Key Learnings from
'Workshop on Wheels'

A PARTICIPATORY TRAINING FOR SUSTAINABLE WASTE GOVERNANCE: A SOUTH- SOUTH KNOWLEDGE TRANSFER PROGRAM,
July 18-23, 2022
Kerala, India

CED

एकिकृत शहरी विकास केन्द्र (CIUD)

eawag aquatic research

UNIL | Université de Lausanne

Swiss Programme for Research on Global Issues for Development

FNSNF Swiss National Science Foundation

Schweizerische Eidgenossenschaft
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Swiss Agency for Development and Cooperation SDC

Foreword

The information and facts mentioned in this document may not necessarily match the accuracy in the waste management processes followed by any site or plant visited by the participants. This document shall be used for the key internal purpose among the project partners and may only be taken as a reference.

The project team would like to thank all those organizations, private companies and the known and unknown individuals who had helped in making the workshop a successful and meaningful event.

The TAG Project Team

2022

Preface

The countries of the South Asian region are increasingly discovering the potential of technologies to solve emerging issues. Political, socio-economical, geographical and environmental issues are common problems that the South Asian countries are facing. Most of the countries in this region are very prone to climate change and climate related disasters. Many are already facing alarming climate change impacts including rapid melting of glaciers of Himalayas, change in rainfall pattern and droughts and desertification. The countries which are on the verge of collapse due to the climate change and its impact must work towards sustainable solutions to cope with these challenges. Meanwhile, the collaboration and partnership among the countries are increasing in coping with various social and environmental problems and sharing their best practices in addressing the issues.

In the past few decades, sharing of the northern and western developed countries' best practices had been used to inspire the least developed and developing countries around the world. However, very often the best practices of the global north are found to be of little relevance for countries of the global south, mostly because of the cultural, geographical and socio-economical differences.

The project "Participatory training for sustainable waste governance: A south-south knowledge transfer" was carried out in India, Nepal and Sri Lanka with the key objective of creating a south-south learning platform. The project represents a Transformation Acceleration Grant (TAG) funded by the Swiss National Science Foundation (SNSF) and the Swiss Agency for Development and Cooperation (SDC)) under the Swiss Programme for Research on Global Issues for Development (r4d). The TAG project is associated with the preceding r4d project "Challenges of municipal solid waste management: Learning from post-crisis governance in initiatives in South Asia". The partner organizations of the TAG project are the Centre for Environment and Development (CED), India; the Centre for Integrated Urban Development (CIUD), Nepal; Janathaksan, Sri Lanka; the University of Lausanne, Switzerland and eawag, Switzerland.

As one of the key activities of the project, CED, India organized a workshop of wheels entitled "Participatory training for sustainable waste governance". The key objective of the workshop was to induce the participants with the innovative SWM activities carried out in Kerala to and observe best practices in the area of SWM in this Indian state. The 'workshop on wheels' was attended by the participants representing municipalities and municipal councils of Nepal and Sri Lanka and the partner organizations.

During the six-day long program, the participants were taken to different parts of Kerala to observe various waste management facilities. Furthermore, experts were made available in all the centers for the clarification on the process of the waste management. The team visited the industrial waste management facility at KEIL in Ernakulam, the bio-medical waste management plant set by Indian Medical Association go Environment (IMAGE) in Mallampuzha, a plastic recycling and recycled-plastic production factory at Kodandu, and the decentralized wastewater treatment system (DeWATS) in Alleppey. This document has been prepared to assess CIUD's key learnings from this workshop.

The Observations and Learnings of the Program

The Plastic Alternatives

One of the most noticeable practice observed in Kerala was the uses of alternatives to plastic bags and carriers. All the shopping malls, stores found to have been using either paper made bags, fabric bags or jute knitted bags instead of plastic. On the first day of training team visited the Green wrap technologies at KINFRA, an industrial area of Trivandrum Kerala. The team observed the business and their process of making shopping bags. The visitors gathered information on their business strategies, cost of the technologies, production capacity as well as demand and supply chain of the products.

In Nepal metropolitan cities like Kathmandu and Lalitpur have tried to ban single use plastic bags several times but failed largely due to many reasons, one of which was not finding a good alternatives.

