

**United Nations Environment Programme  
International Environmental Technology Centre**



# **Needs Assessment Study on Capacity Building on Waste Management**

Prepared for the Global Partnership on Waste Management (GPWM)



# Asian Institute of Technology Regional Resource Centre for Asia and the Pacific

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## LIST OF ACRONYMS

ADB	Asian Development Bank
AfDB	African Development Bank
EBRD	European Bank for Reconstruction and Development
E-Waste	Electronic Waste
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GIZ	German Society for International Cooperation, Ltd.
GPWM	Global Partnership on Waste Management
HW	Hazardous Waste
HCW	Healthcare Waste
IADB	Inter-American Development Bank
IFC	International Finance Corporation
I-Waste	Industrial Waste
JICA	Japan International Cooperation Agency
OECD	Organization for Economic Cooperation and Development
KOICA	Korea International Cooperation Agency
ML	Marine Liter
MSW	Municipal Solid Waste
OW	Organic Waste
RRC AP	Regional Resource Centre for Asia and the Pacific
SIDA	Swedish International Development Cooperation Agency
SWM	Solid Waste Management
UN Habitat	United Nations Human Settlements Programme
UNDP	United Nations Development Programme
UNEP-IETC	United Nations Environment Program-International Environment Technology
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USAID	United States Agency for International Development
SIDA	Swedish International Development Cooperation Agency
WAB	Waste Agriculture Biomass
WP	Waste Plastic
WW	Waste Water

## I. INTRODUCTION

1. The Global Partnership on Waste Management (GPWM) was launched in November 2010 to enhance cooperation among stakeholders and coordinate waste management activities. Specifically, this initiative aims to identify information gaps on waste management and fill in these gaps through information sharing, awareness strengthening, capacity building, improving governance to promote resource conservation and efficiency. The GPWM is an open-ended partnership for international organizations, governments, business, academic institutions, local authorities and non-governmental organizations. The International Environmental Technology Center (IETC) serves as the secretariat of the GPWM.
2. The first report on the Survey of Needs Assessment was conducted in 2011 with an aim of identifying the gaps in the waste management activities around the world and to provide information of what new activities are needed taking into consideration possible partnerships opportunities among stakeholders that will ultimately contribute to avoiding duplication of waste management efforts. The Needs Assessment survey complements the mapping of the ongoing waste management projects that are being implemented by the major international organizations.
3. The Second Edition of the Needs Assessment Report spin off from the maiden report and focused on the implementation of waste management projects particularly in developing nations during the period 2012-2016. This is in line with the GPWM commitment of updating the report on a biennial basis. The second edition also included the conduct of a survey of selected organizations and country focal persons on waste management. Likewise, the second edition of needs assessment complements the mapping of the ongoing and completed waste management projects of about 17 international organizations implementing 188 waste management projects in different parts of the world. The needs assessment report shall provide information on the demand side of waste management while the mapping of waste management projects shall contribute to the supply side of waste management in the global perspective.
4. The Second Edition considers the 7 GPWM thematic areas of solid waste management namely Waste Management and Climate Change, Waste Agricultural Biomass, ISWM, Waste Minimization, Electronic Waste, Marine Litter and Hazardous Waste. Things which do not have use or value are wastes and those still have utility are considered resources. Based on the Guidelines for National Waste Management Strategies Moving from Challenges to Opportunities of UNEP 2013, looking into the aspect of waste streams is important as it provides significant information as to the identification of waste sources (generation), its collection, treatment, and disposal as well as provides inputs in policy formulation and program development. For instance, building and demolition operations are the main sources of construction and demolition waste, packaging waste comes from multiple sources like households, public facilities, offices, retail operations, etc. Waste streams are composed of different materials and have different health and environmental impacts. Interesting to mention

that waste is usually divided into hazardous and non-hazardous waste. Consequently, the methods by which various waste streams are collected, recovered, processed, treated or disposed of may vary broadly. Hence, the policy applied to each waste stream will need to recognize and take into account these differences in order to achieve the relevant policy objective.

5. The purpose of this report is to identify the capacity development needs of the different countries in the implementation of waste management. The report also aims to complement supply with the demand for waste management services around the world, to provide stakeholders opportunities for projects partnerships and to harmonize efforts and avoid duplication. The report highlights waste management projects particularly from the developing nations with an end goal of identifying capacity needs on waste management.

## **II. METHODOLOGY**

6. The Second Edition Report was based generally on the review of the Global Partnership on Waste Management maiden report and a desktop review of the existing waste management of the 43 countries in the Asian, American and African Regions. An excel sheet summarizing the data from the desktop research were utilized in the analysis presented in the different tables.
7. In addition, a survey was conducted using a questionnaire to selected organizations and focal persons on waste management from various countries in the three regions via internet. Nineteen (19) countries responded to the survey and provided information on the specific capacity building needs to implement waste management. Furthermore, an actual interview with selected country focal persons was also conducted to get first-hand information about the actual capacity building needs of concerned agencies and countries on waste management. But this was done to only a few countries. The data were analyzed based on 7 GPWM thematic areas of solid waste management enumerated earlier but focus only on the five (5) considering that marine litter and waste and climate change were not so much given attention by the sources of information. The identified capacity development needs in the completed questionnaires were consolidated and classified into five (5) focus areas namely, organizational capacity affecting SWM, SWM technology, human resource capacity, advocacy and knowledge management and partnership and alliance building capacity.
8. The information contained in the needs assessment report were based on the responses made by the focal persons and country representatives by completing the survey questionnaires sent via email and by allowing the consultant to conduct the face to face interview.

## **III. ORGANIZATIONS AND COUNTRY FOCAL PERSONS SURVEY RESULTS**

9. The following are the consolidated findings of the interview and the completed questionnaires particularly from Brunei, Cambodia, Cameroon, Colombia, Congo, Dominican Republic,

Gambia, India, Indonesia, Iraq, Kuwait Lao PDR, Myanmar, Philippines, Republic of Yemen, Slovakia, Swaziland, Thailand, and Vietnam.

- Waste management policies are present in the concerned countries but these are not properly complied with due mainly to inadequate human resources. This is aggravated by the lack of technical competence and insufficient funding.
- Waste management project implementation does not relate to the issues and concerns of climate change adaptation, greenhouse gases and marine litter.
- Some knowledge products on waste management are already available but these are not utilized efficiently to disseminate to increase the level of awareness and improve waste management practices of citizens of the different countries.
- Waste management policies are available at the central/national government to address the different thematic areas of waste management such as ISWM, waste minimization, electronic waste, hazardous waste and waste agricultural biomass. However, the implementation and enforcement of these policies are inadequate.
- There is a gray area among agencies of the government in the different countries to monitor marine litter.
- The technical knowledge on Life Cycle Analysis, treatment and recovery of electronic wastes, management, and treatment of hazardous wastes are implemented not in a sustainable manner.

#### **IV. CAPACITY DEVELOPMENT NEEDS IDENTIFIED BY THEMATIC AREAS**

##### **Regional Assessment of Capacity Development Needs by Thematic Areas**

10. Based on the desktop review of country reports, the following are the salient findings. The assessment includes forty-three (43) countries using seven (7) thematic areas but highlighting only five (5) as information provided for marine litter and waste and climate change are very limited.
11. Table 1 summarizes the capacity development needs of the different regions by thematic areas. Almost all of the countries (42 out of 43 countries in the three regions considered ISWM and (40 out of 43 countries) Hazardous Waste Management as the areas which the waste management implementation requires capacity building. The different countries in each region have identified their limitations based on the waste streams (See Table 2).



**Table 1. Number of Countries per Thematic Areas by Region**

Thematic Areas	No. of Countries per Region				
	Africa	America	Asia	Total	%
Integrated SWM	15	11	16	42	98%
Hazardous Waste	14	11	15	40	93%
Waste Minimization	14	8	13	35	81%
Waste Agricultural Biomass	13	7	12	32	74%
E-Waste	11	9	11	31	72%

**Table 2. List of Countries by Thematic Areas by Region**

AFRICAN REGION				
E-Waste	Hazardous Waste	ISWM	WAB	Waste Minimization
Burkina Faso	Burkina Faso	Burkina Faso	Burkina Faso	Burkina Faso
Chad	Chad	Chad	Chad	Chad
Egypt	Cote d'Ivoire	Cote d'Ivoire	Cote d'Ivoire	Cote d'Ivoire
Ethiopia	Egypt	Egypt	Ethiopia	Egypt
Kenya	Ethiopia	Ethiopia	Guinea-Bissau	Ethiopia
Lesotho	Guinea-Bissau	Guinea-Bissau	Kenya	Guinea-Bissau
Madagascar	Kenya	Kenya	Lesotho	Kenya
Niger	Lesotho	Lesotho	Madagascar	Lesotho
Sierra Leone	Madagascar	Liberia	Mali	Madagascar
South Africa	Mali	Madagascar	Niger	Mali
Zambia	Niger	Mali	Sierra Leone	Niger
	Sierra Leone	Niger	South Africa	Sierra Leone
	South Africa	Sierra Leone	Zambia	South Africa
	Zambia	South Africa		Zambia
AMERICAN REGION				
E-WASTE	HAZARDOUS WASTE	ISWM	WAB	Waste Minimization
Argentina	Argentina	Barbados	Barbados	Barbados
Chile	Barbados	Argentina	Argentina	Brazil
Colombia	Brazil	Brazil	Brazil	Costa Rica
Costa Rica	Colombia	Colombia	Costa Rica	Honduras
Honduras	Costa Rica	Costa Rica	Honduras	Mexico
Mexico	Honduras	Guatemala	Mexico	Paraguay
Paraguay	Jamaica	Honduras	Trinidad and Tobago	Saint Lucia
Saint Lucia	Mexico	Mexico		Trinidad and Tobago
Trinidad and Tobago	Paraguay	Paraguay		

**ASIAN REGION**

<b>E-WASTE</b>	<b>HAZARDOUS WASTE</b>	<b>ISWM</b>	<b>WAB</b>	<b>Waste Minimization</b>
Cambodia	Azerbaijan	Azerbaijan	Azerbaijan	Azerbaijan
India	Bangladesh	Bangladesh	Bangladesh	Bangladesh
Indonesia	Cambodia	Cambodia	Cambodia	Cambodia
LAO PDR	India	India	Indonesia	India
Malaysia	Indonesia	Indonesia	LAO PDR	Indonesia
Nepal	LAO PDR	LAO PDR	Malaysia	LAO PDR
Pakistan	Malaysia	Malaysia	Nepal	Malaysia
Philippines	Mongolia	Mongolia	Pakistan	Nepal
Thailand	Nepal	Nepal	Philippines	Pakistan
Vietnam	Pakistan	Pakistan	Thailand	Philippines
Yemen	Philippines	Philippines	Vietnam	Thailand
	Thailand	Sri Lanka	Yemen	Vietnam
	Ukraine	Thailand		Yemen
	Vietnam	Ukraine		
	Yemen	Vietnam		
		Yemen		

**Specific Capacity Development Needs Identified by Country**

- Based on the review of the country reports, there are about nine hundred sixteen (916) different specific capacity development needs which were identified in the implementation of waste management in various countries in the three regions. These identified capacity development needs were classified into five (5) focus areas, namely organizational capacity affecting SWM, SWM technology, human resource capacity, advocacy and knowledge management and partnership and alliance building capacity.
- Among the five focal areas, organizational capacity is the most commonly considered capacity building needs (50%) on solid waste management in the different countries in the three regions, while partnership and alliance building capacity (6%) is the least identified needs. The specific organizational capacity needs are in the area of funding, infrastructure and facilities, technical skills and competencies, policy (and review), systems and procedure and institutional arrangements and coordination. Table 3 presents details of the specific capacity development needs of the different countries in the 3 Regions.

