Technical lessons learnt report

UNDP GEF Project
"Reducing UPOPs and Mercury Releases from the Health Sector in Africa"

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Abbreviations

GEF	Global Environment Facility
BAT	Best available Techniques
BEP	Best Environmental Practices
BoQs	Bill of Quantities
CHU	Centre Hospitalier Universitaire
CSB	Basic Health Centre
FAQ	Frequently Asked Questions
GEF	Global Environment Facility
GGHH	Global Green and Healthy Hospitals
HBV	Hepatitis B virus
HCF	Healthcare Facilities
HCV	Hepatitis C virus
HCW	Healthcare Waste
HCWH	Health Care Without Harm
HCWM	Healthcare Waste Management
HHD	HIV, Health and Development
HIV	Human Immunodeficiency Virus
KM	knowledge management
MoH	Ministry of Health
PPE	Personal Protective Equipment
SHiPP	Sustainable Health in Procurement Project
SIDA	Swedish International Development Agency
SOP	Standard Operating Procedure
TOT	Training of Trainers
UNDP	United Nations Development Programme
WG	Working Group
WHO	World Health Organisation

Document structure and key lessons learnt

The regional component of the GEF-funded project entitled "Reducing UPOPs and Mercury Releases from The Health Sector in Africa" was launched in December 2015 and will end in December 2020. The overall objective of this full-size GEF funded project, implemented by UNDP in partnership with WHO and the Non-Government Organization (NGO) Health Care Without Harm, is to implement best environmental practices and introduce non-incineration healthcare waste treatment technologies and mercury-free medical devices in four Sub-Saharan African countries (Ghana, Madagascar, Tanzania and Zambia) to reduce harmful releases from the health sector.

The project promotes best practices and techniques for healthcare waste management with the aim of minimizing or eliminating releases of Persistent Organic Pollutants (POPs) to help countries meet their obligations under the Stockholm Convention on POPs. The project also supports these countries in phasing-down the use of mercury containing medical devices and products, while improving practices for mercury containing wastes with the objective to reduce releases of mercury in support of countries' future obligations under the Minamata Convention.

This technical report outlines the distilled lessons learnt of the UNDP GEF Africa project which provides project experiences considered in future projects. It is structured in accordance with main project interventions and need to be updated towards the end of the project:

1. Build national capacity to enable the assessment, planning, and implementation of healthcare waste management (HCWM) systems.
2. Develop/improve the national policy and regulatory framework pertaining to HCWM.
3. Provide available affordable systems that conform to Best available Techniques and international standards on non-incineration HCWM systems
4. Provide available affordable systems that conform international standards by phasing out of mercury-containing devices and demonstrate mercury waste management and mercury reduction at project facilities.
5. Demonstrate improved HCWM systems including recycling.
6. Establish national HCWM training infrastructures and create awareness on HCWM.

Furthermore, the lessons learned for country specific flagship activities (Chapter 7), project set-up / management (Chapter 8), unexpected events during project implementation including COVID-19 response (Chapter 9) and cooperation with partners and projects (Chapter 10)

Gaps and barriers of the above-mentioned project interventions have been identified and mitigation measures are outlined to prevent, reduce, or control adverse effects of the project:

A. Gap / barrier / problem
   ⇒ Possible mitigation measures
B. …….

Summary of key experiences and lessons learned
Based on the experiences of the project implementation the following key points should be kept in mind continuously to establish a sustainable project:

- ✓ Clear responsibilities and boundaries of the project should be highlighted and discussed with the stakeholder at the beginning of the project activities.
- ✓ Start the drafting of an exit strategy and the involvement of stakeholder in the exit strategy from the start of the project (taking over of ownership).
- ✓ The collection of data on waste amounts and operation costs is fundamental to establish a proper monitoring and reporting system for the project results but also for the future planning of the countries and should therefore be implemented as soon the equipment arrives and should be institutionalized by the countries. A cradle to grave strategy for the project activities should be integrated.
- ✓ Ongoing communication with the relevant stakeholder including the discussion of challenges in the moment these have been identified.
- ✓ A long-term annual financing system for the operation and maintenance of the project interventions after project finalization need to be established during the project time.
- ✓ Identify key financial limitations for sustainable HCWM systems; build capacity on HCWM budgeting; and study/support possible (private/public) financial mechanisms to ensure sustainability of HCWM operations.
- ✓ Considering that the introduction new technologies need additional knowledge on the maintenance and repair of the technicians / agents.
- ✓ The establishment of a capacity building program and asset management system is important.
- ✓ Support the countries to establish a national quality management system for procurement including standardization, communication, specifications, and evaluation based on international standards.