The major learnings from the visit are:

- Use of plastic can be minimized to very basic level, if provided proper alternatives as learned at Green wrap technologies at KINFRA, Trivandrum
- The gap between ban of plastic and failure is providing affordable alternatives in most of the countries which is well addressed in the Kerala.
- Government promoting plastic alternatives, and imposing restriction on the use of plastics with proper alternatives works better to control the plastic based waste.

Participants are being expounded about the production process of paper bags at Green Wrap technologies

Workers at Green Wrap technologies producing paper bags

Managing the plastic waste

Plastics and polymeric material consumptions are rapidly growing around the globe, which leads to the global concern about the management of the plastic based waste. The trend of increasing pattern of

using plastic and polymeric products, and its consequences as plastic wastes are in alarming rate, as millions of metric ton of waste is piling up on the earth's surface and destroying ecological balance of the earth at the land, sea and air. Meanwhile many organizations are working extensively exploring the best solution minimize plastic waste and its management.

Visiting at the ***Hamara Plastic and Hamara Polymers*** on second day of training at Kodandu provided participants a comprehensive knowledge on how plastic waste could be converted into a profitable business.

The participants first visited the Hamara Polymers for observing how the hard plastics and polymers are segregated with their types and colors and shredded for further processing such as washing and shredding along with the segregation units arranged by the colors and grades of plastics and polymers at the center.

Furthermore, the team visited the plastic factory where two different sections, recycle unit and production unit (Amana Plast) and observed the process of plastics beings shredded and melted to produce plastic grains (pellets), and grains being converted into valuable plastic products.

During the entire visit, Mr. Siyad Ali, founder of Hamara Plastic and Hamara Polymers accompanied the team for explanation and responding the queries. The major learnings from the day two of training are

- Plastic waste generates a good amount of profit if utilized properly
- Systematic waste collection enhance the confidence of the waste based organization
- Waste is not just waste but also the source of an employment and a good income
- Plastic waste based organizations and entrepreneurs play vital role in minimizing plastic waste going to landfill sites
- There is an opportunity of business at each stage of the plastic waste management (Collection, recycling, and production)
- If provided alternatives, use of plastics can be minimized, so is the plastic based waste

Hosepipe blowing the shredded plastic, converted to plastic

Team being expounded by the Mr. Siyad Ali, the owner of the Hamara Plastic and Hamara Polymers, on the process of segregation and further processing

Collection of the hard plastics and polymers at Hamara Polymer

Shreded plastics after shorting at Hamara Polymers

Shreded plastics being washed before turning into pellets

Shreded plastics strings under the process of making plastic granules

Processed plastic granules, raw material for production of new plastic products

Mr. Ali demonstrating the process of plastic granules to plastic product at his production site