**Table 3. Specific Capacity Development Needs of the different countries on solid waste management**

<b>Specific Capacity Development Needs</b>	<b>Data Count</b>	<b>%</b>
<b>Advocacy and knowledge management</b>	<b>124</b>	<b>13.54%</b>
Awareness campaign	87	9.50%
Knowledge exchange	8	0.87%
Research	29	3.17%
<b>Human Resource capacity</b>	<b>129</b>	<b>14.08%</b>
Technical skills and competencies	129	14.08%
<b>Organizational capacity affecting SWM</b>	<b>458</b>	<b>50.00%</b>
SWM laws, enforcement / Implementation	77	8.41%
Funding	149	16.27%
Incentive System	10	1.09%
Institutional arrangements and coordination	91	9.93%
Monitoring	11	1.20%
Policy (and review), systems and procedure	118	12.88%
Transparency of information	2	0.22%
<b>Partnership and alliance building capacity</b>	<b>63</b>	<b>6.88%</b>
Community Engagement	37	4.04%
Participation or investment from Private sector	18	1.97%
Extended Producers Responsibility	5	0.55%
Mechanism on informal waste recyclers	3	0.33%
<b>SWM Technology</b>	<b>142</b>	<b>15.50%</b>
Infrastructure and Facilities,	142	15.50%
<b>Grand Total</b>	<b>916</b>	<b>100.00%</b>

14. Table 4 shows that in SWM based on thematic areas namely hazardous waste, waste minimization, electronic waste, waste agriculture biomass, ISWM, marine litter and waste and climate change, most of the countries in the study have limitations in managing SWM in almost all the thematic areas (except marine litter and waste and climate change). Among the five thematic areas, hazardous waste has the highest percentage rate of identified capacity building needs (41%). Of the 376 capacity development needs identified to implement hazardous waste management almost 200 are referring to organizational capacity affecting SWM implementation.

**Table 4. Capacity Development Needs Identified by thematic areas by Region**

Focus Area	Africa	America	Asia	Total	%
<b>E-waste</b>	<b>39</b>	<b>32</b>	<b>37</b>	<b>108</b>	<b>12%</b>
Advocacy and knowledge management	11	8	8	27	<u>3%</u>
Human Resource capacity	1	4	5	10	<u>1%</u>
Organizational capacity affecting SWM	20	14	19	53	<u>6%</u>
Partnership and alliance building capacity	1	3		4	<u>0%</u>
SWM Technology	6	3	5	14	<u>2%</u>
<b>Hazardous Waste</b>	<b>143</b>	<b>83</b>	<b>150</b>	<b>376</b>	<b>41%</b>
Advocacy and knowledge management	18	13	13	44	<u>5%</u>
Human Resource capacity	18	11	26	55	<u>6%</u>
Organizational capacity affecting SWM	71	45	82	198	<u>22%</u>
Partnership and alliance building capacity	12	5	6	23	<u>3%</u>
SWM Technology	24	9	23	56	<u>6%</u>
<b>Integrated SWM</b>	<b>51</b>	<b>57</b>	<b>64</b>	<b>172</b>	<b>19%</b>
Advocacy and knowledge management	4	2	6	12	<u>1%</u>
Human Resource capacity	8	14	14	36	<u>4%</u>
Organizational capacity affecting SWM	24	27	27	78	<u>9%</u>
Partnership and alliance building capacity	2	9	6	17	<u>2%</u>
SWM Technology	13	5	11	29	<u>3%</u>
<b>Waste Agricultural Biomass</b>	<b>45</b>	<b>45</b>	<b>58</b>	<b>148</b>	<b>16%</b>
Advocacy and knowledge management	5	5	12	22	<u>2%</u>
Human Resource capacity	3	7	6	16	<u>2%</u>
Organizational capacity affecting SWM	22	23	28	73	<u>8%</u>
Partnership and alliance building capacity	3	1	3	7	<u>1%</u>
SWM Technology	12	9	9	30	<u>3%</u>
<b>Waste Minimization</b>	<b>46</b>	<b>28</b>	<b>38</b>	<b>112</b>	<b>12%</b>
Advocacy and knowledge management	6	6	7	19	<u>2%</u>
Human Resource capacity	3	4	5	12	<u>1%</u>
Organizational capacity affecting SWM	28	8	20	56	<u>6%</u>
Partnership and alliance building capacity	2	6	4	12	<u>1%</u>
SWM Technology	7	4	2	13	<u>1%</u>
<b>Grand Total</b>	<b>324</b>	<b>245</b>	<b>347</b>	<b>916</b>	<b>100%</b>
<b>%</b>	<b>35%</b>	<b>27%</b>	<b>38%</b>	<b>916</b>	<b>100%</b>

## **Narratives of Capacity Building Needs Assessment Per Waste Stream in the Three Regions**

### **Hazardous Waste**

15. Hazardous waste refers to solid waste management or combination of solid waste which because of its quantity, concentration or physical, chemical or infectious characteristics may: (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed (RA 9003 of 2000).

#### *Asian Region*

16. In Azerbaijan, legislation on hazardous waste disposal exists covering healthcare waste but not e-waste. The technological infrastructure for industrial waste management, technical guidelines, funds, and skilled human resources are needed in order to enforce regulations.

17. In Bangladesh, hazardous waste is not appropriately managed. The Department of Environment (DoE) lacks sufficient skilled human resources, advanced technological facilities, and infrastructural access. DoE to enforce the regulations public awareness is still not satisfactory, even amongst the educated social strata, to which waste producers such as hospital staff belong. Enforcement of regulations is of a greater concern because E-waste, in particular, is funds for technological facilities to safely dispose of hazardous waste, such as incinerators and autoclaves, are lacking.

18. In Cambodia, there is a need to facilitate the enforcement of regulations, improve the technical understanding of officials, increase of incentives for public participation is necessary, whether for the reporting of mismanagement of industrial waste or simply to steer the public away. This renders capacity-building tasks such as constructing incinerators and creating awareness of healthcare waste hazards rather difficult. Regulations on healthcare waste management are inadequate but are currently being amended for improvement. Gaps in the institutional responsibilities for healthcare waste management; private sector could be better involved and better educated on safe hazardous waste management practices.

19. There is a lack of awareness regarding the regulations in India, either among healthcare staff or even among officials. There is a need to improve enforcement and awareness of regulations and to give financial support to hazardous waste management. Responses propose the development of innovative technologies for hazardous waste management and clean-up, including its use as a resource or energy recovery. Technical understanding is thus also an important area for capacity-building and the enforcement of hazardous waste regulations needs to be more comprehensive and skilled human resources for regulatory authorities are necessary.

20. In Indonesia, there is a poor coordination with other departments and agencies, insufficient regulatory capacity and a lack of infrastructure to reach established targets, however, hinder non-compliance with relevant international regulations and Multilateral Environmental

Agreements (MEAs) such as the Stockholm Convention, Basel Convention and the Strategic Approach to International Chemicals Management (SAICM). Insufficient monitoring, controlling and enforcement of hazardous waste treatment and disposal. The lack of waste handling and treatment facilities, poor technical and scientific understanding of hazardous waste management, and Capacity building or technical and scientific understanding about the sources of hazardous waste as well as its prevention, minimization and management could be improved by targeted campaigns, raising awareness on the adverse impacts of hazardous waste on the environment and human health lack of funding. Hazardous wastes from the health care sector needs to be integrated in the review and amendment of the existing healthcare waste management policies needs to take into account the relevant MEAs (Stockholm Convention and Basel Convention), SAICM and relevant guidance (such as the GEF guidance on healthcare waste management) by linking improved procurement practices and the green healthcare concept. Building capacity for providing waste handling and treatment facilities and its respective technical guidelines. A Public-Private Partnership scheme on medical wastes management has already been introduced in one province and needs to be reviewed for replication in other areas.

21. In Lao PDR, responsible institutions do not share information and work collectively in tackling the problem. Specific regulations regarding industrial waste are absent, optimal disposal sites for industrial waste are chosen, creating an environmental and/or public health hazard. The responses mention certain activities that require better funding, to monitor waste disposal activities, and to procure waste collection equipment. The National legislation specifically addressing hazardous and chemical waste does not exist and lacks adequate capacity to discover, monitor, and address breaches. The capacities of hazardous waste management institutions in Lao PDR thus need to be strengthened; the development of a set of technical guidelines, as well as financial assistance from abroad, would also be useful for hazardous waste management failure of institutions to coordinate activities or share information. Technical understanding and available equipment for the waste stream are also poor and the responsible institutions need to be better coordinated because the transparency of information emerges as an issue. Funds and technical guidelines should also be made available to the country and waste generators if management is to be more effective.
22. In Malaysia, a set of technical guidelines aimed at industrial waste management in both sectors may be needed. The monitoring of the industrial waste management system should be comprehensive, given that dumping activities are sometimes not reported to authorities. Identification of gaps in waste management is thus needed. Hazardous waste regulations should be complemented by a more comprehensive policy framework for a more effective implementation. There should also be improvements in technology. The state would welcome technological assistance on hazardous waste minimization strategies, including the use of alternative chemicals and the redesigning of products with a life cycle focus to ensure a decrease in hazardous waste generation capacity-building in creating public awareness of the issue.

23. There should be better hazardous waste management in Mongolia, given that the country imports a significant amount of second-hand goods from China, South Korea, and Singapore. Lack of a repair industry and the lack of spare parts for products with partial defects.
24. Nepal's highest priority need is capacity building and the overall improvement in healthcare waste management is needed, with a focus on the enactment of a clear healthcare waste policy. There must be the identification of safe disposal sites and preparation of technical guidelines on waste management. Industrial waste management is not regulated by legislation in Nepal thus, technical guidelines still remain priority areas for capacity building.
25. Pakistan's public institutional capacity for the implementation of industrial waste policies needs strengthening. The public sector also does not currently have the technical capacity, in terms of facilities, to handle industrial waste, regulatory and scientific capacity is in need of strengthening, local industries also lack the financial capacity to construct waste management facilities. Hazardous waste is mainly generated by industries and hospitals in Pakistan. The responses show that these waste generators are primary targets for capacity building; while industrialists are also generally unaware of waste management principles; Waste collection in industries and hospitals is performed by staff with no training on hazardous waste management. Industries do not have the financial resources to install waste management facilities such as incinerators, public waste management facilities are few in number and generally old, hospitals generally lack the financial resources to contribute to healthcare waste management, skilled human resources are scarce and healthcare waste is often treated as part of MSW. Both the financial and technical capacities of the healthcare sector must be strengthened for the practice of waste management at source. While healthcare waste is covered by legislation, it is not effectively enforced.
26. In the Philippines, there is Republic Act 6969 Hazardous Waste Act. The responses suggest the drafting of an Extended Producers Responsibility Bill, so as to compel industrial waste generators to further participate in waste management efforts. The technical capacity in managing hazardous waste in the Philippines could be much improved. There are currently no large-scale treatment and disposal facilities for hazardous wastes in the country. There is much room for the development of clean or energy-efficient technologies, and (low-cost) non-combustion processes for hazardous waste disposal have been suggested as a focal area for capacity-building. The legislation is underdeveloped regarding hazardous waste. The country would benefit from developing regulations on hazardous and radio-active waste management, including the banning of consumer products containing certain hazardous chemicals; Enforcement capacity must, therefore, be strengthened. The legislation also requires updating to reflect emerging waste management issues, such as the safe closure and rehabilitation of abandoned or inactive mines. Safe non-combustion technologies for the treatment and disposal of healthcare waste (as to avoid pollution in breach of the Clean Air Act) need to be acquired. Skilled human resources for healthcare waste management are also in demand. As financial capacity is weak, encouragement of the private sector to participate in research and development programmes for healthcare waste management is suggested. Policies need to be

developed with regards to the monitoring of healthcare waste policies need to be complimented by enforcement mechanisms.

