Translated Directive on solid waste management and waste separation at source

KINGDOM OF CAMBODIA

NATION REGION KING

Province Battambang

Battambang City

No. 09

Battambang 05.09.2012

DIRECTIVE ON

Solid Waste Management and Waste separation at source
at and around markets
Psa Boeung Chouk, Psa Nat, and Psa Thmey Thmey

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- Refer to the sub-decree No. 36 about solid waste management in the Kingdom of Cambodia, on 27 April 1999.
- Refer to the declaration (Prakas) No. 80 of the Ministry of Interior and the Ministry of Environment about solid waste management in provinces-cities of the Kingdom of Cambodia, on 25 February 2003.
- Refer to the declaration (Prakas) No.1273 about city office establishment for waste management and cleaning of city.
- Refer to the directive of provincial administration Battambang No. 07 on cooperation for the commitment and joining "the Clean City Awards".
- Refer to the statement of provincial administrative Battambang No. 109 on 27 May 2011 about the establishment of the committee, working on the clean city awards, for pleasant landscapes and good services.
- Refer to the statement of Battambang city administration, No. 17 on 17 August 2012 about the establishment of the working group, working on solid waste management, and waste separation at source at and around markets Phsar Boeng Chhouk, Phsar Nat and Phsar Thmey.
- Refer to the requirements of the city administration.

In order to reduce solid waste amount at disposal site, to avoid climate change by reducing GHG emission, to improve the hygienic conditions, public health, environmental cleanliness and beauty of the City, and to achieve a national clean city award, the city administration instructs the market investor of Phsar Boeng Chhouk, market committees, and contractors for

collection stall fee and cleaning fee (Phsar Nat and Phsar Thmey), waste collection company (CINTRI), civil societies, involved authorities, vendors and residents living around the selected three markets in Battambang city, to join the waste management, waste separation, waste storage, and waste recycling (composting) program by taking the following tasks and responsibilities:

A) Vendors and residents living around the three selected markets

- Responsible for their own solid waste inside and in front of their house and at their own stall stand.
- Solid waste must be separated into three categories:
  Waste category 1: sellable waste like paper, metal cans, aluminum cans, all kinds of plastic, iron, etc.). The waste generator can keep and sell this kind of waste for extra income.
  Waste category 2: compostable waste like vegetables, fruit, fish waste, grasses, meat waste, rice and soup waste, tea grounds, coffee grounds, coconut shells, coconut husks, bagasse, leaves, small tree branches, etc.). Waste containing water must be clean enough first.
  Waste category 3: other waste like small pieces of textiles, flannel, used cloths, old shoes, bottles, glass which is not sellable etc.)
- Each vendor or resident must pack and store their own waste in a proper way (see Annex 1).
- All waste which is separately packed must be stored/kept in the front of the stall or house corresponding to the collection time schedule of the collection company (see Annex 3).
- All market vendors and residents living around markets must participate in the waste separation at source program.
- Responsible for separation and storage of waste at their own stall and house. Storing waste in a public area is absolutely forbidden. When waste is on the floor in the front of a sales stall or house because the bag is torn (or waste floates on water) from anywhere in the stall or house, the owner is responsible for cleaning the area and putting it in waste category 3.
- All waste which is separately packed must be stored/kept in the front of the stall or house corresponding to the collection time schedule of the collection company. If not, the market vendor or resident must ask to keep their waste in the stall or house, and wait for the next scheduled collection (see Annex 3).

B) Market committee

- Publicize and instruct the vendor and residents who are living surround the markets to implement waste separation at source.

- Follow-up and control permanently each vendor or each stall, in case they are not participating in waste separation at source; he/she needs to sign a signed participation statement and to start separating his/her waste.

C) Market investor and sub-contractor for collection of stall standard fee and cleaning fee

- Arrange an area where the vendors and residents can store their separated waste in the front of stalls and houses to make the collection convenient and on time.
- Set collection schedule (see Annex 3).
- Arrange a storage area outside of the market where the collection company can collect separated waste on a time schedule (see Annex 2).
- Instruct vendors to implement the directive.
- Explain to market cleaners about waste separation, and separate collection and storage of waste.
- The contractor is responsible to collect the separated waste from the market. The collection activity and delivery of the separated waste to the stored area, which is selected by the market committee and city administration, must be on time.