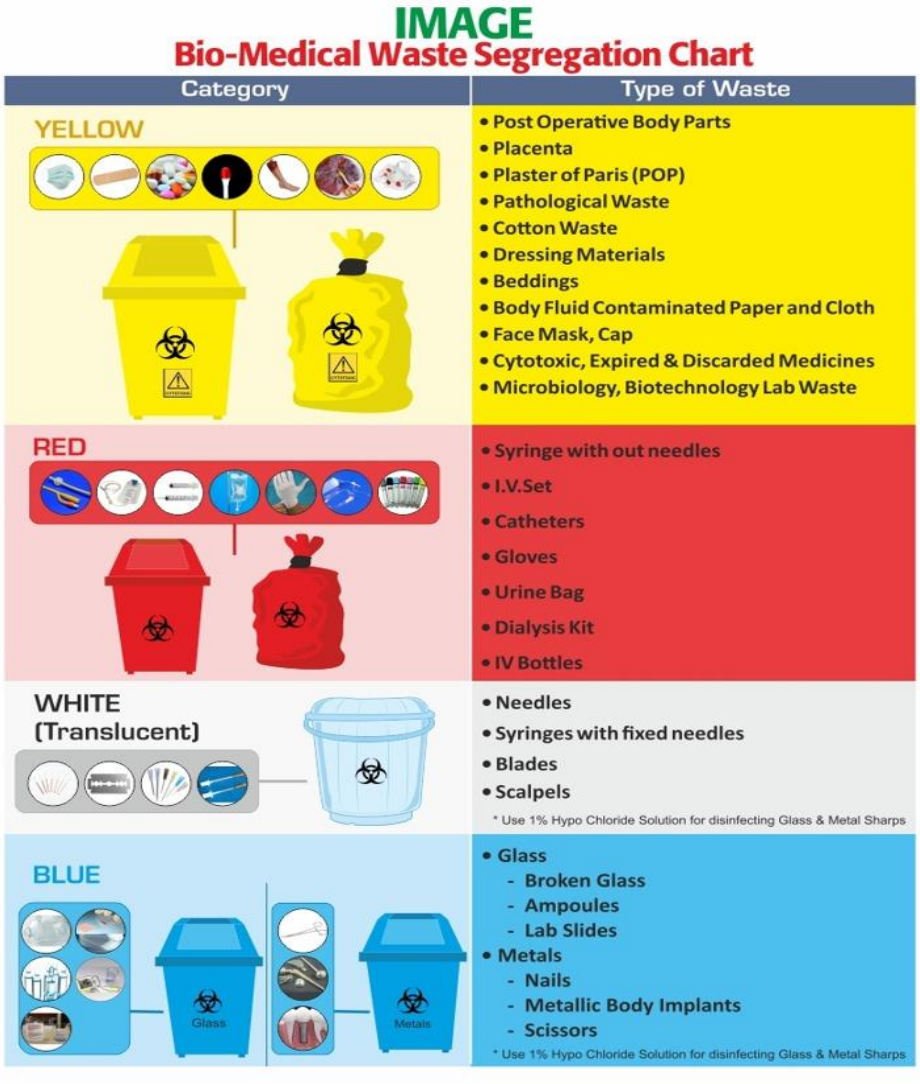
Plastic flowering pot produced as a final product from plastic granuesls

Bio-medical Waste Management

One of the most interesting and useful observations and learnings of the visit was sustainable and centralized management of the bio-medical waste in Palakkad, Kerala. The team observed the comprehensive bio-medical waste management facility with various technologies managed by *Indian Medical Association Goes Eco-Friendly* or **IMAGE**. The facility has all the facilities for collection, transportation, treatment, and scientific disposal of biomedical waste, collected from healthcare facilities such as medical stores, including dental care, ayurveda/AYUSH center, veterinary hospitals/clinics, diagnostic laboratories and domestic biomedical wastes.

On the first day, the participants were briefed at the CED run hospital, about the collection system of bio-medical waste established by the IMAGE. At the same time, the participants were also oriented about the segregation of the bio-medical waste with different color containers and bags provided by the IMAGE. The polythene bags with four color are being practiced by IMAGE for collection of the bio-medical waste.

The following table and chart shows the waste segregation and treatment



Treatment process used for different categories of bio-medical waste

Types of waste	Treatment process of Waste
Yellow Category	The waste which directly goes to incinerator
Red Category	Autoclaving and segregated for recycling process
White Category	Washed and sold to scrap dealer for recycling
Blue Category	Sterilization with HCL solution and segregated for recycling process

Handling Wastes of Blue Category

Metals and glasses are generally categorized under the blue waste, generated by hospitals and clinics. The collected blue packages are first sorted, and separated with plastic and metals by using shredders and water floating techniques. Then the plastics and the metals are collected and piled up for scrap dealers to further processing and recycling. Most of the glasses are reusable and recyclable so the glass wastes are cleaned with hydro chlorine solution for sterilization and cleaning, before sending off to the scrap dealers.