27. Thailand industrial waste is ranked as a very important area for capacity-building and there is much room for improvement regarding enforcement. Funds will be needed for the monitoring of industrial waste disposal, as well as to encourage policy compliance by improving accessibility to waste collection and treatment equipment. Hazardous waste management is also seen as a great priority. Areas of capacity-building include the enactment of policy. Thus a general direction needs to be given to hazardous waste policy, consisting of economic instruments such as encouraging the private sector to invest in waste management activities. Hazardous waste regulations also need to be more effectively enforced many of these local governments do not have the technical capacity to do so. There are no national regulations or guidelines for healthcare waste in the country, thus some healthcare facilities, especially smaller clinics, treat healthcare waste no differently to MSW. Waste management facilities and technology will also have to be procured, and private sector investment would be welcome.
28. Ukraine's highest priority are waste streams, its policy and regulatory, technical, scientific and financial. The country does not have specific policy for hazardous waste.
29. In Viet Nam, capacity-building is generally required across all areas with regards to industrial waste management. Viet Nam's technical capacity for industrial waste management must also be improved; Technical guidelines should be made available and environmental awareness should be improved among waste generators. While industrial waste legislation exists, it needs to be better enforced by relevant institutions. A framework for the delegation of responsibilities in policy enforcement is thus needed technical capacity needs to be strengthened; the public must be made aware of the risks of hazardous waste; while there is good coordination among governmental institutions responsible for hazardous waste, coordination in the private sector must be improved. Legislation and policies for the treatment of healthcare waste exist in Viet Nam, enforcement capacity will need to be improved. Skilled human resources, technical equipment for the management of healthcare waste are lacking. Small and old incinerators need to be replaced, technical guidelines need to be developed, targeting waste generators. Funds will be needed for this purpose.
30. In Yemen, social and institutional ranked as the highest priority area for capacity-building. It is a priority to develop legislation and regulations to enforce waste management plans. Funds will also be needed to educate waste generators in practices such as waste segregation for the purchase of equipment to treat healthcare waste. Healthcare and environmental institutions will need to better coordinate their activities to effectively implement waste management plans.



## *American Region*

31. In Argentina, there is a need to clarify responsibilities among administrative levels. Training for operators needs to be enhanced to ensure their work safety. There is also a need to update the characterization of the toxicity of wastes and develop a regulation on industrial waste.
32. In Barbados, more comprehensive and data-based assessments on the composition and quantity of industrial waste are necessary. Funds are also needed for technologically-advanced treatment of industrial waste would be welcomed by both the public and private sectors. However, the capacity for the enforcement of regulations, especially of local municipalities, can be improved. The understanding of hazardous waste management in Barbados could be improved by data-based assessments on waste composition and quantity, public educational campaigns on potential health and environmental risks of mismanaged waste. Better coordination of government institutions and better training of staff responsible for waste management would also make a positive impact.
33. Even though industrial waste management laws exist in Brazil, economic instruments are needed to support their enforcement. An inventory of best practices needs to be developed to enhance technical understanding of industrial waste management. However, law enforcement and technical guidance. Need to be supported by data and statistics on industrial waste. A consensus on indicators and limits of hazardous substances in waste must first be reached, before policies and implementation strategies can be developed. Methods of safe and efficient waste segregation, when dealing with hazardous wastes, need to be developed, including an inventory of best practices for e-waste management. Data on waste generation needs to be compiled, while preparation also needs to be made for the recovery of contaminated sites. An understanding of waste segregation of hazardous waste from MSW must also be created among the general public
34. In Colombia, there is still a need to update national regulations on transportation of hazardous waste and on competencies of authorities at regional level to ensure effective control and compliance. There is also a need to develop a regulation on the establishment of landfills for the safe disposal of hazardous wastes. Hence, there is a clear need to promote the national hazardous waste management policy with local waste management authorities. The existing policy also needs to be promoted with waste generators as these often do not know about their responsibilities regarding hazardous waste management. The existing regulations on healthcare waste need to be updated and harmonized with the existing national hazardous waste policy. Related to the need for updating the policy on healthcare waste is the need to update the technical guidelines on healthcare waste management
35. Although the normative framework exists in Costa Rica, control mechanisms that are being implemented by the Ministry of Health need to be developed further, and new ways of exerting control with scarce human and financial resources need to be explored. It is also important to make funds available to deal with those substances that cannot be treated or disposed of within the country.

36. In Honduras, the areas in which capacity building is needed most are policies, regulations, and finance. Strengthening of technical knowledge of waste management staff, and social awareness of the risks of healthcare waste and enforcement of existing regulations need to be improved. The needs for capacity-building in industrial waste management mainly centre upon policies/regulations and finance. There is also a need for specific regulations on industrial waste management. Finally, there is a need to sensitize and involve relevant stakeholders in establishing waste management plans for industrial wastes.
37. In Jamaica, regulations on trade effluents need to be better enforced. Moreover, there is a lack of knowledge and interest in environmentally sound waste management practices in the industrial sector. Responsibilities of government bodies (such as the National Solid Waste Management Authority, the Ministry of Health, and the National Environment and Planning Agency) must be made clear and realistic, in order to prevent issues from falling outside the scope of responsibility of all institutions. Cooperation is needed at all levels to improve hazardous waste management in Jamaica. The country also needs more guidance from international conventions (such as the Cartagena Convention) in developing hazardous waste policies and regulations, especially regarding the transboundary movement of waste. Public awareness programmes should be designed with the aim of involving the public in the monitoring and enforcement framework. Finally, cooperation with the private sector is needed in order to procure funds for hazardous waste management.
38. In Mexico, the responses suggest that the development of private sector industries for recycling waste tires and rims should be made a priority. Recycled tires and rims are expected to be useful as a resource for public works projects, the general public must be made aware of these benefits if waste segregation and recycling is to take place. Above all, financial investment needs to be made the construction of facilities for the treatment and disposal of hazardous and industrial waste in Campeche. The responses emphasize that facilities will need to be able to cover a wide range of waste, including pesticides, agricultural chemicals, and batteries. The state government needs to cooperate with non-governmental organizations, the private sector, and community representatives. In particular, the healthcare sector has not been the target of many educational campaigns. As waste generators, the support of healthcare staff is clearly required. Finally, better financial investment into healthcare waste management would be welcome. Femsa Foundation identifies the need to create and improve technical capacities in the private sector. In order to increase the price for materials and hence attract private investment, it is necessary to put in place incentives. The funding of infrastructure, such as needs to be complemented by incentives to increasingly use recycled materials. New recycling plants and improved collection systems, Mexico City does not have its own plans regarding the hazardous and industrial waste streams. Mexico City does not have its own regulations regarding the hazardous and industrial waste streams. Technical guidelines for waste management should be made available. The technical and financial capacity of the country needs to be improved above all. More research needs to be undertaken on hazardous waste in Mexico. In particular, hazardous waste prevention and the remediation of polluted soils are two issues that require immediate attention. The lack of financial resources and facilities to treat, in particular, hazardous waste from the industrial sector, needs to be

addressed above all. Furthermore, the industrial sector and governmental institutions need to cooperate and coordinate their efforts in the industrial waste disposal. Nevertheless, the responses by MGM Inova suggest that strengthening the technical capacity and awareness of healthcare staff on waste management appears important. In particular, the consequences of mismanagement of healthcare waste are rarely considered by healthcare staff although regulations exist and are partially implemented, the emissions from industrial waste still need to be addressed, as they create local air pollution and lead to respiratory diseases in the city. There is also a need to strengthen institutional capacity and coordination between the public and the private sector. In addition to emissions affecting the broader public, workers directly exposed to the risks of dealing with industrial waste need to be better trained. There is a need to improve hazardous waste management. To improve equipment there is also a need to strengthen coordination and cooperation between the government and the private sector. Healthcare facilities need to finance their own waste management, including training for healthcare facility staff.

39. In Paraguay, the management of industrial waste needs to be significantly improved. Nevertheless, technical and scientific knowledge at the level of the authorities needs to be enhanced. However, regulations need to be updated and responsibilities among authorities need to be clarified. However, another major issue is the lack of public awareness on the importance of hazardous waste management. Healthcare waste is disposed of in incinerators with waste generators responsible for the cost of these services. However, these capacities still need to be strengthened in local authorities.
40. In Saint Lucia, current legislation will nevertheless require harmonization, while institutions responsible for its enforcement will need to be better coordinated and given clearer roles.
41. The responses in Trinidad and Tobago suggest that it is not yet clear which ministries and institutions will be responsible for hazardous waste management, while considerable funds also need to be sought for policy implementation. Nevertheless, the enactment and enforcement of prepared legislation should be priorities for the country. To find a solution to the lack of financial resources to encourage waste minimization and safe disposal. Legislation will also need the potential for capacity-strengthening in public education, as awareness of emission and pollution hazards is low. Technical guidelines for biomedical waste management, also need to be developed. Importantly, however, healthcare-related sectors need to be made aware of these practices if they are to participate in waste management at source to showcase the best waste management practices or technologies available. Funds will then be needed to implement or procure the technologies.

### ***African Region***

42. In Burkina Faso, there is a pressing need for funding, because it is currently lacking for the procurement of technology needed for the collection and disposal of healthcare waste. Equally, skilled human resources for the maintenance of machinery such as incinerators would be greatly welcomed. International partnerships to make available funds, technology, and skilled human resources would be greatly welcomed. Collaboration between the industrial

sector and governmental institutions responsible for the environment would benefit industrial waste management. Hazardous waste such as pesticides, batteries, lubricating oils and radioactive material is found in the country and better methods for waste characterization. Burkina Faso also requires funding for the transportation and storage of hazardous waste. Public awareness on the health risks of hazardous waste could also be improved. Expansion into a clear framework of action and expansion in the mandate of governmental institutions upon the environment would have a positive impact.

43. In Chad, awareness and communication activities are thus needed. The responses also suggest that technical capacity is an area where improvement is greatly needed, given that much healthcare waste management equipment in Chad is substandard. Financial investment is desperately needed for the purchase of new equipment for healthcare waste collection, transportation, incineration and landfilling, while understanding of the methods of using equipment should also be improved. However, there is firstly a need to harmonize this framework with international law, and secondly a need to build enforcement capacities in the country. There is, therefore, a need to strengthen understanding and involvement on both the institutional and social levels. However, as industrial activity is increasing, it is necessary to take measures to prepare sound institutional capacities for industrial waste management in the country. It will be also necessary to build good waste management practices especially in the industrial sector.
44. In general, Cote d'Ivoire requires funds. Thus aside from the availability of funds, to implement better strategies for the management of industrial waste. Cote d'Ivoire would also benefit from more specific regulations regarding industrial waste disposal, and better waste management education of industrial waste generators. However, again, funds are lacking for equipment, such as autoclaves, to safely dispose of hazardous waste. It also requires regulatory expansion and enforcement to cover hazardous waste, and in particular, e-waste.
45. In Egypt, building capacities for the enforcement of regulations and for the creation of economic instruments are required. A priority for Egypt's Ministry of Environment lies in the improvement of technical and scientific capacities in private companies, public industries, and administrations. Building up human capacities and technical knowledge about cleaner production approaches, resource efficiency and sustainable consumption and production are the essential management of hazardous waste in Egypt. Complementing local efforts with resource mobilization as well as better coordination on the regulatory and policy level will be key in achieving improved results in mobilizing resources for strengthened enforcement and training staff in public administrations and the healthcare sector are important components for better managing this waste stream. Involving the community, through education and awareness campaigns, is also required to improve the overall management of this waste stream.
46. In Ethiopia, Industrial waste generators need to better understand the concepts of waste prevention and minimization. They need to be equipped with cleaner production methods. From a societal perspective, public awareness of industrial waste hazards could also be improved. The enforcement of existing policies and regulations could also be strengthened.

The first step towards better hazardous waste management is thus the enactment of legislation on treatment and disposal. Public awareness of hazardous waste risks could be increased. Finally, institutional coordination, including the exchange of information and integration of work, could be improved. Although there are policies and regulations regarding healthcare waste in the country, they are poorly implemented and enforced. Coordination among authorities could thus also be strengthened and clear roles should be made for each body. The lack of funds and low public awareness also are significant problems with regards to improving the management of healthcare waste.