The THREE key lessons learnt:

1) **Develop or revise legal documents** an official Working Group (WG) need to be established. The members of the WG need to be intersectoral and knowledgeable on Best available Techniques (BAT) and Best Environmental Practices (BEP) to plan towards safe and environmentally friendly HCWM systems.
2) Identify key financial limitations for sustainable HCWM systems; build capacity on **HCWM budgeting**; and study/support possible (private/public) financial mechanisms to ensure sustainability of HCWM operations.
3) The carried out technical assessment in the four project countries showed for medical equipment, such as autoclaves, that **poor operation, bad maintenance and absence of repair capacity** remain the main reasons for breakdown and sub-optimal functioning of existing technologies resulting in frequent breakdowns.

1 Build national capacity on HCWM

At the beginning of the project a 10-day Training of Trainers (ToT) on HCWM has been conducted for project stakeholder and trainers from all target countries. Master trainers received intensive training in content, effective teaching methods, evaluation tools, and Training of Trainers programs.

A. The aim of the training was to build up capacity and to enable the trainees to conduct trainings by themselves. Only a few additional trainings on HCWM have been conducted by the trained trainers. Segregation quality is still weak in some pilot facilities, autoclave operators are lacking knowledge and awareness.
    - ⇒ Prepare national HCWM training plan at different levels (national, district, facility levels) and ensure trained trainers are integrated into the training plan.
    - ⇒ Provide incentives for trained trainers on follow up national trainings. Inserting of HCWM in the national health service education structure (Universities, Nurse schools etc.).

2 Strengthening of the legal framework

The development and revision of the HCWM related policies, strategies, regulations, guidelines etc. are the base for the sustainable implementation and operation of a safe and environmental HCWM system.

A. The relevant legal framework has been assessed and the development or revision of legal documents was identified. Thus, not all countries filled the identified gaps due to constrains of capacity, awareness, turnover of staff or extensive administration procedures.
    - ⇒ Improving of capacities on HCWM on ministerial and stakeholder level by providing training, conduct excursions to modern waste management systems (e.g. conducted by the trained trainer like mentioned above).
    - ⇒ Initiating the revision of the legal system at the beginning of the project to ensure sufficient time for the approval of the documents.
    - ⇒ Building capacity and provide trainings on improved enforcement mechanisms to ensure proper implementation of existing legal framework.
B. To develop or revise legal documents an official WG need to be established. The members of the WG need to be intersectoral and knowledgeable on BAT and BEP to plan towards safe and environmentally friendly HCWM systems.
    - ⇒ Including of hospitals, regulators and local governmental administration of health and environment into the WG.
    - ⇒ Ensuring that the WG members have the relevant knowledge - if not, further training should be planned and / or onsite visits to modern waste management systems could be supportive.
    - ⇒ Sustainability of Working Groups should be ensured especially for post-project period. WGs or such HCWM coordination structures (including Ministry of Health (MoH), Ministry of Environment, Ministry of Finance, and relevant agencies, donors etc.) should be formalized/institutionalized under auspices of relevant national stakeholder.

3 Introduction of non-incineration technologies

3.1 Infrastructure

To install waste treatment technology (autoclaves), housing is needed to avoid negative weather impacts and to ensure safety requirements. Furthermore, it is needed to protect and secure the delivered equipment, the supply of high voltage (3-phase) stable power of high capacity and the continuous supply of water.

A. Although the construction of the buildings itself should be relatively fast (about 2 months), the actual completion of the construction took 6-12 months due to complicated administrative and financial procedures at the level of the beneficiary HCFs.
   - ⇒ The building of housing should be initiated at the very beginning of the project – parallel to the assessment - to provide sufficient time to clarify all administrative and financial procedures.
   - ⇒ Developing a checklist of all requirements with a time plan for completion and involve the national UNDP team in intensive monitoring of the progress.