Workers collecting syringes and tubes for

Separated needles from the syringe

Medicinal bottes, ampoules collected for sterilizing

Shredding for seprating metal, plastic and glass

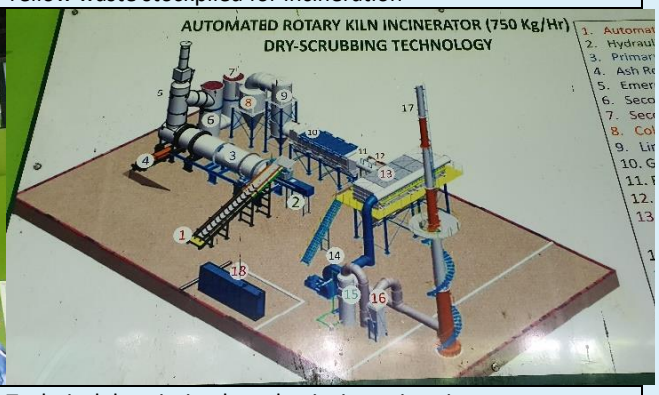
Handling Wastes of Yellow Category

In the facility, an automated incinerator with the capacity of 750 kg/ hour has been used to incinerate the wastes. The plant has three types of incinerators: a primary (rotary) and secondary (static) combustion chambers and an intermediate flue-mixing chamber. The primary chambers are operated on a controlled air-condition with temperature range in between 800 ^{o}C to 900 ^{o}C and secondary chamber with excess air condition and temperature range from 1050 ^{o}C to 100 ^{o}C. The claimed combustion efficiency of the incinerator is more than 99 %. The flue gas goes through various filtration units embedded with the machine. The heat exchanger, dioxin control system, filtration system, all these are working under a software controller called SCADA, and are connected online for continuous monitoring system to monitor the stack emission and chamber temperature at real time

Participants observing the incineration unit

Yellow waste stockpiled for incineration

Primary chamber of the incinerator installed at IMAGE



Technical description board at incineration site

The key learnings from the incineration process of bio-medical waste are

1. Incineration is not only the process of burning the waste into ashes, but also management of the gases which are the byproduct generated during the process

2. The site for the plant with the segregation unit has to follow some specific guidelines such as in area full of greenery
3. Incineration process can be remotely controlled with modern technology installed at facility

Handling Wastes of Red Category

The management of the red colored bio-medical waste begins with the autoclaving to sterilize the contaminated waste before segregation. The sterilized waste after the autoclaving is then sent to segregation section where more than 50 people continuously working to segregate the waste contents. Waste like rubber and plastic pipes, tubes, medicine container, gloves, IV bottles, syringes without needles etc. are separated and collected in on container for bulk packing.

At the final stage, the segregated waste are packed and stored in the IMAGE ware house before collected by the scrap dealers.

The first step of red category of bio-medical waste is autoclave

Segregatio of the bio-medical waste after autoclaving

Workers busy on segregation of waste after sterilization

Sterilized rubber globes piled-up , ready to sent for recyling units

Key learnings from the IMAGE bio-medical waste management facility at Palakkad are

- Bio-medical waste management is more than autoclaving and disposing them at landfill site
- A complete bio-medical waste management consists of incineration, autoclaving, waste water treatment, sorting and segregation for recycling and reusing
- Bio-medical waste also contains values which can be exchanged for value of money

Harmful waste water also needs to be treated before releasing into water system

Segregation at source of waste generation and packages with segregated waste bags saves lots of time, money and energy

Handling White Category Waste

Needles, syringes with fixed needles, blades, and scalpels are generally categorized under the white waste generated from the Hospitals and clinics, the collected white waste packages are first sorted, and autoclaved before sorting with plastic and metals. Then the plastics and the metals are collected and piled up for scrap dealers to further processing and recycling. Most of the metals are recyclable so the metal wastes are sent to recycle centers via scrap dealers.

	
change pictures	Change pictures to match the subject
	
Medicinal bottles, ampoules collected for sterilizing	Shredding for seprating metal, plastic and glass

The key learnings from the white category waste management in IMAGE are

1. Handling sharp needles and blades are riskier and difficult than any other waste in the bio-medical waste management.
2. More than 95% of the metal waste are recyclable and are sold for the good monetary value.
3. Skilled man power and custom made machineries are required to separate embedded needles and blades from plastic.

Management of Biomedical Waste, Hazardous Waste Sanitary Landfill at (KEIL)

On the fourth day, the participants visited the Kerala Enviro Infrastructure Limited (KEIL) at Ernakulam, Kerala. The facility was established to dispose hazardous waste generated in various industries from the Kerala State in the engineered landfills. The company is functioning at the 50 acres of land purchased in the name of Govt. of Kerala from FACT-Cochin Division, and leased to KEIL for 50 years.

