

Desk research findings on “Selection of one to two hotspot/ target area to give awareness raising on water related ecosystem, waste disposal, environmental justice, mitigation measure at targeted city/region located at the bank of Aye Yar Waddy river, and field observation, data collection Field observation, Data collection, questionnaire survey at selected sites on Waste disposal, gold mining at stream and river”

## **Abstract**

“The desk research found the criteria, to be considered to select hotspot/ target area to give awareness raising on water and water related ecosystem, waste disposal, environmental justice, mitigation measure at targeted city/region located at the bank of Aye Yar Waddy river .”

### **1. Introduction**

Forest Resource Environment Development and Conservation Association (FREDA) is implementing the project on “Advancing Cooperation Between Lower Mekong Countries to support governance, transparency and local voices, concerning with water and Water Related Ecosystem” from 5<sup>th</sup> October, 2022 to 15 August 2023, with the financial assistant of Pact, Inc. under “Mekong Connections: Governance, Transparency, and Local Voices” funded by the US Department of State East Asia and Pacific Bureau.

Desk research findings on “Selection of one to two hotspot/ target area to give awareness raising on water related ecosystem, waste disposal, environmental justice, mitigation measure at targeted city/region located at the bank of Aye Yar Waddy river, and field observation, data collection” are reported.

### **2. Literature review**

Public Health Internal Guideline Development team conducted Four Evidence review on effective strategies for raising awareness on Indoor air quality at home in 2020. They used review protocol, literatures, public health evidence study selection, public health evidence such as effectiveness of a household environmental health intervention delivered by rural public health nurses, biomarker (lead, cotinine) and household samples (carbon monoxide (CO), radon, mould/mildew, and drinking water contaminants), CO from combustion sources (e.g. wood stove), in wall humidity as a proxy for mould/mildew risk, evaluation of outcomes such as environmental health self-efficacy, each risk specific self-efficacy score,

environmental health precaution adoption, adoption, and process model and precautionary action. Intensive awareness strategies on “Tailored information for raising awareness for poor indoor air quality at home” was made. Health economic evidence study, health economic analysis were made. Change in knowledge, change in attitudes, changes in behavior, change in beliefs, changes in health related symptoms associated with exposure to poor indoor air quality were evaluated. Research recommendation were given to reduce respiratory health outcomes allergic health outcomes cardiac health outcomes, pregnancy related health outcomes, and to promote health related quality of life. [1]

Myanmar has been facing considerable challenges with the management of waste in the recent as a result of increasing income and consumption levels, urban growth, and lack of effective waste treatment and disposal methods. The IGES Centre Collaborating with UNEP on Environmental Technologies (CCET) provided technical assistance to the Ministry of Natural Resources and Environmental Conservation (MONREC) and other key stakeholders, including Mandalay City Development Committee (MCDC), towards the development of sustainable waste management strategies at the national and city levels based on a holistic waste management approach: addressing all waste streams (solid waste, liquid waste / wastewater, and gaseous emissions), primarily focusing on solid waste and its relationship with other types of waste since early 2016. Waste management in Myanmar has traditionally been the responsibility of township and city development committees designated within respective States and Regions. In Yangon, Mandalay and Nay Pyi Taw, three autonomous City Development Committees, their respective Pollution Control and Cleansing Departments (PCCDs) and their network of administrative branches and sub- units are tasked with solid waste management. At present, waste collected by respective townships and city development committees is transported to open dumping sites located within city boundaries, which face a number of challenges in terms of operations and management. Municipal waste collection systems in Myanmar cities can largely be characterized as labor intensive, relying on the use of both manual workers and non-specialized vehicles. Similarly, recycling activities are carried out in many cities in Myanmar mostly by the informal sector, which includes waste pickers, waste collectors, and waste dealers. All major cities (Yangon, Mandalay and Nay Pyi Taw)

experience bottlenecks with regard to managing industrial waste, which is often transported to landfill sites without prior treatment. Mandalay and Yangon collect medical waste from large hospitals and special clinics on a daily basis while collection service is provided to smaller facilities once a week or on an on-call basis. Domestic waste water is usually released into storm water drainage systems and natural waterways; industrial wastewater is currently managed in a haphazard manner, although a number of private companies located in Special Economic Zones (SEZ) are progressively implementing wastewater treatment systems. The main sources of outdoor air pollution include inefficient modes of waste transport, inefficient combustion of household fuels for cooking, lighting and heating, coal fired power plants, industrial agriculture and waste burning.[2]

IGES and CCET recommended to be considered at the local level, “township and city development committees should take leadership and responsibility for planning and implementing city waste management strategies and action plans in consultation with relevant stakeholders, including citizens and civil society groups, the informal sector, small- and medium recycling associations, academia as well as other key public departments. The strategies should first prioritize extending regular waste collection services across all areas of towns and cities, including informal communities and peri-urban zones, establish proper mechanisms to control the current illegal dumping and open burning of waste, and make efforts to improve final disposal sites from open dumping to control and sanitary landfills. As a next step, each township and city development committee should more concentrate on developing resource management strategies based on waste hierarchy including waste prevention, minimization, reuse, recycling, and recovery prior to final waste disposal. This will involve promoting customary recovery, repair and reuse practices, working to divert the landfilling of food waste for other purposes, such as composting and bioenergy generation, and maximizing the participation of communities, including engaging informal and small-scale entrepreneurial recyclers in the conventional waste management sector. Over the long-term, individual township and city development committees should aim toward introducing a more holistic approach for managing all residual waste, such as implementing pollution control measures for tackling emissions and effluents potentially hazardous to human and environmental health. As above, successful

application of these strategies will necessitate building partnerships with relevant stakeholders, as well as encouraging citizen participation and awareness raising with a view to promote overall behavior change: harnessing adequate financial and human resources for these actions thus remains crucial.