47. In Guinea-Bissau, regulations for healthcare waste management, such as the hygiene law and environmental framework law, exist but are not enforced adequately due to a lack of economic capacity. Responsibilities for healthcare waste management should be better organized, with better coordination among institutions such as the Ministries of Environment and of Health. The country would benefit from a source of funding to acquire waste collection equipment. It would also benefit from the introduction of a policy framework to deal with industrial waste management, including the maintenance and management of technological equipment. Many stakeholders and responsible institutions exist with regard to industrial waste and they could be better coordinated, while areas of authority should be clearly delegated. The legislation, therefore, is an area of capacity building for Guinea-Bissau. Technical and financial capacity for the treatment of hazardous waste and e-waste is also poor. Public awareness of the risks of hazardous waste needs to be improved. Finally, the coordination among institutions and stakeholders, including the private sector, should be strengthened.
48. The most immediate task faced in Kenya is to develop a policy and regulatory framework for industrial waste, given that no legislation currently exists, and institutions responsible for waste management do not coordinate their efforts. A better technical and scientific understanding of industrial waste management is also needed to support the development of policies, while funds are needed to set up facilities. Funds are required to maintain and expand healthcare waste infrastructure such as autoclaves and incinerator while better research is needed on effective waste segregation and disposal methods. Public awareness of the hazards of mismanaged waste could also be improved while cooperation between governmental and healthcare institutions could be strengthened. Steps still need to be taken to minimize hazardous waste generation, such as improving public awareness of its risks to health and the environment. Better cooperation with other waste management institutions in the country is also desirable.
49. Lesotho needs to build upon its technical capacities of managing industrial waste. With regard to hazardous waste management, the responses suggest that legislative and technical capacity is the main area to be improved. Differing governmental priorities also deplete funds from hazardous waste management. Finally, public awareness of the risks of hazardous waste also could be improved. Little funding is available for healthcare waste management, such as a sustainable procurement policy to reduce the generation of mercury as waste. The wider community is generally unaware of the risks of healthcare waste; public education may hence be another area for capacity-building.

50. In Madagascar, for mainly financial reasons, the trans-boundary movements of hazardous waste into Madagascar is not well-monitored or policed. Madagascar hence requires a source of funding to effectively implement its national laws and international agreements. Financial attention is clearly required, the technical deficiencies are not only limited to the public, there is also an absence of skilled human resources within authorities responsible for healthcare waste management. Funds are additionally needed to communicate with and inform local communities. From an institutional perspective, coordination between agencies and between the public and industrial sectors must also be improved.
51. In Mali, financial and technical capacities need to be built in order to implement environmentally sound waste management practices in industries. The role of different institutions in waste management should be clarified by policy. The development of technical guidelines and the maintenance of waste management equipment are priorities. Furthermore, the strategy needs to be elaborated in order to specifically address e-waste, a waste stream that falls outside the scope of legislation at present. E-waste management, in particular, requires capacity-building activities in public awareness, in order to better involve local communities in waste segregation and to minimize health and environmental risks.
52. Niger Government requires funding for the procurement waste management equipment. The private sector should, therefore, be more integrated into industrial waste management. Coordination and partnership between the private and public sector can also be attempted. It could be improved, however, if enforcement plans were to be developed. Aside from the expansion of regulated areas, Niger's public sector will also require better financing. The level of technical capacity is inconsistent, with technical deficiencies identified in areas such as waste segregation, storage, collection, and treatment. There is little awareness of the relation between the mismanagement of waste and poor health. If a framework for action on healthcare waste is developed, insufficient funds may also emerge as a concern, while institutional coordination could also be improved.
53. In Sierra Leone, ministries need to be better coordinated. The participation of local communities in industrial waste management would make a positive impact if public awareness campaigns were to be successfully implemented. Thus the technical and financial capacities of the country require strengthening, alongside a better system of policy enforcement. technical capacity and social awareness again need to be developed. Technical capacity will need to be developed, as there is not enough equipment for the treatment and disposal of hazardous wastes. The low level of awareness is compounded by the lack of enforcement capacity of existent healthcare waste legislation, due to insufficient monitoring by responsible ministries the country lacks equipment for healthcare waste management and funds to procure them will be necessary.
54. In South Africa, there is an urgent need to build capacities in public administration and entities in the health sector to support the enforcement of healthcare waste legislation, through improved management, auditing, and monitoring. Moreover, education and awareness-raising, based on sound research, has an important role to play in choosing and implementing the most appropriate technologies for the treatment of healthcare waste it is of particular importance to

build relevant local capacity. The capacities needed are, above all, related to the identification of alternative technologies and the feasibility of implementing them at the local level (e.g. availability of engineering skills). Increasing the knowledge on the safe disposal of household hazardous waste through awareness-raising at the household level is important. Capacity development is needed to support the implementation of extended producer responsibility programs, undertake cost-benefit analyses of technology options, and establish small and medium-sized enterprises in new areas of hazardous waste management through the design and implementation of industry waste management plans (IndWMPs), will need to be complemented and followed by initiatives that make alternative technologies more viable. Capacities will have to be built to evaluate and implement industry waste management plans (IndWMPs) and to monitor the outcomes of such plans eco-labelling programmes and inventories on the exposure to pollutant releases through waste and air quality information systems can be effective tools in enhancing the social awareness of an industry's eco-efficiency among consumers.

55. To improve performance in Zambia, it is necessary to channel resources into the purchase of more durable equipment and accessories for healthcare waste handling and disposal. Even if public involvement is not so necessary for healthcare waste, it is important to raise awareness on waste segregation practices. The promotion of capacity building and technical guidance are fundamental in this regard. To improve performance in the recycling, recovery, and reuse of materials contained in hazardous waste, it will be necessary to allocate more resources to waste management in the future. The active participation of the general public and companies will be required. In particular, insufficient technical expertise among practitioners, ignoring the life-cycle approach, and the lack of technical guidance are hindrances for more effective management of industrial waste; the public needs more awareness and detailed knowledge on the handling and disposal of industrial waste. As for the other waste streams, finances need to be made available, by both the industry and the public sector, Equipment and facilities for healthcare waste disposal.
56. As summarize in Table 5 the capacity development needs of the different countries in managing hazardous wastes are basically related to organizational capacity with special focus on the aspect of the availability of funding, more effective enforcement and implementation of policies and institutional arrangements.

**Table 5. Number of Capacity Development Needs for Hazardous Waste per Region**

Capacity Focus Area	Africa	America	Asia	Grand Total	%
<b>Advocacy and knowledge management</b>	<b>18</b>	<b>13</b>	<b>13</b>	<b>44</b>	<b>12%</b>
Awareness campaign	15	6	9	30	8%
Knowledge exchange	1	2	1	4	1%
Research	2	5	3	10	3%
<b>Human Resource capacity</b>	<b>18</b>	<b>11</b>	<b>26</b>	<b>55</b>	<b>15%</b>
Technical skills and competencies	18	11	26	55	15%

<b>Organizational capacity affecting SWM</b>	<b>71</b>	<b>45</b>	<b>82</b>	<b>198</b>	<b>52%</b>
Enforcement / Implementation	7	11	27	45	12%
Funding	27	14	20	61	16%
Incentive System		1	2	3	1%
Institutional arrangements and coordination	18	11	13	42	11%
Monitoring	4		5	9	2%
Policy, Systems, and procedure	15	8	14	37	10%
Transparency of information			1	1	0%
<b>Partnership and alliance building capacity</b>	<b>12</b>	<b>5</b>	<b>6</b>	<b>23</b>	<b>6%</b>
Community Engagement	6	2	2	10	3%
Development of Private SWM industries	5	3	3	11	3%
Extended Producers Responsibility	1		1	2	1%
<b>SWM Technology</b>	<b>24</b>	<b>9</b>	<b>23</b>	<b>56</b>	<b>15%</b>
Infrastructure and Facilities	24	9	23	56	15%
<b>TOTAL</b>	<b>143</b>	<b>83</b>	<b>150</b>	<b>376</b>	<b>100%</b>

## Integrated Solid Waste Management

57. ISWM is a comprehensive waste prevention, recycling, composting, and disposal program. An effective ISWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment (USEPA, 2002). The following are the narrative assessment of the integrate solid waste management implementation in the different countries in the three regions.

### *Asian Region*

58. In Azerbaijan modern infrastructure, technical guidelines, and skilled human resources are needed to implement an ISWM.

59. Bangladesh has no sufficient funds for MSW management, sufficient understanding of MSW management and environmental awareness amongst societal groups tasked with the disposal of MSW, often within the lower strata of society.

60. Cambodia needs improvement in understanding the technical side of the MSW management at both national and subnational levels. Specifically, technical capacities of the waste collection and recycling industries in the private sector. The management of sanitary landfills needs to be strengthened. Guidelines and regulations need to be supported and implemented with the availability of adequate funds for technology. Skilled human resources are also a need. Public awareness of MSW management issues could also be improved. Benefits of segregating waste, traditional recyclers, such as rag-pickers and those living close to dumpsites, also require education on the health risks of MSW. ISWM plan should be developed, each component should be more clearly delegated to the responsible authorities, and funds should be mobilized towards its implementation despite a limited national budget.



61. India has a shortage of skilled human resources in regulatory authorities on MSW. It needs better coordination and the sharing of responsibilities between different MSW management institutions, public awareness, and enthusiasm for the 3R initiatives must also be improved, and technologies may need to be modified to suit the waste and climatic conditions in India.
62. In Indonesia, a law on solid waste management has been enacted but is currently not well implemented and enforced at all governmental levels. Even though waste minimization and collection targets exist at the national level, they are loosely adopted within the policy frameworks of local governments. Capacity must be built at the local policy level to implement regulations and develop guidelines. Raising public participation and awareness on waste minimization, at-source separation, and recycling through education is highlighted as crucial in improving MSW management. Mechanisms to coordinate within and between relevant bodies at all governmental levels must be strengthened. Elevated operational costs, limited budget allocations to waste management activities, high level of mismanagement and an almost absolute reliance on public funding sources constitute major financial hurdles for implementing a more effective waste management system in Indonesia. Making MSW a policy priority of local governments and developing more innovative financing mechanisms, such as public-private partnerships (PPP), will be fundamental in securing financing for MSW management. With regards to PPPs, the staff in local governments will need to thoroughly understand each party's rights and responsibilities in managing waste through such a scheme. The process of strengthening financial and human resource capacities needs to go hand in hand with an improved technical and scientific understanding. At the municipal level, waste handling and treatment facilities are often lacking and capacity building for choosing the most adequate technologies is needed.
63. Coordination of activities among MSW management institutions is not present in Lao PDR. It lacks sufficient (well-maintained) equipment for MSW management, institutional capacity-building, clear MSW management regulations or requirements (although there are overarching waste management policies). Financial concerns are also seen as important, as the country wishes to procure new waste collection equipment. Community involvement in waste segregation can also be further improved.
64. For Malaysia, different municipalities need to coordinate management systems to improve MSW management. Strengthening is needed among municipal institutions, different municipalities need to collectively set standards.
65. In Mongolia, studies for waste management need to be expanded to cover the research of technologies to recover energy, as well as the treatment of the specific coal and cinder waste generated in winter.
66. Enforcement capacity is a priority area for strengthening in Nepal. There is lack of funds and skilled human resources in environmental authorities. While equipment, such as that of waste collection, needs to be procured. There is also a need for use of economic instruments, such as rewards and penalties, to encourage waste generators to participate in MSW management, yet such economic legislation again will require effective enforcement.