B. One size housing was planned, despite different autoclave sizes and waste amounts needed to be housed.
   - ⇒ Adapting of infrastructure drawings to the expected waste amounts and equipment size.
   - ⇒ Allow space for potential expansion is Healthcare Facilities (HCFs) start to accept waste from neighboring facilities
   - ⇒ Allow space for storing recyclable materials

C. The high demands on the electricity connection (cables with a capacity to provide 25 to 75 kVA) proved to be a challenge for some hospitals and required the setup of new power transformers.
   - ⇒ Clarification of the electricity needs from the start of the project: confirmation of the availability in the pilot facilities or planning for upgrading where possible

D. In some cases, it was not clarified who is responsible for maintenance of the established waste handling buildings.
   - ⇒ Clarification of responsibilities from the start of the project in writing.
   - ⇒ Outlining of maintenance needs and providing of information about possible costs for maintaining the infrastructure

E. Cost for site preparation: The initial assessment showed that stable water supply and especially the supply of electricity, was a challenge in some facilities.
   - ⇒ Providing of clear cost indications for each pilot facility
   - ⇒ Written confirmation of available budget or agreement on upgrading of infrastructure by the countries. Or change of pilot facility.

3.2 Equipment

The project delivered non-incineration equipment (autoclaves) of different sizes and auxiliary equipment needed for the operation of the system including the logistics. Each country identified different needs of equipment.

A. In some facilities the delivered equipment was not used although was of good quality and operational.
   - ⇒ Awareness raising and training on the advantages and use of the equipment (advocating).
   - ⇒ The use of the equipment needs to be demonstrated and discussed onsite.

- ⇒ Involvement of private sector (private company is operating the equipment – outsourcing)
- ⇒ Relocation of equipment.

B. Water quality and electricity for the autoclave was not adequate (causes malfunction of the autoclave).
   - ⇒ Ensuring good media supply by including water treatment systems (filter and water softener) and voltage stabilizer

C. In the first three-months of autoclave operation technical problems occurred which partly hindered the usage of the autoclaves due to unclear communication strategy between pilot facilities, local agent and the supplier and replacement / shifting of trained operators by untrained operators
   - ⇒ Developing of Standard Operation Procedure (SOP) on how to communicate technical problems between hospitals and local agent (ownership).
   - ⇒ Following up on ongoing refresher training of operators by manufacturers / local agents / local HCWM trainer.

D. Low quality of certain equipment has been identified after delivery of equipment (e.g. needle cutter).
   - ⇒ High quality should be reflected in the specifications of the equipment and during commissioning.
   - ⇒ Establishing of a project / county-based quality system to ensure that the delivered equipment is in line with the specifications.

E. In some hospitals weak warehouse management has been identified as delivered spare parts disappeared.
   - ⇒ Handing over of spare parts to the hospital manager. Manager should commit ownership.
   - ⇒ Setting-up of a transparent storage management with clear responsibilities and documentation.
   - ⇒ Capacity building of warehouse staff should be included in the project document.

3.3 Operation and maintenance of equipment

A. The carried out technical assessment in the four project countries showed for medical equipment, such as autoclaves, that poor operation, bad maintenance and absence of repair capacity remain the main reasons for breakdown and sub-optimal functioning of existing technologies resulting in frequent breakdowns.
   - ⇒ Ensuring of reliable maintenance of new devices/technologies by providing extensive and qualified training of the technicians provided by the manufacturer prior to the installation of the equipment.
   - ⇒ Provision of maintenance and operation training of hospital technicians and technicians of MoH.
   - ⇒ Considering of long-term contracts for maintenance or an extended warranty time or increasing of spare part package: Full spare-part package for 2500 hours (to reduce waiting times for sending spare parts) or 10-year spare part guarantee (availability of spare parts from the manufacturer)
   - ⇒ Establishing of an annual national budget for HCWM maintenance to provide sustainable capacity building for technicians, providing of tools and travel budget.
   - ⇒ Capacity building on testing for treatment operations and developing testing standards (and schedules) as well as monitoring framework to enforce implementation of the testing protocols.
   - ⇒ Ensuring reliable supply chain of autoclave tests available in countries.