IGES and CCET recommended to be considered at the national level, MONREC in cooperation with other relevant government departments and ministries, should formalize the establishment of an effective legal framework, supported by enabling policies, financial mechanisms and an operational monitoring/enforcement system on waste management at the national level. This should include developing waste management performance indicators and the requisite methodology to track progress of city waste management strategies against national targets, as well as maintaining a national waste database. MONREC and its partners should also work towards incentivizing city actions aimed at improving waste management through national awards and certification programs. In addition, national guidelines should be established regarding waste classification, as well as the development of definitions related to sustainable materials management with a view towards facilitating trade and investment in recycling, recovery and other related waste management solutions.

Although waste management in Myanmar is still lacking in many respects compared to other, more experienced countries, international co-operation can play a catalytic role in helping the country improve governance and build the local capacity and infrastructure necessary for effective waste management. For instance, enhancing access to capital financing will be essential for developing the critical infrastructure for addressing increasing levels of waste generation, as well as the collection, transport, treatment and introduction of more sustainable disposal options. At the same time, it is worth noting that international funding for waste management should also be economically affordable and appropriate to the local circumstances of Myanmar as opposed to being determined by countries which have modernized their waste systems over a longer time period. In this regard, a major priority for Myanmar will be to continue strengthening knowledge and performance of the public sector with a view towards establishing more inclusive approaches, such as the endorsement of proactive policies, regulations, and sound institutions that ensure that the country is equipped with the competencies and skills

to deliver sustainable, locally supported waste management systems. Accordingly, promoting city-to-city cooperation between Myanmar cities and mentor cities with longstanding- experience in upgrading their waste management systems presents a useful strategy for encouraging the sharing of experiences such as best practices, as well as other technical assistance.[2]

Myanmar's National Waste Management Strategy and Master Plan [3] was developed with the participation of 14 State and Region Development Affairs Committees, Yangon City Development Committee, Mandalay City Development Committee, Nay Pyi Taw Development Committee, and all other Township and City Development Committees. National Waste Management Strategy and Master Plan greatly contributed towards ensuring the strategy remained practical, implementable and relevant to the country's needs. The National Waste Management Strategy and Master Plan for Myanmar has identified the following strategic goals, each of which is then briefly discussed with some key targets and proposed activities.

Goal A: Extending sound waste collection service to all citizens and eliminating uncontrolled disposal and open burning as a first step towards environmentally sound waste management

- (i) Achieve sound waste collection service for all citizens
- (ii) Eliminate the uncontrolled dumping and burning in the cities and mandate the operation of environmentally sound disposal facilities

Goal B: Extending sustainable and environmentally sound management of industrial and other hazardous wastes

- (i) Mandate separate collection and sound treatment of hazardous waste including infectious medical waste, agro-chemical waste from non-hazardous waste
- (ii) Mandate sound collection and environmentally friendly treatment of all industrial waste and agro-chemical waste

Goal C: Substantively prevent waste through 3Rs and thereby establish a resource circular society

- (i) Mandate the development of city waste management strategies and

action plans with actual waste reduction targets by all CDCs and TDCs

- (ii) Mandate the introduction of targets for diverting the food waste from landfills
- (iii) Mandate the separate collection and set waste recycling targets for industrial, medical and other wastes

#### Goal D: Ensure sustainable financing mechanisms

- (i) All City and Township Development Committees conduct full cost accounting for waste service
- (ii) All City and Township Development Committees establish cost reflective tariffs for waste management services

#### Goal E: Awareness raising, advocacy and capacity building

- (i) Increase in the number of townships that have implemented standard awareness-raising programmes for their residents
- (ii) Increase in the number of schools in the townships that have established environmental education programmes for their students

#### Goal F: Compliance, monitoring, enforcement and recognition

- (i) City and Township Development Committees establish benchmark performance indicators
- (ii) Increase in the number of successful enforcement actions filed against non-compliant entities by City and Township Development Committees

Roles and responsibilities CSOs and NGOs for implementing the Myanmar's National Waste Management Strategy and Master Plan are;

CSOs and NGOs are important sources of support, including with regard to raising awareness, disseminating information and providing technical guidance. CSOs and NGOs may also provide relevant organized services, such

as cooperatives that serve to reduce waste generation. CSOs and NGOs often play a critical role in terms of shaping and influencing the political acceptability of waste management policies, and therefore can be considered a valuable ally.[3]

### 3. Objective

The objectives of the documentary research on the selection of hotspot/ target area to give awareness raising on water and water related ecosystem, waste disposal, environmental justice, mitigation measure at targeted city/region located at the bank of Aye Yar Waddy river .” are;