67. The institutional capacity of the public sector emerges as a primary area for strengthening in Pakistan. While MSW policies exist, implementation levels are poor due to ill-equipped governmental institutions; Governmental environmental institutions are generally directed by politicians or public sector workers who do not have enough knowledge on waste management. There is little awareness of the health and environmental hazards generated by untreated or dumped MSW; community participation will be needed for policies to be effective.
68. The Philippines SWM is guided by its national policy the Ecological Solid Waste Management (Republic Act 9003) of 2000. This is mandating waste segregation at source. It includes waste characterization, collection and transport require improvement in terms of equipment and guidelines (such as a waste analysis and characterization survey); different waste streams found within MSW, such as construction/demolition waste and marine litter, need to be addressed. Existing dumpsites, especially if in environmentally critical areas, must be immediately rehabilitated. To improve technical capacities for MSW management, local government units will need to overcome financial obstacles, given that large-scale waste management efforts, such as sanitary landfills, require construction; Contracting activities to the private sector or the establishment of public-private partnerships are valid options; New technological and financial support should then be implemented into more comprehensive policies.
69. For Sri Lanka, the implementation of national plans at the local level is identified as a target for improvement. A sizeable amount of MSW collected is bio-degradable and can be treated as organic waste, while waste plastics are also not always segregated. Support from the public as well as the political will of local governments must be strengthened. Separate local-level plans should be developed, and include campaigns to educate communities (especially schoolchildren) on the benefits of waste management. As much as possible, these plans and initiatives should be linked to existing projects, such as Pulsar, to facilitate institutional coordination.
70. In Thailand, MSW management is ranked as the highest priority area for capacity-building; the country requires better technical capacity. Skilled human resources for MSW management are needed, waste collection and disposal practices need to be standardized by carrying out nationwide studies. A clear framework for MSW management addressing waste segregation, collection, transportation, disposal; policy and implementation areas also need to be improved. Monitoring issues are also absent.
71. Municipal solid waste is the highest priority waste stream in Ukraine. It needs assistance on policy, regulatory, technical, scientific, and finance.
72. Capacity-building is required across all areas regarding MSW management in Vietnam. Technical capacity should be developed to improve the enforcement levels of legislation. The coordination between institutions responsible for MSW management should be strengthened. Community participation in MSW management is needed, given that the public are generators of this waste stream. Waste segregation, in particular, should be promoted.

73. For Yemen, the need for capacity-building in MSW management is low; most needs to improve its technical capacity for MSW management; technical guidelines for MSW management thus need to be developed. Equipment for the collection and disposal of MSW is not well-used and is poorly maintained. Local communities also could play a bigger role in MSW management, if the benefits of waste segregation were better understood.

### ***American Region***

74. MSW management in Argentina needs further capacity building; Capacity building at the municipal and provincial levels is needed; there is little awareness of the topic among the broader public.

75. Technologies such as waste-to-energy facilities will be proposed if funds are available to the public sector in Barbados. Clearer strategies are also required for public education and participation in MSW management, such as incentives or penalties to encourage recycling. Continual training of skilled human resources to enact MSW management strategies also is a priority area for long-term efforts.

76. In Brazil, economic instruments are needed to encourage environmentally sound waste management. Technical capacity also needs to be built, as the country needs expert assistance to build and operate waste disposal systems, and to develop a set of waste management guidelines.

77. Regulations in Colombia need to be developed for separation at source, selective collection, transfer stations, and material recovery facilities (MRF). There is a need to develop policies and regulations that involve the private sector in the financing of the integrated waste management, taking into account the Extended Producer Responsibility (EPR) principle. It is also necessary to conduct feasibility studies on alternative practices and technologies that are commercially available and applicable in the country. Thus, there is a clear need to develop technical guidelines to include recycled raw materials and by-products in the market and ensure their quality and to strengthen technical capacity to valorize waste, for example through energy recovery from MSW and use of organic waste. Considering the social dimension of MSW management, there is a need to identify mechanisms to formalize the activities of informal waste recyclers and to create opportunities for internally displaced people. From an institutional point of view, capacity building is also needed to strengthen institutions to unify technical criteria and regulations on waste management to create an integrated approach. For construction and demolition waste, there is a normative framework relating to construction and demolition (C&D) waste, but it needs updating to better promote recycling and valorization of the waste. Technical knowledge needs to be promoted to enhance the recycling of C&D waste.

78. Costa Rica recently developed a new normative framework on solid waste management, which needs to be better promoted among institutions and in society. Effective enforcement of the new laws also will require improvements in funding, technical knowledge, institutional capacity, and societal participation. Funds need to be made available, and knowledge on the financial management of waste services needs to be strengthened in municipalities and

institutions, institutions need management and technical support to fulfill these new responsibilities. Regarding the social dimension of MSW management, informal waste workers need to be empowered in their role in the solid waste management system so that these mostly family-run and micro-businesses are included. However, in order to implement future regulations on industrial waste, technical knowledge and information needs to be generated and made available to the responsible institutions to better assess different options of the treatment, reuse or recycling of industrial wastes. Waste workers would also need to be trained and equipped with technical knowledge so that they can participate in a future industrial waste management system.

79. Guatemala needs technical capacity building, environmental education, legal support, financial assistance for projects is needed for all waste streams.
80. For Honduras, solid waste management receives some external funding, and assistance is mainly focused on capacity building. However, MSW management still needs to be strengthened. Skilled human resources are needed as well as the capacity to secure funds for MSW management.
81. Promoting an outreach campaign to the private sector for building technical capacity is suggested in Mexico, while awareness-raising. The involvement of communities is definitely needed. Climate, a private sector stakeholder, show that Mexico needs to above all strengthen its technical capacity for waste management. Regulatory capacity for waste management needs to be strengthened. Improving financial capacity would also be beneficial to waste management in the country. From an economic perspective, institutional and financial adjustments need to be made in the waste sector. The government needs to make available more funds for infrastructure and technology developments, so as to increase the economic value of reusing and recycling waste. At the same time, the informal sector of waste collection needs to be regulated in a way that companies invest and create employment, also benefiting informal rag-pickers. The technical capacity of the Ministry of Works and Services (in charge of the equipment and facilities) needs to be improved. More funds need to be made available in order for infrastructure, such as the vehicle fleet for waste collection, to be upgraded. Given that MSW management is the responsibility of many agencies of Mexico City (such as the Ministry of Environment and the Ministry of Works and Services), a supervisory body for solid waste management could be set up to coordinate activities. In particular, many landfills do not meet standards, skilled human resources are lacking. Finally, public participation in MSW management at source could also be improved. In addition to capacity building in the area of finance, it is also important to strengthen public awareness and create a culture of recycling. The country needs to improve its access to funds for waste management. Other important areas of capacity-building for waste management include institutional strengthening and technical and scientific understanding. Staff in municipal governments would need technical training and inter-municipal associations would need to be strengthened in order to increase cooperation and use scarce resources more efficiently.
82. The MSW management system in Paraguay needs to be more inclusive, involving communities, neighbourhood committees, and other organizations.

83. For Sri Lanka, Faint Lucia, the financial resources are needed at the institutional level to purchase equipment for use in landfills which are not readily available. Secondly, policymaking and implementation is an area that needs to be developed. A long-term strategy with clear delegation of activities to institutions will be needed.
84. For Trinidad and Tobago, it is a priority for the new policy to be implemented. It is also very important that local communities participate in MSW management. Proposed policies will finally need to be delegated clearly to institutions to avoid duplication or lapses in efforts.

### *African Region*

85. Better understanding and maintenance of existing MSW management equipment would benefit Burkina Faso. Committees could coordinate the efforts of not only government institutions but also non-governmental organizations and partnerships.
86. Chad's responses rank MSW as the highest-priority waste stream in which capacity-building is needed. Grants are needed in order to procurement equipment and to build infrastructure, such as waste segregation centres and landfills, especially as only collection and transportation equipment is well-maintained. Fee payments for the removal of household waste need to be enforced, while waste management laws need to be better publicized.
87. From a financial perspective, Cote d'Ivoire needs funds for the procurement of waste collection requires better maintenance. From a societal perspective, MSW generators do not understand concepts of waste segregation, and thus public education programmes could be implemented.
88. In Egypt, building capacities to better understand the functioning of equipment as well as to develop technical guidelines will need to go hand in hand with securing sufficient funds to manage MSW in an adequate manner. Improving the coordination among governmental entities responsible for regulating and operating MSW management is also required.
89. There are MSW management policies and regulations in Ethiopia, although they are not comprehensive. There are gaps in regulatory scope; certain types of waste remain outside of regulations. The proposed responses include a detailed study to identify potential sources of funding for improvements in waste management.
90. For Guinea-Bissau, funds are needed for the procurement of equipment for all types of MSW. The area of scientific and technical capacity thus also requires strengthening. Clarifying the roles of institutions such as the Mayor, the Ministries of Environment, Health, Social Infrastructure, Finance, as well as banks, would improve the efficiency of efforts.
91. Coordination between institutions in policy-making needs to be improved in Kenya. Kenya also needs to improve its technical capacity to manage MSW. Waste segregation, in particular, should be introduced to the public.

92. Lesotho lacks a set of clear guidelines and policy directions to improve MSW management. Efforts also need to be directed towards the community, developing practices such as waste segregation.
93. Liberia (Environmental Protection Agency)'s responses to the needs assessment survey show that the country needs to create, above all, social conditions that facilitate waste management. The country also needs to build its technical and scientific capacity as well as develop better policies and regulations.
94. Attention thus needs to be given to the state of MSW legislation in Madagascar, while implementation needs to be more effective. Existing equipment is poorly maintained, while more funds are required for new waste collection equipment. Existing policies, therefore, could be enforced much more effectively through policy expansion and a supply of resources.
95. Governmental institutions need to be strengthened with sound financial investment in Mali in order to build technical and enforcement capacities. More awareness-raising activities are required in the country.
96. For Niger, specific guidelines on disposal, as well as juridical procedures for the enforcement of legislation, is absent.
97. Improvements, such as the purchase of equipment, is needed in Sierra Leone. It will require a source of funding. Waste segregation at source is not undertaken, and public environmental campaigns are needed in order to support existing MSW management policies in the country.
98. It is necessary to develop capacities in South Africa to effectively select and implement appropriate, alternative technological solutions (e.g. energy recovery, thermal treatment, beneficiation, recycling). To effectively design and operate such facilities, the process will have to be supported financially. In this regard, capacity building in the full-cost accounting of waste management, particularly within municipalities, is required. Capacity building and awareness programs at the household level are needed to ensure at-source separation and collection of recyclable materials.
99. For Zambia, the principles of extended producer responsibility (EPR) in its regulatory framework, full implementation have yet to be achieved. Capacity building on revising and implementing guidelines and strategies is therefore needed, both at the national and the local level, rendering the mobilization of funds for awareness raising programmes as well as for the purchase of equipment and infrastructure a further priority.
100. The SWM focal persons and government representatives from the different countries in the 3 regions able to identify one hundred seventy-two (172) capacity building needs in relation to ISWM. Consistent with hazardous waste management, organizational capacities ranked first (45%) followed by human resource capacity and SWM technology. The three areas of concern are true in all the three regions. The limitations on organizational capacity have something to do mostly with the availability of funding for SWM (See Table 6).