The visit was scheduled with a brief introductory session of KEIL, including technical details of the landfill sites where they have been managing industrial hazardous waste, and other facilities available at the KEIL. The team of experts accompanied the participants throughout the visit to facilitate and provide detail information on different components seen at the landfill site and other facilities of KEIL like bio-medical waste treatment plant and leachate treatment plant.

The landfill site seen at the KEIL was very well managed and kept well maintained. The Nepalese participants have only seen the unmanaged landfill site and was very amazed to see such a beautifully and scientifically managed and maintained landfill site at the heart of the Industrial zone of Kerala.

The visit and observation has not just extended the knowledge of the participants, but also helped to gain the sense of responsibility that waste management should be done without hampering nature.

Executive Director of KEIL Introducing about the KEIL to the participants

The participants observing layers of waste covered by the protective sheets

The participants walking through the well maintained landfill site

The participants walking towards leachate treatment plant at KEIL

In Kerala, many small organizations are working in management of waste. The KEIL is the one of the biggest organizations that is handling the industrial and bio-hazardous waste of Kerala. Visiting inside

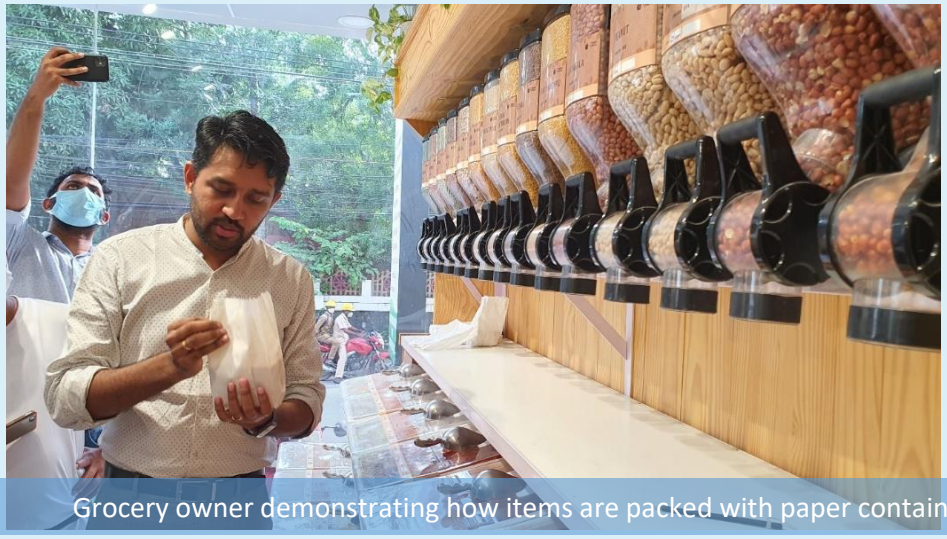
the KEIL was an exposure to the system that has been managing the waste in more secure and systematic ways.

The key learnings from the KEIL visit are briefed below.

- Management of any sort of waste can be done in the most sophisticated manner, if the technologies developed locally are well implemented. KEIL has been managing one of the most hazardous wastes in such a manner that it doesn't do any harm to nature. We found that it was possible only with the application of the appropriate technologies developed locally in the management of waste.
- Direct government engagement and support is must to flourish the private organization working on waste management. Private companies backed by government support can perform in a long run and support to form win-win situation.
- Team of experts or quality human resources are must to handle the technical job of the waste management. Without quality human resources, management of waste will not function as it should be at a full capacity.

7 to 9 Green Grocery Store- A Plastic Free Green Grocery Store

On the way to Alleppey, participants visited a grocery shop, open with innovative idea to combat against the plastic waste generation. The 7 to 9 Green Grocery is a popular grocery store amongst the people who cares about the nature and joining fight against the plastic waste. The basic concept behind the store is to bring the local people's own container or re-use the old container. If not, the store provides paper bags for the grocery items and glassware for the liquids. It is a self-served grocery store which helps to reduce and re-use concept to practice in real life and support immensely to minimize the single use used plastic waste.