1. To select one to two hotspot/target area
2. To share the knowledge on the sustainable development goals including clean water and sanitation for all, the causes of sedimentation and siltation in rivers, "Plastic pollution in Myanmar, the impact of open defecation or poor quality toilets, the *water pollution from agriculture* and disposal of black water, solid waste and liquid waste such as chemical fertilizer and pesticides into stream and rivers,
3. To conduct field observation, data collection and
4. To give recommendation or suggestions to address the issues such as water pollution from agriculture, mining, deforestation, plastic and hazardous waste disposal

### 4. Materials and Method

#### 4.1 Research Method

Desk research or Secondary research or “[documentary research](#)” was used in this study. *Desk research* is a type of research that is based on the material published in reports and similar documents that are available in public libraries, websites, data obtained from surveys already carried out, etc. Some organizations also store data that can be used for research purposes. It is a research method that involves the use of existing data. These are collected and summarized to increase the overall effectiveness of the investigation. Secondary research is much more cost-effective than [primary research](#), as it uses existing data, unlike primary research, in which data is collected first-hand by organizations, companies, or may employ a third party to obtain the data in your name. It’s also called “[documentary research](#)“. One of the most popular ways to collect data for desk research is through the Internet. [4]

## 4.2 Research Orientation

4.2.1 Discussion and meeting were made on 18-11-2022, 28-11-2022, 28-12-2022, and 25-1-2023 with the consultants, NGO, CSO and people who had experiences in environmental conservation, sustainable agriculture, extension on plastic pollution control, and sustainable management of water related ecosystem. Questionnaire survey was conducted related to water pollution in November and December, 2022 to get information. SWOT analysis was done to address plastic waste disposal in Ayeyarwaddy river, by consultant and gave presentation on 28<sup>th</sup> December, 2022. Participants suggested to address issues. Literature review was done based on the literatures shown in the references.

## 5. Findings

1. The Ayeyarwaddy river is threatened by pollutants and sedimentary deposits. Pollutants and sediment in the Ayeyarwaddy river are due to the decades of neglect, over-exploitation, and extensive pollution associated with deforestation, urbanization, and industrialization. Excessive sediment loading from mining activities and soil erosion along the river is a significant factor. The increase in sediment concentration leads to siltation. The Ayeyarwaddy River deposits around 360 million tons of sediment annually (Robinson, 2007). According to data from 2005 data and experiments, the Ayeyarwaddy sediment load is the third highest in the world (Robinson, 2007). The siltation creates frequent and rapid shifts in the course of Ayeyarwaddy with numerous sandbars, which have a major impact on river navigation, especially in the summer months. Deforestation also contributes to sedimentation and subsequent siltation. MacKinnon (1997) estimated that almost 75% of Myanmar's forest ecosystem was lost by the early 1990s. Despite the significance of siltation impacting the river, no recent studies could be found. More studies will be necessary to address siltation.[5]
2. Highest variation of dissolved oxygen has been observed in Mandalay ranging from 9.21 to 4.88 mg/L. SintKu and Mandalay saw the highest turbidity of up to 142 NTU in summer but found lower turbidity up to 5 NTU in the rainy season. Unlike Mandalay and SintKu, downstream Pyi, Hinthada, and Nyaung Done received elevated turbidity around 700 NTU, where Hinthada saw the highest turbidity level of 721 NTU. pH levels in the whole river escalated in the rainy season and Mandalay found the highest pH, 10.53. The levels of nitrate



nitrogen, sulfate, hardness, zinc, and lead along the river both in the summer and the rainy season did not show any alarming numbers. Iron levels along the river were generally high and were much higher in the rainy season. Salinity levels along the river exceed the maximum concentration limit for irrigation water. Elevated arsenic levels in the upper study area - Consistent arsenic levels of 30 ppb were found in SintKu and in Mandalay in summer months but the levels dropped to 10 ppb in the rainy season. In Pyi, Hinthada, and Nyaung Done, 10 ppb levels of arsenic were found in the summer but the trace of arsenic concentration disappeared to zero ppb in the rainy season. Cyanide levels in the study area Serious levels of cyanide were tested in SintKu, Mandalay, and Nyaung Done throughout the study period. WHO sets maximum acceptable level 0.07 mg/L for cyanide and the highest trace of cyanide in SintKu was 0.14 mg/L in the summer. High levels of ammonia nitrogen in rainy season .Ammonia nitrogen levels along the river were noticeably lower in summer period but they all escalated in the rainy season. Highest ammonia nitrogen tests were in the Ayeyarwaddy region, meaning Hinthada and Nyaung Done, in the rainy season around 3 mg/L. High levels of pathogens. All tests in every sites along the river gave positive for coliforms and E.coli. Wash rooms and toilets were observed on river banks and directly on the river as well. Ships and floating dwellings have direct discharge toilets. Sewage discharges were seen flowing into the river in every site.[5]