**Table 6. Number of Capacity Development Needs for ISWM per Region**

Capacity Focus Area	Africa	America	Asia	Grand Total	%
<b>Advocacy and knowledge management</b>	<b>4</b>	<b>2</b>	<b>6</b>	<b>12</b>	<b>7%</b>
Awareness campaign	4	1	3	8	5%
Research		1	3	4	2%
<b>Human Resource capacity</b>	<b>8</b>	<b>14</b>	<b>14</b>	<b>36</b>	<b>21%</b>
Technical skills and competencies	8	14	14	36	21%
<b>Organizational capacity affecting SWM</b>	<b>24</b>	<b>27</b>	<b>27</b>	<b>78</b>	<b>45%</b>
Enforcement / Implementation	2	6	6	14	8%
Funding	10	10	6	26	15%
Incentive System		1	1	2	1%
Institutional arrangements and coordination	5	5	8	18	10%
Monitoring			1	1	1%
Policy, Systems, and procedure	7	5	4	16	9%
Transparency of information			1	1	1%
<b>Partnership and alliance building capacity</b>	<b>2</b>	<b>9</b>	<b>6</b>	<b>17</b>	<b>10%</b>
Community Engagement	1	5	6	12	7%
Extended Producers Responsibility	1	1		2	1%
Mechanism on informal waste recyclers		3		3	2%
<b>SWM Technology</b>	<b>13</b>	<b>5</b>	<b>11</b>	<b>29</b>	<b>17%</b>
Infrastructure and Facilities	13	5	11	29	17%
<b>TOTAL</b>	<b>51</b>	<b>57</b>	<b>64</b>	<b>172</b>	<b>100%</b>

### Waste Agricultural Biomass (WAB)

101. Waste Agricultural Biomass refers to organic products from agriculture that are not sold as food nor used in the manufacturing of other goods. Mostly, this biomass is in the form of residual stalks from crops, leaves, roots, seeds and seed shells etc. Common examples are wheat and paddy straw, bagasse (residue from sugarcane milling in sugar production), seed hulls (rice husks, groundnut husks), waste wood from timber processing, etc. (UNEP IETC, 2013).

102. Almost all countries in Asia rely heavily on agriculture as the primary sector that boosts economic development. However, it is very ironic that almost all of the countries included in the study do not have existing policy in managing WAB. In the countries like Bangladesh, Cambodia, Indonesia, Lao PDR, Malaysia, Nepal, the Philippines, Thailand, Vietnam and Yemen the policy on the use of waste agriculture biomass is non-existent. The absence of policy hinders implementation of WAB management as there is no incentive system to support utilization of WAB.

103. Another area of concern is the lack of technical capacity for using WAB as a resource, organic waste generators are usually not aware of the technical methods of composting which

could be attributed to the absence of appropriate equipment. There is still a low understanding of WAB processing and utilization and its life cycle approach, a field where efforts in capacity building are required.

104. The lack of information and awareness on WAB management is prevalent in many Asian countries. This can be addressed by raising the awareness of people with special focus on the farmers, financing for pilot projects on WAB processing and utilization is needed, to mainstream WAB knowledge and technology and scale it up at later stages.
105. Given large agricultural output, among many Asian countries, development of policies, technical understanding on areas such as the use of WAB as energy could be a sound proposition.
106. Institutional capacity for policy implementation is lacking, technical equipment will also need to be purchased, and the agricultural sector should be informed of the potential value and uses of WAB so that farmers get encouraged to readily contribute to waste management activities.

### *America*

107. Legislation on waste agricultural biomass is not very strong in Argentina. Policies and funding for collection and treatment do not exist.
108. Improvements in the coordination of governmental institutions and the training of staff on organic waste management increase the effectiveness of legislation. Therefore, education of the agricultural sector on the management of WAB needs to be implemented. Technical assistance and cost-effective means for the conversion of WAB into an energy resource is required. The responses suggest that waste bagasse use should be included into a WAB policy framework. (Barbados)
109. For Costa Rica, technological capacity needs to be built in the responsible institutions, the Ministry of Health and Ministry of Environment, Energy, and Telecommunication. Public and private funds would be needed to develop a platform that could respond to the needs of establishing organic and agricultural biomass waste management as an economic activity.
110. For Honduras, societal awareness on the productive use of WAB is low and could be strengthened. The use of organic waste as a resource is nevertheless seen as a potential for the further development of the country, including the achievement of self-sustainability in managing organic waste.
111. In order to be effectively implemented, coordination between governmental institution Mexico on the federal, state, and local level needs to be improved. The state currently lacks equipment for the collection, characterization, and treatment of organic waste. Funds need to be made available for these technologies. Above all, financial investment, equipment, and infrastructure for WAB management is needed. On the one hand, farmers should be trained on the use of WAB especially as a fertilizer, or towards WAB management in ways that minimize



risks to the environment. On the other hand; farmers should also be made more aware of existing agricultural laws and regulations. For organic waste, technical knowledge on composting and uncontrolled anaerobic emissions from MSW landfills need to be increased. The main area for capacity-building is on organic waste. The country's policies scale needs to be strengthened, given that there is a lack of an organic waste management framework, regulations need to be strengthened, and the treatment methods and capacities of existing facilities are not monitored or reported. Public awareness on waste segregation would also help implement organic waste treatment on a large. What is needed, are pilot projects on compost technologies and the development of schemes that facilitate and scale up the implementation of locally used technologies, local institutions need to be strengthened and human resources for composting need to be developed within local authorities. Nevertheless, for WAB, the development of capacities in many areas needs to be encouraged. An awareness and understanding of WAB management and its benefits should be created, while policies encouraging the use of WAB as an energy resource should be developed. Skilled human and technological resources for WAB management should also be procured. For municipal solid waste and e-waste, natural Resources show that industrial waste management needs to be strengthened. Due to scarce public funds, schemes of public-private-partnerships shall be promoted and incentives for the private sector created so that WAB can unfold its potentials. Other important waste streams requiring capacity-building include MSW, WAB, and e-waste. For organic waste, to enforce the existing laws, financial resources are needed to connect domestic pipes to the city's sewage system. Financial resources are also needed to provide suburban areas with sanitary services.

112. For Trinidad and Tobago, the enactment of policy is a concern. Creation of public awareness is thus important focal areas if the management of organic waste and WAB is to be improved. Also, there is a need for sufficient funding and appropriate technical capacity.

### *African Region*

113. While composting is practiced in Burkina Faso, funding is needed for the use of organic waste and WAB on a large scale schemes. Focusing more on the role of the waste generators would contribute in making the composting process more effective.
114. For Chad, the understanding of segregation and the potential uses of organic waste needs to be strengthened, especially on the societal level, despite the existence of framework policies. Financial investment will also be needed to begin projects such as composting. It is, therefore, necessary to popularize the segregation and use of the waste stream.
115. In Cote d'Ivoire, societal awareness is key regarding the management of organic waste and WAB. Funds for the procurement of composting equipment need also to be made available. In short, interest needs to be generated in the management of organic waste and WAB in Cote d'Ivoire.
116. In Ethiopia, there is no policy regarding organic waste management hence, people would not know what to do. A clear and doable policy together with active educational campaign towards the recovery and reuse of organic wastes should be prioritized by the government.

Ethiopia will also require more coordinated efforts among environmental institutions, and a sound financial base.

117. In Guinea-Bissau, the introduction of such technologies as composting and the conversion of WAB into energy sources into Guinea-Bissau may be beneficial given that agricultural produce is the country's key export.
118. In Kenya, a policy framework needs to be developed. The framework also needs to outline mechanisms to promote the opportunities associated with WAB use to the agricultural sector. For organic waste, policies on organic waste exist, but they are neither effective nor detailed and need to be updated. Funds need to be made available to the organic agriculture sector in order for technical capacity to be built and the use of organic waste to become economically viable.
119. Policies encouraging the use of organic waste could be developed in Lesotho, while technical guidelines could be published. For Madagascar, a general commencement of initiatives with regards to these waste. Streams are needed. This should also include appropriate guidance to waste generators, an improvement in scientific understanding, as well as a sound financial base.
120. Governmental institutions in Mali need to the organic waste streams if waste management practices are to be improved. It is also important that the public and the agricultural sector participate in organic or agricultural waste management activities. Awareness-raising is needed in order to create an understanding of the potential uses and benefits of organic and agricultural waste.
121. There is a need to modernize existing waste management practices in Niger. Also, the development of a waste management framework would be beneficial.
122. The expansion of technical capacity is lacking in Sierra Leone. At present, there are no policies or regulations addressing organic waste issue in the country. A clear framework regarding organic waste would be useful in encouraging its use as a resource. Better communication is needed in order to access local farmers unaware of the potential for WAB to be used as a resource. The country needs funds and equipment in order to improve its technical capacity in managing WAB.
123. South Africa needs capacity building on technology solutions to deal with biomass, through among others, energy recovery and biorefinery, creating the capacity to respond to existing funding calls, e.g. national green fund, Industrial Development Corporation (IDC) green economy fund, multilateral development cooperation, and others, will be a considerable asset in attracting finance to the management of this waste stream. In social terms, raising awareness on the use and advantage of green energies from WAB is an important element in making them more accepted and economically viable. For organic waste, developing know-how on alternative technology solutions, ranging from composting to anaerobic digestion through thermal treatment to biorefinery are critical elements in building up adequate capacities. Developing business skills, involving the private sector through improved

accessibility to schemes such as public-private partnerships, in particular at the municipal level, are equally necessary. Setting up the institutional infrastructure that deals with organic waste management is required to promote the establishment of Small and Medium Enterprise and engagement in Public-Private Partnerships (PPPs) that can promote organic waste.

124. It is necessary to start awareness raising programmes in Zambia, sensitizing the general public about managing organic waste and applying reuse methods in their households and companies. The lack of financial resources and human resources within public administrations both remain challenges for implementing improved organic waste management practices.
125. Technical understanding by all stakeholders in Malaysia would significantly reduce the amount of organic waste disposed of simply as MSW, capacity-building in the areas of policy-making. WAB management can also take place on a larger, centralized scale to reduce costs to individual farms. The introduction of technology to treat a greater variety of WAB and for different uses (such as energy) is also possible. WAB management capacities in Asia need to be built primarily within the agricultural sector. As the level of awareness and understanding of the use of WAB is very poor. The agricultural sector thus needs to be made aware of WAB management techniques, while economic instruments must be used to encourage environmentally sound management practices. An organization or an institution needs to be made responsible for WAB management, as none are currently dedicated to this activity
126. Low-cost technologies for the conversion of WAB into an energy resource can be demonstrated and developed in the industrial and agricultural sector. There are currently no policies in Yemen addressing the management of organic waste and WAB. However, WAB is not ranked as high priority area for capacity-building. To encourage the resourceful use of organic waste and WAB, funds will be needed, and local communities will need to be made aware of the potential benefits of waste management.
127. Thailand needs to improve technical capacities. Also, considerable investment will be needed to improve technical capacities at such a scale, thus the involvement of the private sector can be encouraged.
128. For Vietnam, separate policies and regulations for the management of organic waste need to be developed. Institutional strengthening of authorities will be required and that the responsibilities of ministries do not overlap. To ensure that the enforcement of new regulations is effective, research towards better and larger-scale composting technologies will be needed. Funds will need to be made available.
129. In summary, there are about one hundred forty-eight (148) identified needs to manage waste agricultural biomass. Again, the need for organizational capacities is the highest among the specific capacity needs which is more prevalent among countries in Asia compare with countries from America and Africa (See Table 7).

**Table 7. Number of Capacity Development Needs for Waste Agricultural Biomass per Region**

Capacity Focus Areas	Africa	America	Asia	Grand Total	%
<b>Advocacy and knowledge management</b>	<b>5</b>	<b>5</b>	<b>12</b>	<b>22</b>	<b>15%</b>
Awareness campaign	5	4	9	18	12%
Knowledge exchange			1	1	1%
Research		1	2	3	2%
<b>Human Resource capacity</b>	<b>3</b>	<b>7</b>	<b>6</b>	<b>16</b>	<b>11%</b>
Technical skills and competencies	3	7	6	16	11%
<b>Organizational capacity affecting SWM</b>	<b>22</b>	<b>23</b>	<b>28</b>	<b>73</b>	<b>49%</b>
Enforcement / Implementation		3	2	5	3%
Funding	11	9	7	27	18%
Incentive System		1	2	3	2%
Institutional arrangements and coordination	3	4	5	12	8%
Monitoring		1		1	1%
Policy, Systems, and procedure	8	5	12	25	17%
<b>Partnership and alliance building capacity</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>7</b>	<b>5%</b>
Community Engagement	1	1	2	4	3%
Development of Private SWM industries	2		1	3	2%
<b>SWM Technology</b>	<b>12</b>	<b>9</b>	<b>9</b>	<b>30</b>	<b>20%</b>
Infrastructure and Facilities	12	9	9	30	20%
<b>TOTAL</b>	<b>45</b>	<b>45</b>	<b>58</b>	<b>148</b>	<b>100%</b>

### Waste Minimization

130. Waste minimization aims to eliminate waste before it is produced and reduce its quantity and toxicity. Prevention is the primary goal, followed by reuse, recycling, treatment and appropriate disposal (Queensland Government DEHP, 2013).