B. A high turnover rate of the operators was experienced, and some operators had not the capacity to operate the autoclave safely.
   - ⇒ Ongoing training and monitoring of autoclave operator
   - ⇒ Development of an incentive system to provide attractive working conditions

C. Operation costs: the availability of funds to cover operation costs of new treatment systems are limited due to budget constraints.
   - ⇒ Strategies to cover or compensate additional operation cost on national level should be discussed and developed at the beginning of the project start and followed up.
   - ⇒ Clear outlining of costs for the operation and maintenance of the established system after finalization of the project (including data management / exit strategy).

4 Phasing-out of mercury containing devices

In accordance to the "Minamata Convention on Mercury" the project supported the phasing out of mercury containing thermometer and sphygmomanometer from the pilot facilities and provided new non-mercury containing equipment.

A. Centralized procurement by UNDP Regional / global procurement was effective but complicated (difficulties with shipping, customs, import duties)
   - ⇒ Procuring of equipment at national level where possible.
   - ⇒ Conducting of a market study and support market transformation in favour of mercury-free devices, supporting national supply chains via local procurement of mercury free devices. Support centralized national procurers (Medical Stores) for capacity building towards green procurement practices for mercury-free medical devices.

B. Weak quality control system for medical devices in the countries was observed and made it hard to ensure that only equipment which fulfils required standards is accepted.
   - ⇒ Establishing of a quality control system for reliable and efficient equipment.
   - ⇒ Training of procurement staff onsite how to check the quality of the equipment.

C. Low capacity observed in project countries especially for validation and calibration of medical equipment which can be a challenge for the quality assurance during procurement process and durability for the usage of mercury free, digital medical devices.
   - ⇒ Assessing of validation and calibration requirements and countries capacities.
   - ⇒ Providing of clear guidance and training on validation / calibration of equipment when necessary.
   - ⇒ Guidance and capacities in the countries needs to be available before arrival of new equipment.

D. Replacement of mercury containing devices: medical devices such as thermometers and sphygmomanometers were not always owned by the hospitals but by the physicians and the patients.
   - ⇒ For an exchange of these devices, final recipients must be well identified and if necessary, changed.

E. The project followed the 1:1 replacement scheme for mercury containing devices: for each mercury containing device, one without mercury was exchanged. A lot of facilities were lacking on thermometers and sphygmomanometers; therefore, equipment is shared between patients, which might lead to cross contaminations.
   - ⇒ Instead of strict 1:1 replacement strategy, providing mercury free devices in accordance with the need. Considering of higher budget for new equipment to enable the staff to use the equipment safely.
   - ⇒ Incentives would be provided to promote/recognize mercury free healthcare facilities.

F. Some medical staff was not convinced that the new equipment is as accurate as the mercury containing ones and is reluctant to use the new equipment:
   - ⇒ Awareness raising and training on digital equipment on the ground is essential. Formal trainings should be adopted – starting at the school of health.
   - ⇒ Establishing of a maintenance system for the new digital equipment, to ensure lasting operation and reliable energy supply (batteries).
   - ⇒ Assisting in identification of local supply channels for the chargers and batteries to sustain the use of new equipment.

G. Only one size arm-cuffs of sphygmomanometers have been procured which were not suitable for children.
   ⇒ Considering of different sized arm-cuffs during the planning of equipment.
H. There was a problem on the security of the storage facility, as the stored phased-out mercury containing devices have been stolen from the storage facility probably for selling in on the informal market.
   ⇒ The storage of mercury containing devices need to be inaccessible to unauthorized persons and monitored regularly.
   ⇒ Disposal strategy for mercury waste should be identified/ensured in line with country's obligations under Minamata Convention.

5 Demonstrate HCWM systems including recycling

At the country level, the team of national experts work with each model facility and the central/cluster facility to provide support to the central/cluster facility in the implementation of their plans, reducing their waste streams by introducing recycling activities and support HCFs in improving the HCWM monitoring.

A. All 4 countries planned for "central or cluster" treatment facilities. The "cluster" facilities were equipped with a waste autoclave and serves as a central treatment hub for surrounding facilities that do not have autoclaves. Some central treatment facilities are not using the full capacity of the autoclaves – not enough waste is delivered to establish a financially effective system.
   - ⇒ Organizing of information meetings with surrounding health facilities which are potential candidates to be connected to the cluster system.
   - ⇒ Proactive marketing and supporting of the cluster strategy.
   - ⇒ Supporting the centralized facilities to set up a business plan.