D) Waste collection company or waste collection contractor

- Arrange a clear collection schedule for collection of separated waste (see Annex 3).
- Responsible for collecting and transporting waste category 2 and 3 every day, according to the schedule (see Annex 4).
- Compostable waste must be collected and delivered to the composting plant every day. Other waste must be disposed of in the landfill, which is designated by the City (see Annex 3).

E) Civil societies

- Prepare curriculum, documents, or other information materials referring to the content of the directive. Educate and publish about the advantages of waste separation at source to market vendors and residents. Convince and motivate them to participate in waste separation at source.
- Advise and instruct people on how to do household and community based composting.
- The COMPED organization is responsible for utilizing compostable waste by doing compost.

F) Working Group

- Encourage the promotion activities, follow up, control, and evaluate the directive implementation.
- Coordinate all stakeholders by implementation of the directive.
- Report the result, step by step, of implementation to the provincial governor.

The directive implementation will be started two weeks after the date of assignation as a pilot project. Official implementation will be started four weeks after the date of assignation.
The city administration hopes that all stakeholders will implement the directive with responsibly and success.

City Governor
[Sign and Stamp]

Copy to:

- Provincial Administration.
- Provincial Department for Public Works and Transportation
- Provincial Department for Environment
- City Council

To be informed:

- Selected Commune Administration
- Development Partner Organization
- Market Committee
- Waste Collection Company, CINTRI

As implementer:

- Archive

Annex to the Directive:

- Annex 1: Waste storage
  Compostable waste must be stored in any kind of plastic bag, except a black bag. The vegetable or fruit wholesalers are requested to manage their own waste by putting it in one place in their own sales stall. Use a black plastic bag for other waste which must be sent to a landfill.
- Annex 2: Waste collection point:
  (i) Market Thmey: at the same place in the area of the bus station, north part.
  (ii) Because no space is available for a collection point, therefore, waste bins must be available for storage of waste (a) green bins are for compostable waste and (b) other bins must be for other waste.
  (iii) Because market investor is responsible and a collection point is not available, the investor is in charge of collecting and transferring waste.
- Annex 3 Collection schedule

(i) Market Thmey: (a) For vendors and residents: all kinds of separated household and market waste must be ready before 4:00 PM for collection. For the case that waste is not ready at 4:00 PM, the waste owner is responsible for their own waste, until the next scheduled collection, not keeping it in the front of a sales stall or house. (b) For cleaners: waste must be transferred to a collection point before 6:00 PM and stored separately. (c) For the waste collection company: responsible for collecting waste between 6:00 to 7:00 PM, and transferring it as separated to a landfill and composting site.

(ii) Phsar Nat: (a) vendors and residents: all kinds of separated household and market waste must be ready before 5:00 PM for collection. For the case that waste is not ready at 5:00 PM, the waste owner is responsible for their own waste, until the next scheduled collection, not keeping it in the front of a sales stall or house. (b) For cleaners: waste must be transferred to a collection point before 7:00 PM and stored separately. (c) For the waste collection company: responsible for collecting waste two times between 6:00 – 8:00 AM, and 7:00 to 8:00 PM transferring it as separated to a landfill and composting site.

(iii) Phsar Boeng Chhouk: (a) vendors and residents: all kinds of separated household and market waste must be ready before 6:00 AM and 7:00 PM for collection. For the case that waste is not ready at 5:00 PM, the waste owner is responsible for their own waste, until the next scheduled collection, not keeping it in the front of a sales stall or house. (b) For cleaners: waste must be transferred to a collection point before between 6:00 AM - 7:00 PM, and stored separately, and transferred as separated to a landfill and composting site.

- Annex 4: Waste must be collected and transferred separately

(i) Compostable waste must be collected and transferred to a composting site every day.

(ii) Other waste must be collected and transferred with mixed waste to a landfill every day.