3. Plastic pollution is damaging the beauty of Myanmar and affecting people's health. A new survey on plastic pollution in Myanmar conducted by Fauna and Flora International (FFI) in collaboration with Thant Myanmar reveals that 119 tons of plastic waste enter the Ayeyarwady River every day, and Myanmar's coastlines are heavily affected by micro plastics. Their findings show that the upper Irrawaddy regions contribute 58 tons of plastic pollution per day, with the lower delta region and Yangon, Myanmar's capital, adding a further 32 tons and 29 tons respectively. One of the participant said that he had ever seen fisherman got only plastic in their fishing net. [6]
4. Ecology of the river is under serious threat. The population of Ayeyarwaddy River dolphins, an indicator of the health of the ecosystem, has noticeably declined. Sighting of the dolphins has become very rare in the lower part of the river. According to the latest Red List of threatened species produced by the International Union for Conservation of Nature (IUCN), the status of the Ayeyawady dolphin has been raised from “vulnerable” to “endangered” because its numbers have fallen by half over the past 60 years due to human

activities. Environmental degradation along the Irrawaddy River is also to blame for declining fisheries, as are fishermen who use electrical shockers to boost their catches, affecting the river's small Irrawaddy dolphin population in ways both direct and indirect. Further threats to the species are caused by land use changes for palm oil plantations. The Irrawaddy Dolphin is critically endangered, with only about 79 left in the Ayeyarwady River in Myanmar. Human activities threaten their survival, such as pollution, overfishing, illegal fishing methods, excessive boat traffic.

5. *Estuarine crocodiles (Crocodylus porosus)* and river terrapin (*Botagur baska*) are also on the verge of extinction in accordance with the World Wildlife Conservation's prediction. A new survey has revealed another hurdle facing Myanmar's already- threatened turtle hatchlings: plastic. As if avoiding being harvested as eggs and enduring soaring nest temperatures were not enough, these helpless newborns must now clamber over washed-up plastic bottle caps, coffee sachets and food packaging on their hazardous journey down the beach to reach the relative safety of the sea.
  
6. The 2014 Myanmar population and housing census showed that 25.7 percent of households have using traditional pit latrines, bucket surface latrines or no latrines at all. Open defecation or poor quality toilets that ruin their health and pollute their environment. Inadequate sanitation systems spread human waste into rivers, lakes and soil, contaminating the water resources, and as a consequences waterborne diseases. Ministry of Health, Department of Public Health, Health Information Division published the "Public Health Statistics, 2017-2019", and it is known that environmental sanitation is one of basic requirements for the uplift of human well-being and quality living conditions. The information on sanitary latrine coverage by households was assessed and reported annually by Basic Health Services Professional- BHSP. At national level, 68.3 percent of households had sanitary latrine in 2016 and the coverage increased to 72.9 percent in 2019. Over the four-year period of 2016 to 2019, a steady increase of latrine coverage was seen in most states and regions except Chin State for which the coverage decreased in the year 2019. Rakhine State had the lowest coverage with a minimal increase throughout the four years period. The level of coverage was fluctuated during these four years in Shan(East), Shan(South) and Kachin States, and Tanintharyi Region. In 2019,

Yangon Region had the highest level of sanitary latrine coverage at 85.9 percent whereas Rakhine State had the lowest coverage at 39.1 percent. Although Shan(North) State, Bago Region, Chin State, Shan(South) State, and Ayeyawady Region had over 60 percent coverage, it was lower than the national average.[7]

Sanitary Latrine Coverage, Myanmar, 2016-2019

No	Year	% of household
1	2016	68.3
2	2017	70.0
3	2018	71.1
4	2019	72.9

7. According to a global review on water pollution from agriculture, conducted by Food and Agriculture Organization (FAO) and the CGIAR research program on water, land and ecosystems (WLE), led by the international water management institute (IWMI), it was found that pollutants from agriculture such as nitrogen, phosphorus, pesticides, biochemical, sediments, salts, organic matter, pathogens reach to water bodies (e.g. rivers, lakes, aquifers, coastal waters, marine waters). the most common chemical contaminant found in groundwater aquifers is nitrate from farming.[8] FAO found that the biggest source of water pollution today is agriculture. Water pollution from unsustainable agricultural practices poses a serious risk to human health and the planet's ecosystems, a problem often underestimated by policymakers and farmers alike, cautions a new report. In many countries the biggest source of water pollution today is agriculture — not cities or industry — while worldwide, the most common chemical contaminant found in groundwater aquifers is nitrate from farming, according to a new book titled *More people, more food, worse water? A global review of water pollution from agriculture*. [8] With the observation of high phosphate concentration, nutrient loading and pesticide contamination from the agricultural excess fertilizers and pesticides are also possible, especially in the delta (BOBLME, 2011). Myanmar used 352,698 tons of chemical fertilizers and 4940 metric tons of pesticides in 2009-10 (BOBLME, 2011).

Use of chemical fertilizer and pesticide (kg/ha) in Mekong countries at 2019 is shown in following table for taking into consideration on their impacts.[9]

Sr	Mekong countries	Nitrogen fertilizer use per hectare( Kg/ha)	Phosphrous fertilizer use per hectare( Kg/ha)	Pesticide use per hectare
1	Cambodia	27.57	13.05	No data
2	China	198.23	75.78	13.07
3	Laos	No data	No data	0.11
4	Myanmar	28.27	14.48	1.39
5	Thailand	59.28	17.26	1.32
6	Vietnam	127.2	62.25	1.63

Source <https://ourworldindata.org/fertilizers>( Fertilizers Data Explorer)  
<https://ourworldindata.org/grapher/pesticide-use-per-hectare-of-cropland>

8. Primarily rice is grown in across the [Ayeyarwady](#), [Bago](#) and [Yangon](#) delta regions due to the major river system running across. These respectively account for 33.59%, 17.72% and 10.07% of the total harvestable area. Most of rice is grown in the Delta of the Ayeyarwady River. The following table shows the rice-harvested areas from different producing zones.[10]