#### *Asia Region*

131. For Azerbaijan, enactment of legislation is a challenge. Technical capacity for the management of waste plastics, especially skilled human resources. Public education aimed at promoting the segregation of waste plastics from other MSW and adequate funding and meet legal requirements in waste management. Enforcement for this waste stream

132. For Bangladesh, there is a need for assistance in the maintenance of trend, as well as expanding the means of waste management.

133. Cambodia does not have laws regulating waste plastics have been poorly promoted to local communities and recycling is not often practiced. A more comprehensive awareness campaign directed at the general public is required.

134. India requires capacity-building for the regulatory authorities; public awareness of waste segregation and the 3R principle could be improved through educational campaigns increasing skilled human resources in authorities. Coordination between ministries and municipalities must also be improved, waste management of plastics is not well-understood by societal waste generators.
135. Indonesia requires an introduction to an integrated and life cycle approach to plastic manufacturing and waste management into the legal framework; integrating waste plastics into the city level waste management from the upstream to the downstream level and to effectively enforce it building capacity to improve the coordination along the value chain. Guidance on technologies for the plastics' life-cycle management, including wastes plastics management. Research on and the implementation of the use of environmentally-friendly plastics, voluntary efforts still lack the legal and policy support.
136. Responsible institutions need to be strengthened in LAO PDR, in particular in their ability to procure technical and financial assistance from abroad. Aside from waste disposal, waste prevention strategies have also not been comprehensively explored. Public awareness-raising campaigns, especially on the subjects of waste segregation and the 3R principle, could be implemented.
137. There is much room for improvement in Malaysia with regards to public awareness; educational campaigns directed at local communities would be valuable.
138. Technology transfer programmes to cover different types of plastics would be welcome in Nepal. A clearer and more concrete framework is thus also in demand (Governmental policies). Better organization of recycling stakeholders, whether formal or informal, may be needed
139. Pakistan lacks a comprehensive policy addressing the management of waste plastics, particularly with regards to recycling. Heavy use of plastic bags as well as littering habits has negatively impacted the country's water management system, with sewers being clogged by waste plastics, causing urban flooding. To enact and enforce a policy on waste plastics, Pakistan needs to create an effective waste collection system.
140. Implementation and enforcement of current policies are ranked as areas that most require capacity-building in the Philippines. There are no clear national guidelines on how to implement recycling or waste prevention. Standards, therefore, vary between municipalities and barangays (districts/wards). Local governments may also lack plastic recycling facilities or infrastructure to practice waste collection.
141. In Thailand, the management of waste plastics needs to be addressed by a separate policy.
142. A separate policy for the segregation and recycling of waste plastics needs to be developed in Vietnam. Technical capacity for the recycling of waste plastics has yet to be built up, the public must be involved in efforts to separately manage waste plastics. Practices such as waste segregation need to be promoted through awareness campaigns.

143. For Yemen, there are currently neither policies nor technical guidelines addressing the management of waste plastics in Yemen. It is thus a priority that appropriate legislation is enacted, and the technical capacity to manage the waste stream is developed. Financial and social areas also require a degree of capacity-building. Equipment and facilities for the management of waste plastics will require support in funding, while community participation in waste segregation would be welcomed.

### *American Region*

144. The management of waste plastics in Barbados needs to be strengthened primarily through a reduction in improper disposal. Public awareness campaigns require continuation and expansion in order to change behaviours and communicate the health and environmental impacts of improper disposal. There is, therefore, room for expansion with regards to legislation on the management of waste plastics.

145. Aside from regulatory difficulties, technical capacity also needs to be improved in Brazil. Improvements in technical capacity can be best achieved by developing an inventory of best practices for the waste stream.

146. For Costa Rica, public and private funds would be needed to develop a platform that could respond to the needs of establishing organic and agricultural biomass waste management as an economic activity.

147. For Honduras, participation in recycling of plastics is broad and the mostly family-run businesses have acquired a certain level of knowledge on plastics recycling

148. Cooperation between the public and private sector is inadequate in Mexico, even though improvements are being made. Waste segregation and recycling are also poorly understood by the public; community participation in the management process for waste plastics needs to be improved. Qualified staff and experts are needed in the recycling sector if sustainable, long-term recycling programmes are to be successful. Above all, exportable materials such as plastics, aluminium, cardboard, etc. need to be valorised within the Mexican market. Also, in private companies' capacities need to be strengthened and recycling infrastructure built up so that materials can be reused within the Mexican market. Nevertheless, an adequate technical capacity for the segregation and treatment of waste plastics in Mexico City should be achieved first and foremost. In particular, the technical capacity for plastic recycling must be developed. The private recycling sector should be encouraged to expand its plastic recycling capacity, and new recycling facilities and plants need to be constructed. Regulations on the recycling of plastics exist, but they are not applied. There is a lack of social awareness and information on how to effectively recycle. Another problem is the lack of financial resources to purchase recycling containers for public spaces such as parks and schools, which again leads to waste being dumped in the city's rivers.

149. Control mechanisms and technical standards need to be developed in Paraguay to adequately implement the management of waste plastics. In particular, broader community participation

in the recycling of plastics should be promoted. An environmental education programme for recycling should also be developed.

150. Obstacles in Saint Lucia includes the lack of funds needed, as well as funds for public awareness campaigns, waste plastics collection, and treatment. Thus environmental education and public awareness campaigns will be needed in order to eliminate habits such as littering and create awareness of waste management issues.
151. For Trinidad and Tobago, funds will be needed. Community participation is also desired. In particular, non-governmental organizations can be encouraged to engage in public awareness campaigns.

### *African Region*

152. For Burkina Faso, proposed legislation aiming to ban the use of plastic bags is unpopular. Better coordination of institutions responsible for waste management would also make a positive impact.
153. For Chad, Research has been conducted to find a solution to the generation of waste plastics in the country, and continued investigation will be needed. Recycling is seen as a solution, but needs financial investment.
154. The sector also lacks infrastructure. Public awareness of waste plastics treatment methods can be improved in Cote d'Ivoire. Therefore, interest needs to be generated for the management of this waste stream. Moreover, environmental regulations are vague, could be more comprehensive in addressing the generation of waste plastics and disposal of plastic bags.
155. In Egypt, with no specific policies in place, it will be essential to train policy makers to introduce the adequate reforms, aiming at better managing and utilizing waste plastics. Allocating resources to proper waste management activities in public industries and administrations will be crucial in solving the financial constraints.
156. Despite a basic public awareness of the environmental effects of waste plastics, there are few initiatives on waste prevention in Ethiopia. Efforts towards waste plastic management would also be improved through the development of technical guidelines and a sustainable source of funds.
157. In Guinea-Bissau, the effects of dioxins and furans in waste plastics are understood; however technical guidelines for treatment and disposal are still lacking. The management of waste plastics also needs to be implemented within local communities. Capacity-building across all areas will require a source of funding, especially in the enactment and enforcement of specific waste plastic regulations.
158. Kenya needs to strengthen its policy framework and institutional cooperation and a national policy and partnership framework is required. Economic incentives for the recycling and re-

use of plastics should also be developed. Research can also be undertaken in Kenya for the alternative use of waste plastics, such as conversion into fuels.

159. The enactment of policies in Lesotho, such as a levy on plastic consumption, has been particularly slow. Hence it is important to develop a general interest towards the management of waste plastics before efforts can be implemented with greater success.
160. The management of waste plastics is also seen as a very high-priority area for capacity-building in Madagascar. Funds are needed for the development of technical equipment and guidelines on the management of waste plastics. The public, as waste plastic generators, should also be better educated to practice waste prevention or minimization. Nevertheless, developing regulations would be a useful first step.
161. For Mali, regarding waste plastics, the immediate task for the national government is to implement two legislative documents that are being drafted: a law banning non-biodegradable plastic bags and a decree towards its enforcement. Finding a source of funds is also seen as a priority.
162. The management of waste plastics is seen as a very important area for capacity-building in Niger. A government strategy and action plan are in existence to minimize waste plastics. However, limited funding, unequal levels of clarity and coordination among institutions, and the lack of specific legislation on waste plastics compromise the effectiveness of the action plan.
163. There are no policies on the management of waste plastics in Sierra Leone, while public awareness and participation in waste prevention or minimization are low. In addition, there is also a need for funds in order to purchase equipment for the treatment, recycling, and disposal of waste plastics.
164. In South Africa, to secure financial viability of the recycling sector it is necessary to implement appropriate financial mechanisms. It is emphasized that advancements in the technological field are needed to ensure that processing and manufacturing of packaging waste can be undertaken locally and can thereby be a factor in spurring local economic development. Awareness raising at the household level is important to support the source separation and recovery of different types of post-consumer recyclables.
165. For Zambia, there is a need to develop legislation with regards to waste plastics. Local authorities and waste service providers need to acquire an understanding of the properties of plastics as well as of the technical options for treating them. The selection of the proper equipment needs to be followed by its purchase.
166. As presented in Table 8, there are about one hundred twelve (112) identified needs in managing waste minimization efforts in which 50% are related to organizational capacities, also advocacy and knowledge management and SWM technology. This is particularly prevalent in countries from African Region.



**Table 8. Number of Capacity Development Needs for Waste Minimization per Region**

Capacity Focus Area	Africa	America	Asia	Grand Total	%
<b>Advocacy and knowledge management</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>19</b>	<b>17%</b>
Awareness campaign	4	5	6	15	13%
Knowledge exchange		1		1	1%
Research	2		1	3	3%
<b>Human Resource capacity</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>12</b>	<b>11%</b>
Technical skills and competencies	3	4	5	12	11%
<b>Organizational capacity affecting SWM</b>	<b>28</b>	<b>8</b>	<b>20</b>	<b>56</b>	<b>50%</b>
Enforcement / Implementation	2	2	6	10	9%
Funding	9	5	3	17	15%
Incentive System	1			1	1%
Institutional arrangements and coordination	3		3	6	5%
Policy, Systems and procedure	13	1	8	22	20%
<b>Partnership and alliance building capacity</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>12</b>	<b>11%</b>
Community Engagement	2	4	4	10	9%
Development of Private SWM industries		2		2	2%
<b>SWM Technology</b>	<b>7</b>	<b>4</b>	<b>2</b>	<b>13</b>	<b>12%</b>
Infrastructure and Facilities	7	4	2	13	12%
<b>TOTAL</b>	<b>46</b>	<b>28</b>	<b>38</b>	<b>112</b>	<b>100%</b>

## Electronic Waste

167. Electronic waste (E-waste) is a popular, informal name for electronic products nearing the end of their "useful life." Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Many of these products can be reused, refurbished, or recycled (CalRecycle, 2016).

### *Asian Region*

168. Cambodia needs regulations in order to address the issues of locally generated waste and second-hand imported electrical and electronic equipment. Although guidelines on e-waste management have been developed, they need to be better distributed to stakeholders at the subnational level.

169. India needs technical and scientific capacity-building, including public awareness of the hazards of e-waste, and the development of innovative technologies on the recovery of precious metals from e-waste.

170. Indonesia requires review and seeking of synergies with other existing regulations. It needs to take into account the relevant MEAs (Stockholm Convention and Basel Convention), SAICM and other relevant guidance.