Grocery owner demonstrating how items are packed with paper containers

The participants had interaction with the grocery owner who explained everything about the store and his initiation including how this idea works and how much unnecessary plastics are stopped from being unnecessary used. Every item in the shop was purchased on bulk and put on the baskets and jars, so

that customers can refill the items at their own required quantity. The code numbers printed on every container allow customers to print their details, including the expiry date of the product and nutrition values with contents of the elements.

Customers approaching with used bag for the grocery items and vegetables

The short visit at the 7 to 9 grocery shop was very inspiring as it was a good example of how we can contribute in the minimization of plastic waste with an innovative ideas. How the adoption of 3R policy of the waste can be practice in daily life and how the alternative of the plastics can be promoted. The entire participants were fascinated by an innovative idea of doing business with green concept.

Since, the store was the first of its kind in Kerala, many people visit and shop to promote the idea, which subsequently support in the reduction of plastic waste.

The main learning from the 7 to 9 grocery shop are

- One time used plastics can be avoided with and re-used containers which are readily available at the homes
- Many innovative ideas like 7 to 9 grocery with free plastics contributes to Kerala for minimizing the plastic based waste can be explored and piloted

People love the innovative idea which directly contributes the saving the nature and environment they lived on

Alleppey Decentralized Waste-water Treatment System and Community composting

As one of the final schedules, visit of the participants was fixed for observing the decentralized waste-water treatment system (DeWATS) and community based composting practice at Alleppey, Kerala. The participants were taken to the Chathanad colony where scavengers and waste pickers were living, with minimum sanitation facilities. A few years back, they didn't have their separate toilets and they totally depended on a public toilet constructed by the municipality. The liquid waste of the public toilet was directly discharged to the canal that passes through the other communities and was mixed with the main canal of Alleppey.

The initiation was taken by the project called **canAlpy** funded by the corporate social responsibility (CSR) funds of different corporate house of the city of Alleppey**.** Each home in the colony has been provided its own toilet, washing area, and bathing area. The 52 families previously shared a communal latrine, which has since been converted to a study area/ library room for local students**.**

Before/after image of the Chathanad colony displayed at the learning center, illustrates how project CanAlpy transformed the colony

The constructed DeWATS system consists of three major component units that includes settling dam or settler where all the liquid waste is collected, the second unit is an aerobic baffled reactor (ABR) with multiple-stage reactor that consists a series of up-flow reactors connected by means of baffles that force wastewater to flow under and over them as it passes from the influent to the effluent.

Participants observing the DeWATS constructed at Chatanad colony

The major learnings from the CanAlpy project site observations are listed below.

- Small initiation by mobilizing CSR fund, brings changes into entire community if mobilized the resources with purpose
- Decentralized wastewater treatment systems can be applied in a small communal and it allows to produce safe treated water before it is discharged in the local water bodies such as rivers, canals, ponds and lakes

With so many exposures and extended knowledge regarding the waste management and good governance of waste, the program, Workshop on Wheels" was successfully concluded on the seventh day.

The Impression from the Visit

The six-day long training organized by the CED was very fruitful and successful. With the arrangement of direct observation and interaction program to different sectors of the waste management agencies of Kerala, the participants accumulated an extensive knowledge on the sustainable approaches of the solid waste management. The south-south learning and sharing program was the perfect blend of learnings with theoretical as well as practical knowledge with direct exposures and interactions. Since the participants were the key stakeholders of the municipality including the waste practitioners, handlers and decision makers, the 'Workshop on Wheels' had a lot of takeaways, inspirations and the motivations. The visit also helped develop a network among the participants for the interactions and knowledge sharing.

Way Forwards

Kirtipur Municipality's Plans and Approaches

After the workshop in Kerala, the municipality has come up with the following program to mainstream the TAG program learning and inspiration.

Bio-Medical Waste Management

The municipality has prioritized bio-medical waste management. For that, the municipality is developing a centralized bio-medical waste management system. This includes the collection

bio-medical wastes from one community hospital and 12 health care centers of the municipality on government owned land where municipal waste is collected, segregated and transferred.