<b>Production zone</b>	<b>Harvested area (% total harvested area)</b>
Ayeyarwady Region	33.59
Bago Region	17.72
Yangon Region	10.07
Sagaing Region	8.88
Shan State	5.95
Rakhine State	5.84
Mon State	4.97
Mandalay Region	4.89
Magway Region	3.25
Kachin State	1.93
Tanintharyi Region	1.50
Chin State	0.59
Kayah State	0.50
Kayin State	0.31

The type of crop grown is strongly associated with expenditures on fertilizers. Maize and paddy growers are spending significantly more on inorganic fertilizer than farmers that do not grow these crops. Maize, monsoon paddy, and cool/dry season paddy growers spend 95, 44, and 73 percent more (equivalent to 107, 49, and 82 USD more), respectively, on fertilizers than farmers who do not grow these crops. Fertilizer use in Myanmar has been decreasing and notably very low. In 2009, the farmers applied only 5 kg NPK per ha of arable land, which was just 25% of the amount applied in 1995.[10]

9. Another criterion to be considered in selecting hotspot/ target area to give awareness raising on water related ecosystem is security. Existing conflict, [Internal Conflict in Myanmar](#) is known that [Insurgencies](#) have been ongoing in Myanmar, and the unrest is known across the nation, especially in Kachin state and Sagaing region. It was recommended not to select in Kachin state and Sagaing region target area to give awareness raising on water related ecosystem.[11]

10. Field observations noted by program manager at Yangon region are;

- 1) disposal of waste from bus door to road, market
- 2) expectorate among the people
- 3) spitting betel nut chewers, disposal of betel nut packing plastic
- 4) disposal of plastic waste along the road side,
- 5) disposal of waste in side drain
- 6) most of the side drain does not have cover, and it need to apply sustainable drainage system to prevent plastic waste, disposed by people
- 7) disposal of waste at the yard, where the land owner does not live
- 8) plastic waste in Yangon river, Ngamoe yeik creek, Pazuntaung creek
- 9) pesticide spraying in rice field, pesticide odor is noticed near cultivable area. Ngamoeyeik river also polluted with plastic
- 10) lack of environmental ethic
- 11) noise pollution all night long from water compressor, used at deep tube well, to sell water.

11. It is found that it need to conduct participatory monitoring and evaluation on the implementation of the National Waste Management Strategy and Master Plan for Myanmar, especially at the water related ecosystem.

12. Criteria and indicator for sustainable cities and communities should be

developed and try to apply at hotspot/ target area to give awareness raising on water related ecosystem, waste disposal, environmental justice, and mitigation measure. Field observation, Data collection, questionnaire survey should be done based on the criteria and indicators at selected sites.

13. Proposed criteria and indicators are;

- 1) Existence of waste collection service to all citizens.
- 2) Lack of uncontrolled disposal and open burning
- 3) Adoption of environmentally sound waste management practices
- 4) Existence of environmentally sound disposal facilities
- 5) Existence of sustainable and environmentally sound management of industrial and other hazardous wastes
- 6) Application of separate collection and sound treatment of hazardous waste system, including infectious medical waste, agro-chemical waste from non- hazardous waste
- 7) Application of sound collection and environmentally friendly treatment of all industrial waste and agro-chemical waste
- 8) Prevention of waste through 3Rs and thereby establish a resource circular society
- 9) The development of city waste management strategies and action plans with actual waste reduction targets by all CDCs and TDCs, and implementation status.
- 10) Introduction of targets for diverting the food waste from landfills
- 11) Separate collection and set waste recycling targets for industrial, medical and other wastes
- 12) Existence of sustainable financing mechanisms such as full cost accounting for waste service at All City and Township Development Committees
- 13) Establishment of cost reflective tariffs for waste management services at All City and Township Development Committees
- 14) Existence of Awareness raising, advocacy and capacity building

program

- 15) Evaluation of the townships that have implemented standard awareness-raising programs for their residents and behavioral change assessment.
  - 16) Monitoring and evaluation on environmental education programmes at schools, and behavioral change assessment for their students.
  - 17) Compliance, monitoring, enforcement and recognition based on benchmark performance indicators at City and Township
  - 18) Status of the number of successful enforcement actions filed against non-compliant entities by City and Township Development Committees.
  - 19) Partnership of CSOs, NGOs and local community based organization in implementing the Myanmar's National Waste Management Strategy and Master Plan, concerning with raising awareness, disseminating information, providing technical guidance, and policy recommendation.
  - 20) Existence of cooperatives that serve to reduce waste generation.
  - 21) Partnership of CSOs, NGOs and local community based organization in shaping and influencing the political acceptability of waste management policies.
14. Myanmar's National Waste Management Strategy and Master Plan [3] was developed with the participation of 14 state and region development affairs committees, Yangon City Development Committee-YCDC, Mandalay City Development Committee-MCDC, Nay Pyi Taw Development Committee, and all other township and city development committees. For the stakeholder identification and stakeholder engagement, it is found that function and duties of Yangon city development committee are as follow;[12]
1. Planning urban projects;
  2. Supervision and implementation of lands;
  3. The Committee conducts the encroachment of buildings, houses, tents and not to bank up the construction materials on the authorized land, empty plots,