171. In LAO PDR, various stakeholders in the country require training, education, and awareness-raising on the potential hazards of mismanaged e-waste, responsible institutions need to gain increased access to information and funding will also be needed to prevent e-waste from becoming a major concern to Lao PDR.
172. In Malaysia, environmental institutions need to be strengthened and technical capacity should be improved. Policies such as the Voluntary Take-Back Scheme for waste from imported electronic equipment are weakly implemented, generally due to the financial unsustainability of initiatives. Recyclers do not always have access to up-to-date technologies and guidelines; only wet chemical processes and electrolysis. In addition, recyclers also require better infrastructural support, such as collection centres for different types of e-waste.
173. Nepal needs to identify the e-waste concerns it faces and longer-term areas for capacity-building are needed. Specific policies on e-waste must be present and the enactment of legislation is another priority to be improved. In addition, it should include the procurement of funds developing societal awareness, and the coordination of institutions to better enforce future policies. Developing societal awareness and the coordination of institutions is needed to better enforce future policies.
174. In Pakistan, waste stream is not addressed by policy. Institutional capacity, in terms of the enactment of a policy, the delegation of tasks, there are no environmental institutions responsible for its management. Negligence of e-waste can be partly explained by a lack of technical understanding of its health and environmental hazards, and safe means of treatment and disposal. The procurement of technology needs to be built and funds are required regarding e-waste.
175. The Philippines is in need of the development of an e-waste policy framework. It needs to be made clear which institutions at both national and local levels will be responsible for policy implementation and be supported by adequate facilities for technologies such as e-waste recycling. The costs of these facilities are high (an Integrated Recycling Facility will cost approximately USD 8.2 million), and the country will require financial support. It also requires long-term needs that include the launching of a public awareness campaign in order to promote segregation of e-waste from other MSW.
176. E-waste management in Thailand is also considered an important area for strengthening. General awareness of the waste stream must be developed.
177. Vietnam currently does not have the technical capacity to treat e-waste on a large scale. Research for technological development is thus needed; of particular interest is the area of e-waste recycling, including for the procurement of equipment. Finally, the responsibilities of various ministries in implementing e-waste treatment, recycling, and disposal will have to be made clear in order to avoid the institutional problems of, such as overlapping tasks.
178. E-waste ranked as a high priority area for capacity-building in Yemen. Financial, social and institutional areas also require a degree of capacity-building. Efforts to improve e-waste management will require funding, interest from governmental institutions, and public support.

### *American Region*

179. Argentina does not have legislation on e-waste although a project on establishing legislation on e-waste was initiated in 2005. Also, funding is needed to formalize recycling activities or to finance technical solutions for e-waste management.
180. In Chile, waste electric and electronic equipment (WEEE) needs to be categorized according to material composition and level of hazard. The establishment of infrastructure for the treatment and recovery of e-waste is required, the standards should also be developed for the treatment of e-wastes. There is also a need to support the development of regional projects in e-waste recycling, including awareness raising campaigns for consumers, and capacity building are needed for the stakeholders involved in an integrated approach to e-waste management. International exchange of experience and knowledge needs to be promoted to enhance e-waste management in the region.
181. In Colombia, to effectively implement the legislative framework, assistance is needed to clarify responsibilities of all the actors in the e-waste management chain. Support is, however, needed to strengthen the capacity of local and regional authorities. There is also a need to develop economic instruments to create a viable and self-sustaining recycling system and in order to minimize the disposal of e-waste in sanitary landfills, there is a need to enhance the recycling infrastructure.
182. In Costa Rica, work needs to be done on technical guidelines on the management of e-waste. Support is needed to develop these guidelines and to distribute them among the producers and import companies of electronic goods, responsible for dealing with end-of-life electronic goods. There is also a need to support in establishing sustainable financial schemes for the e-waste management system.
183. In Honduras, there is a need to broaden awareness of the hazards of e-waste in society. Institutional capacity also needs to be built in order to establish responsibilities for e-waste management to foster participation and exchange of experience and information in international forums on e-waste, such as the recent efforts that have been undertaken to develop a regional framework for the Latin American region.
184. In Mexico, more research is needed on the issue of e-waste and potential environmentally sound treatment methods. Although recently there have been campaigns to promote better e-waste management, public awareness and technical capacity on the management of this waste stream is still lacking. Mexico's Campeche in treating e-waste needs to be improved. The creation of partnerships between the public and private sectors is suggested by the responses as a means of securing funds fostering needed private investment into e-waste management for building technical capacities. Public education of the benefits of e-waste management is also necessary in order to promote practices such as waste segregation across the state. On the policy level, there is the need for clear signals through constant economic incentives that induce consumers to change inefficient and dispose of damaged electronic materials correctly. Awareness campaigns could complement regulatory and economic efforts and increase demand for recycled materials. Developing comprehensive legislation on e-waste is thus the

priority need for the city while increasing technical capacity and facilities for e-waste management is also an important task.

185. In Paraguay, regulations, and guidelines need to be developed for e-waste, while technical and scientific knowledge also needs to be strengthened.
186. Saint Lucia requires a general improvement of its capacity to manage e-waste. Funding will be required for public awareness campaigns and technical capacity-building.
187. In Trinidad and Tobago, specific regulations, concerning the private e-waste management sector, will be needed and encouragement of e-waste management will require financial resources, and the capacity to secure funding will be required.

### ***African Region***

188. The management of e-waste in Burkina Faso will primarily require skilled human resources and funds. Aspects that require development also include public awareness, coordination among e-waste stakeholders, and specific legislation with regards to e-waste, all of which are currently lacking.
189. The Chad's responses suggest that it is above all important to restructure and better equip governmental institutions so that attention is given to e-waste. Public awareness needs to be raised, especially among target groups who come into regular contact with e-waste.
190. In Egypt, in order to improve the current situation, it is important to build capacities in the development of waste policies and to reform the policy framework. Raising awareness on e-waste recycling and its economic and environmental benefits will also be required.
191. In Ethiopia, there are no separate policies and regulations with regards to the disposal of e-waste in Ethiopia, a situation that requires immediate attention. Also, authorities need a better technical understanding of e-waste management.
192. Kenya has no policies and regulations specifically addressing e-waste, although they are currently being developed. In order to set up e-waste management infrastructure, funds need to be made available, more research is still required in order to assess the challenges and opportunities provided by e-waste in the country, and public concern over mismanaged e-waste should be improved.
193. In Lesotho, studies are needed as there is currently little knowledge on both the means of e-waste management as well as technical aspects and the effects of mismanagement. Also, a study of institutional structures to manage e-waste needs to be conducted. Funding and public awareness concerns are thus important, but more long-term issues to be resolved.
194. In Madagascar, funds are needed especially for procuring technical equipment and developing a set of guidelines regarding the characterization of e-waste. It is also important to delegate clear responsibilities. In short, the development of a policy with sound financial support is needed.

195. In Niger, there is a need to modernize recycling procedures. The development of a framework for the management of this waste stream may also be needed.
196. Currently, there are no policies for e-waste management in Sierra Leone and there is little awareness across all levels of society of the concepts of e-waste management. In addition, institutional coordination needs to be strengthened to effectively implement efforts on policymaking and public education. Funds and technology also need to be made available to the country if it is to be able to treat and dispose of e-waste.
197. In South Africa, there is an urgent need to develop and implement an Industry Waste Management Plan (Ind WMP) that supports the institutional, legal and financial. To make these programs viable they will have to be accompanied by sustained awareness-raising initiatives informing consumers about safe disposal facilities for their e-waste.
198. In Zambia, building up an adequate policy and regulatory framework that comprehensively addresses e-waste is essential and could benefit from technical and financial support. ZEMA will have to provide guidelines on e-waste management to all stakeholders handling e-waste. The characteristics and impacts of e-waste and proper disposal methods will also have an important role to play in improving the environmentally sound management of e-waste and develop the involvement of the public.
199. As presented in Table 9, concerned country representatives and focal persons on SWM have identified 108 capacity building needs in relation to electronic wastes. This is particularly in the aspect of organizational capacity which is translated in the need for availability of funding and in relation to policy, systems, and procedures. It seems that many of the countries in the 3 Regions which do not have yet a national policy in managing electronic wastes.

**Table 9. Number of Capacity Development Needs for Electronic Waste per Region**

Capacity Focus Area	Africa	America	Asia	Grand Total	%
<b>Advocacy and knowledge management</b>	<b>11</b>	<b>8</b>	<b>8</b>	<b>27</b>	<b>25%</b>
Awareness campaign	7	4	5	16	15%
Knowledge exchange		2		2	2%
Research	4	2	3	9	8%
<b>Human Resource capacity</b>	<b>1</b>	<b>4</b>	<b>5</b>	<b>10</b>	<b>9%</b>
Technical skills and competencies	1	4	5	10	9%
<b>Organizational capacity affecting SWM</b>	<b>20</b>	<b>14</b>	<b>19</b>	<b>53</b>	<b>49%</b>
Enforcement / Implementation		1	2	3	3%
Funding	5	6	7	18	17%
Incentive System		1		1	1%
Institutional arrangements and coordination	5	2	6	13	12%
Policy, Systems, and procedure	10	4	4	18	17%
<b>Partnership and alliance building capacity</b>	<b>1</b>	<b>3</b>		<b>4</b>	<b>4%</b>
Community Engagement	1			1	1%

Development of Private SWM industries		2	2	2%	
Extended Producers Responsibility		1	1	1%	
<b>SWM Technology</b>	<b>6</b>	<b>3</b>	<b>5</b>	<b>14</b>	<b>13%</b>
Infrastructure and Facilities	6	3	5	14	13%
<b>TOTAL</b>	<b>39</b>	<b>32</b>	<b>37</b>	<b>108</b>	<b>100%</b>

## Waste and Climate Change

200. Climate change is the general change in temperature, rainfall, wind, and other climate patterns over a period of time. We consider the actions of people as a cause of this change. Thus we say that climate change is a direct or indirect result of human activity. The United Nations Intergovernmental Panel on Climate Change (2014) defines climate change as a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use (CCC Philippines, 2014).

201. Climate Change is an urgent issue but no single country in the study has claimed implementing waste management project in relation to Climate Change. This could be attributed to the fact that incorporating climate change in solid waste management is a bit challenging task as perceived by the concerned personnel of the countries in the study.

## Marine Litter

202. Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. The Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; or accidentally lost, including material lost at sea in bad weather (UNEP, 2009).

203. Among the countries included in this report, there is no existing marine litter management as an initiative to address waste management at the national and local levels.

## V. CONCLUSION

Waste management is a priority agenda in the national and global platforms on the environment. The Global Partnership on Waste Management put forward seven (7) thematic areas namely hazardous waste, electronic waste, ISWM, waste minimization, waste agricultural biomass, marine litter and waste and climate change. Based on the country reports, survey conducted for country focal persons and interview with country representatives, waste management during the period 2012-2016 only focuses on five (5) thematic areas as marine litter and relating waste management on climate change are least priority of many of the waste management efforts in the Asian, American and African Regions particularly for the countries included in the report.

The needs assessment has shown that the most common capacity development needs to implement waste management in all thematic areas is organizational capacity. The ability of both the public and the private sectors to implement SWM. These organizational capacity needs are specifically referring to the availability of funding for SWM which is a glaring reality confronting many nations in the three Regions. Another capacity building needs consistently identified is the institutional arrangement. In the different countries, national framework and policies are present but have difficulties in coordination among concerned agencies that contribute to the poor SWM implementation. In African Region, capacity development needs identified to implement waste minimization aside from organizational capacity is, in relation to advocacy and knowledge management as well as SWM technology. The Asian Region have more serious capacity building concerns in managing waste agricultural biomass. While agriculture is the primary sector of almost all countries in Asian Region there are the capacity development limitations particularly with regard to the organizational capacity and the presence of policy, systems, and procedures to specifically manage waste agricultural biomass.

The needs assessment report aims to provide a big picture of the waste management implementation in the different countries with special focus on identifying the capacity building needs (demand side) that will be required by the different stakeholders. The report further intends to contribute in providing information that will hope to contribute to the improvement of over-all implementation of waste management in various countries of the 3 Regions.

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