For this plan, the municipality has the following immediate action plans and activities:

a. Construction of a BWM management center
b. Implementation of a biomedical waste collection system
c. Capacity development for sanitary workers and staff of health posts
d. Ratification of an agreement between the municipality, health care centers, scrap dealers and private sector companies for collection, treatment and disposing
e. Management of human resources for sustainable operation
f. Development of a guideline for biomedical waste management

The municipality is also planning to expand its bio-medical waste management system at a larger scale adding more components, such as an incinerator and other treatments units including wastewater treatment plants, similar to the one of IMAGE in Pallakad, Kerala. The extended plan will also collect bio-medical waste from privately owned health services such as private hospitals, clinics and labs.

Other Waste Management Programs of the Municipality

a. Promotion of segregation at source. For this, the municipality is distributing waste collection bins to 2500 households
b. Developing IEC materials
c. Development of monitoring mechanisms
d. Development of waste collection software (mobile based application)
e. Organizing regular campaigns
f. Establishing of a few community-owned composting plants
g. Plastic waste minimization programs. This includes the collection of plastic wastes, providing alternative of the plastic bags in the household level and also establishing plastic banks where people can deposit plastic waste such as PET bottles and get a few coins in return.

CIUD's Way Forward

CIUD will be working in close coordination with the Kirtipur municipality in waste management of the municipality, also reflecting the learning from Kerala. CIUD also envisions to bring bio-medical waste (BMW) management to the national level as BMW is a serious and hazardous yet less attended kind of waste in Nepal. CIUD seeks to broaden the knowledge and capacity of local governments, private sectors, sanitation workers, etc. for comprehensive BMW at both local and national levels. Moreover, CIUD look forward to collaborating with the TAG project partners and other agencies in working more in the municipal waste management sector

through technical interventions, researches and the south-south as well as north-south learning.

TAG Support to the Kirtipur Municipality

There is a provision of providing technical support to municipality and a budget of 5000 CHF or 625,000 Nepalese rupees for equipment. Initially, CIUD had thought of providing an autoclave machine to the municipality for centralized BMW. Later it was found that an autoclave machine of good quality with well-equipped facilities and a horizontal one costs about 2 million Nepali rupees.

Meanwhile, CIUD communicated with an organization called Health Care Foundation Nepal (HECAF) 3600 for their suggestion. This organization has been working on BMW for a long time and has pioneered in this sector in Nepal. Coincidentally, HECAF was also planning to promote centralized BMW in the Kirtipur municipality. Soon, HECAF asked the Leo Club, a local charity, for additional help. Luckily, the Leo Club immediately agreed to provide support of about 2 million rupees to purchase an autoclave machine with the specification as per our requirements. Meanwhile, the municipality has also allocated a budget of 1 million Rupees and has already identified an area within the premises of the existing transfer center where municipal waste from the municipality is collected, segregated and is sent off to the landfill site.

So far three meetings between the municipality, CIUD, HECAF, and the Leo Club have been held and all agreed on initiating a Common Facility for the BMW management for the municipality.

Since the Leo Club was supporting the establishment of an autoclave machine in the facility, it was recommended that the TAG project could provide an e-rickshaw for the collection of bio-medical waste from all the health care centers in the municipality to the facility. As CIUD quickly explored the price of the rickshaw, it seems like the budget of CHF 5000 (or 625,000 Nepali Rupees) will be sufficient to buy one and modify the vehicle such as adding the container as per the WHO guidelines on BMW management. The municipality will take the responsibility to regularly operate it and bear maintenance costs. The cost of factory-manufactured ones without additional modification is about 450,000 to 500,000.

CIUD will also manage to develop a standard operating procedure (SOP) for the overall management of BMW including collection, treatment and final management of the treated waste. The SOP will also include the operation and management system.

Also, the HECAF has taken the responsibility for the system, design of the facility, developing its SOP and capacity enhancement of the BMW handlers as well as assessment of the waste generated within the municipality.

So, it seems the TAG project has succeeded in bringing in new partners and sensitized the key stakeholders for the comprehensive BWM management for the Kirtipur municipality.