- reserve lands and roads without permissions and demolishing, removing and relocating;
4. Innovate and update the urban development plan upon the committee owned land or the land authorized by Yangon City Development Committee and reserve land;
  5. Managing greenness in traffic islands and pavements/ platforms along the main roads;
  6. Conducting, supervising and maintaining the public gardens, parks, playgrounds, recreation center and providing the entertainment areas;
  7. Construction and maintenance the public toilets in appropriate locations;
  8. Inspection of the buildings to be built whether they are in consistent with the current laws, regulations and authorize them to construct, denial or prohibition and take-action against the offenders;
  9. Defining zones for the construction of buildings in each area, delimitation of restricted areas, type of building style, permitted designs, peg out work model, the number of floors in the building, the distance between building boundary and the road boundary, minimum required area of a room and the specified construction materials;
  10. Repair and removal of the dangerous buildings, components and parts and sanction to reside;
  11. Maintenance of Committee-owned buildings;
  12. Preservation of Yangon City Heritage buildings;
  13. Cooperation in disaster prevention process, arranging firefighting equipment, demolition or cancellation of the fire-hazardous buildings and tents;
  14. Traffic areas, terminals and construction of parking lots in accordance with rules and regulations;
  15. The committee is responsible for collecting municipal taxes and carrying out municipal activities. Authorize to an appropriate organization or individual for an appropriate period of time, either through a contract system or through auction system or through tender system or Being able to carry out and assign tasks to ensure transparency through other suitable and good systems;
  16. Construction, repairing, maintenance of public roads and pedestrian bridges, underground pipelines; dykes, the streams that the committee has the right to manage; drains, construction of water infrastructure;
  17. Conducting the placement of infrastructure within the road boundary;
  18. Construction of roads, management in accordance with the road features, supervision; setting rules and take-action;
  19. Naming roads; numbering and naming buildings and lands and announcing such activities to the public;



20. Lighting in municipal markets; public places and buildings, roads parks and street lights flower gardens;
21. Adequate water supply works within the authorize territorial limits of the city;
22. To provide adequate water, construction and maintenance of reservoirs, artesian well, water pipelines, exploring and the use of water resources;
23. Reservation to keep Inya Lake, Kandawgyi Lake and other lake clean and tidy;
24. Conducting the waste water to maintain, washing, cleaning and supervision and construction of sewers for efficient dispose of waste water;
25. Improving the flow of water;
26. Management for drilling, extraction and distribution of ground-water;
27. Carrying out public health activities, delivering health education and protection activities and coordination with the relevant Department of health;
28. Establishing and supervising the necessary measures in connection with well, lake and drainage schemes to be hygienic;
29. Inspection and taking-action in food production which sell in markets and street stalls whether they are hygienic or not;
30. Construction, maintenance and management of municipal markets and supervision of private owned markets, stores and malls;
31. Removing and disposing of obscene, abominable and waste materials, cleansing roads and eliminating stray dogs;
32. Building and establishing the animal pounds to capture, detain and eliminate the harmful animals and maintain the stray animals;
33. Management and taking action on animals such as buffalo, cattle and pets by setting rules;
34. For public consumption, distribution and management in production of meat and fish;
35. Prohibiting and inspecting the meat and fish selling, transporting, storing, maintaining which is not suitable for consumption and disgusting as well as dangerous things;
36. Systematically collect and dispose of daily waste, management as needed;
37. Determining the waste disposal sites to do waste transfer system, waste bins, tanks, garbage trucks and designate the final disposal site, relocation, closure and use in other way of management and supervision;
38. Around the city, in order to maintain and improve the quality of water, air and land by taking-action and supervising against relevant government departments and coordination with experts to implement effectively that discharge of liquid and wastes from factories, workshops, vehicles, machinery and exhaust fumes from human's products whether it is harmful to public health;

39. Manage and supervise for construction of burial machines, burial permission and caving;
40. Management and supervision of designate cemeteries, relocation, closing, cancellation and other way of using the demolished cemetery;
41. According to the type of slow-moving vehicles, issuing vehicles license and driver license by setting rules, revocation of license with limited period or cancellation, suspension of license which is failed to renew and inspection, supervise, arrest and take-action against unregulated slow-moving vehicles;
42. Taking-action, supervision and specification of rules regarding with roadsides stalls and street hawkers;
43. Inspecting and permitting of guest houses, hostels, private pawnshops and brokerage, the operation of water-supply private companies;
44. Setting rules regarding with revocation, cancellation and permission, disclosure of any activities or advertisement carried out by an individual or organization within a limited period;
45. According to the policy of committee, conducting, prohibitions and punishments rules are announced to the entire population of Yangon and all those who enter and leave out of the city in a timely manner through various forms of public communication;
46. Managing which is related to production activities belonging to committee;
47. Carrying out research required for the work of committee, continuing legal affairs and education;
48. Preservation and rehabilitation a mentally ill person who is wandering around people with skin diseases caring for homeless children and beggars;

These duties are implemented by the following Departments of YCDC (<https://www.ycdc.gov.mm>)

1. Committee Office
2. Administration Department
3. Finance & Accounts Department
4. Assessor's Department
5. Engineering Department (Roads & Bridges)
6. Engineering Department (Buildings)
7. Engineering Department (Water & Sanitation)
8. Engineering Department (Drainage Management)
9. Urban Environmental Conservation & Cleansing Department
10. Markets & Commodities Center Department
11. Veterinary & Production Department
12. Vehicles, Heavy Machinery Management & Maintenance Department

13. Urban Land Administration Department
14. Playgrounds, Parks & Gardens Department
15. Public Relations & Information Department
16. Public Health Department
17. Urban Planning Department
18. Security & Disciplinary Department

The Mandalay City Development Committee-MCDC is the administrative body of Mandalay which has wide-ranging responsibilities, including city planning, land administration, tax collection, and urban development. MCDC raises its own revenues through tax collection, fees, licenses and property development.[13]

Projects are being carried out in all sectors with the three objectives;

- to make the city clean
- to keep the city beautiful
- to enable the city dwellers to enjoy a pleasant life

These objectives are being implemented by the following 14 departments of MCDC.

- (1) Administration Department
- (2) Motor Transport & Workshop Department
- (3) Market and Slaughter House Department
- (4) Finance Department
- (5) Revenue Department
- (6) Cleansing Department
- (7) Playgrounds, Parks and Gardens Department
- (8) Building and Central Stores Department
- (9) Roads and Bridges Department

(10)Water and Sanitation Department

(11)Urban Planning and Land Administration Department

(12)Public Relations and Information Department

(13)Inspection Department

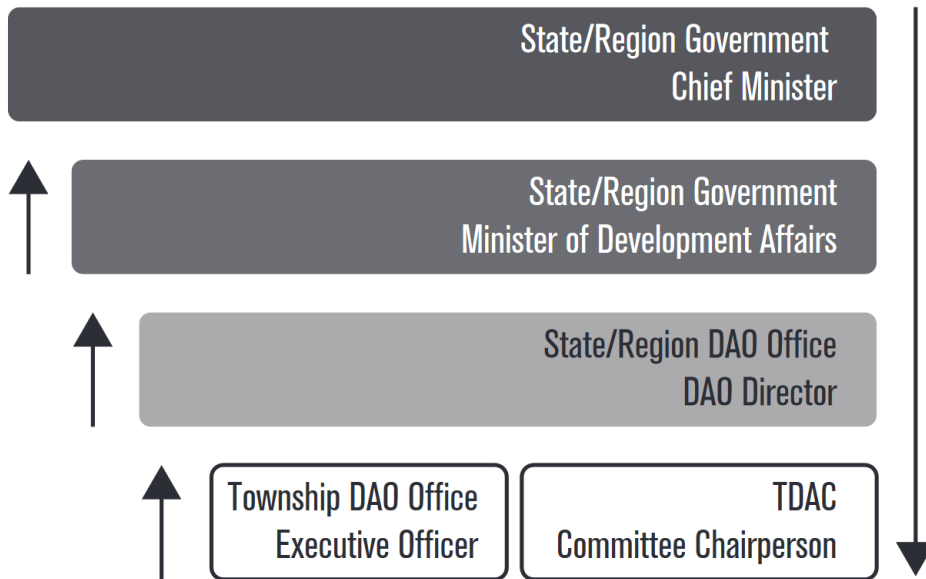
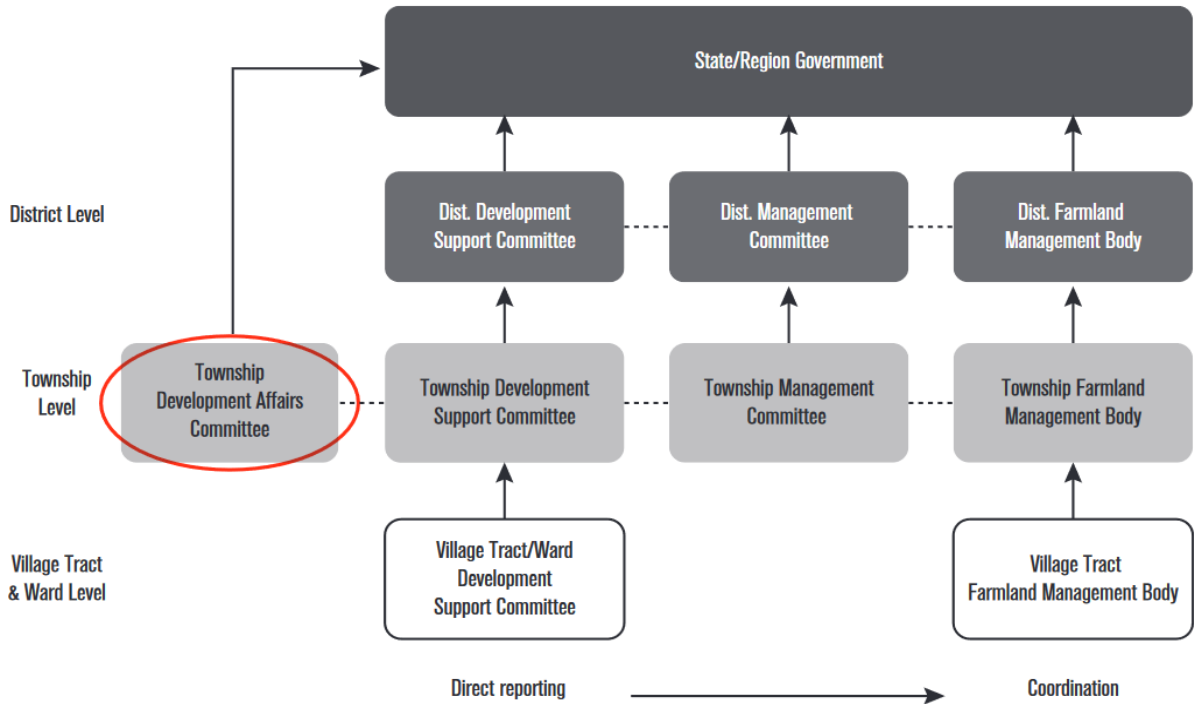
(14)Agriculture and Livestock Breeding Department

Besides these objectives MCDC has a strong drive to become an innovative or “Smart” city; implementing new technologies and setting up an e-government.

The Water and Sanitation Department is one of the 14 departments. They are responsible for the water supply and sanitation in Mandalay. At the moment, MCDC can serve piped-water of varying quality to around 30% of the city population for 8 hours per day on average, most residents now use bottled water for drinking and private shallow tube wells for household water. NRW is estimated at 60% - 75%. MCDC water and sanitation department therefore faces a challenge in improving its operations.

Starting from 2014, VEI has implemented two Water Operator Partnership (WOP) programs co-financed by Asian Development Bank (ADB). These programs supported to regenerate tube wells, to increase capacity in water quality testing, to develop a water safety plan, to enhance non-revenue water management and to boost knowledge on hydraulic modelling. Then, the collaboration was promoted into Mandalay’s Water WorX Project in 2018. The primary purposes of this project are to improve the overall performance of the Water and Sanitation department at MCDC and to provide support to deliver and expand adequate services to its clients.

According to the municipal governance in Myanmar, it is found that the structure of 14 state and region development affairs committees is illustrated as follow, [14]



## 6. Recommendations

Based on the above finding, it is recommended that hotspot/ target area should

be selected at Yangon region and Ayeyarwaddy region to share the knowledge on the sustainable development goals including clean water and sanitation for all, the causes of sedimentation and siltation in rivers, "Plastic pollution in Myanmar, the impact of open defecation or poor quality toilets, the water pollution from agriculture and disposal of black water, solid waste and liquid waste such as chemical fertilizer and pesticides into stream and rivers. It is recommended to try Criteria and indicator for sustainable cities and communities should be developed and try to apply at hotspot/ target area to give awareness raising on water related ecosystem, waste disposal, environmental justice, and mitigation measure.

It is also recommended to conduct field observation, data collection, questionnaire survey based on the criteria and indicators at selected sites. Proposed criteria and indicators are;

- 1) Is there waste collection service to all citizens?
- 2) Is there uncontrolled disposal and open burning?
- 3) Does the city and township development committee adopt environmentally sound waste management practices?(e.g., disposal at waterway, gully, stream, river, lake)
- 4) Are there enough environmentally sound disposal facilities?
- 5) Does the responsible organization such as Environmental Conservation Department ensure for the existence of sustainable and environmentally sound management of industrial and other hazardous wastes?
- 6) Does the people apply separate collection and sound treatment of hazardous waste system, including infectious medical waste, agro-chemical waste from non- hazardous waste?
- 7) Is there application of sound collection and environmentally friendly treatment of all industrial waste and agro-chemical waste?
- 8) Is there prevention of waste through 3Rs and thereby establish a resource circular society?
- 9) Does the city waste management strategies and action plans had been developed and implemented with actual waste reduction targets by all

CDCs and TDCs? What is the implementation status? What does they need?

- 10) Is there adoption of diverting the food waste from landfills?
- 11) Is there separate collection and set waste recycling targets for industrial, medical and other wastes?
- 12) Is there existence of sustainable financing mechanisms such as full cost accounting for waste service at All City and Township Development Committees?
- 13) Is there establishment of cost reflective tariffs for waste management services at All City and Township Development Committees?
- 14) Is there awareness raising, advocacy and capacity building program?
- 15) Is there evaluation of the townships that have implemented standard awareness-raising programs for their residents and behavioral change assessment?
- 16) Is there monitoring and evaluation on environmental education programs at schools, and behavioral change assessment for their students?
- 17) Is there compliance, monitoring, enforcement and recognition based on benchmark performance indicators at City and Township?
- 18) What is the status of the number of successful enforcement actions filed against non-compliant entities by City and Township Development Committees?
- 19) Are there partnership of CSOs, NGOs and local community based organization in implementing the Myanmar's National Waste Management Strategy and Master Plan, concerning with raising awareness, disseminating information, providing technical guidance, and policy recommendation?
- 20) Is there existence of cooperatives that serve to reduce waste generation?
- 21) Are there partnership of CSOs, NGOs and local community based

organization in shaping and influencing the political acceptability of waste management policies”

- 22) What does it need to Make cities and human settlements inclusive, safe, resilient and sustainable?

## **7. Conclusion**

It need to address lack of environmental ethic, environmental injustice, plastic waste problem, open defecation and water pollution in Myanmar. Participation of 14 state and region development affairs committees, Yangon City Development Committee-YCDC, Mandalay City Development Committee-MCDC, Nay Pyi Taw Development Committee, and all other township and city development committees is important for the Participatory Monitoring, Evaluation and Learning for the progress of the implementation of “Myanmar’s national waste management strategy and master plan”

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