B. Supplies and consumables for HCW classification, segregation, transport and storage were provided to all pilot facilities and proved to be very critical element of demonstration of HCWM systems.
   - ⇒ Continuous capacity building trainings on HCWM practices for better classification, segregation, transport and storage of healthcare waste.
   - ⇒ Support for local supply of healthcare waste logistic, storage equipment and consumables by promoting sustainable procurement practices.
   - ⇒ Conduct market study for availability and affordability of local supply of HCWM consumables as well as promote local production of basic HCWM consumables, where feasible, via closed-loop recycling.

C. The recycling program for plastic proposed in the Project Document has proven difficult to implement in some countries, as there is little or no market for the recovered plastic in the communities where the project facilities are situated.
   - ⇒ Passing of the collected plastic to scavengers for free, thereby meeting the environmental goal of ensuring that the materials are recycled.

D. Financial incentive for the hospital is missing to follow up with recycling activities.
   - ⇒ Providing of additional specific awareness raising sessions for hospital management.

E. In some model facilities the HCWM monitoring systems are still weak.
   - ⇒ Providing of continues awareness / training session for the responsible person on HCWM in the model facilities.
   - ⇒ Developing of monitoring tools together with hospitals and MoH.
   - ⇒ Supporting MoH to establish a national monitoring system on HCWM.
   - ⇒ Costs related to data collection; monitoring should be considered within HCWM budget planning.

6 Capacity development, training and awareness

The training of healthcare professionals, especially Environmental Health Officers and Nurses, is well on the way to being strengthened in Schools of Hygiene and other teaching institutions in the four countries. This will greatly improve the HCWM skills of the future medical professionals, which in turn will support the future operation and expansion of the HCWM systems.

A. The training on HCWM should be institutionalized in the health service curriculums of the countries (Schools of Hygiene and other teaching institutions), to ensure that capacity on HCWM improves continuously – also after finalization of the project. Not all country followed this approach.
   ⇒ Advocating of the importance to establish national HCWM training infrastructure by the project management to the relevant ministries and training institutes
   ⇒ Ongoing support of the project to adapt the training curriculums
B. Developing learning modules on HCWM linked gender equality; social, environmental safeguards; and communication; and integrating these modules into curriculums. It was experienced that the trained master trainers have not been involved or do not have the capacity to identify and select the correct equipment and quality of waste equipment and mercury free devices.
   ⇒ Building capacity to allow beneficiaries to select right equipment (ownership)
   ⇒ Supporting of the countries to set-up of a quality system on procurement.

7 Country specific flagship activities

Each country investigated specific topics, with the aim of gaining experience and sharing the conclusions with the other project countries.

7.1 Ghana: Evaluation of sharp management tools

Three different sharp management devices were supplied to each of the facilities for use after training on how to use these devices: (1) cardboard safety boxes (2) plastic sharps containers with a needle separation device and (3) needle cutters. After three months an evaluation survey was conducted to check staff satisfaction and preferences for the three different devices. A total of 166 staff from 5 project hospitals responded and evaluated the ease of use and safety of these three sharps management tools. The use of these devices depends also on their availability and possibly the convenience of their use. Most of the health staff preferred the plastic sharp container for that it is mostly robust, safe and secure to handle, easy to use, puncture-proof and cannot rupture.

A. Although the plastic sharp container are designed to separate the needle from the syringe, quite a number of medical staff dropped the complete syringe into the box without separation, which leads to a quick filling rate (costs) and overfilled container (risks of needle pricks).
    - ⇒ Redesigning of the cover of the opening to prevent clinical staff from dropping the whole syringe into the container.
    - ⇒ Providing of continues training on the correct use of the device.
B. Recycling of the plastic syringe bodies after autoclaving was not introduced in the timeframe of the project although this would be a good possibility to push for circular waste management economy.
    - ⇒ Raising of awareness and knowledge of medical staff and management as well as of recycling companies on the reliable and safe decontamination of waste by autoclaving, which allows further recycling of the waste.
    - ⇒ Identifying, educating and contracting of recycling companies which are interested in the recycling of decontaminated plastic syringes.
C. Beside the 3 different sharp management devices also other options like needle melter are available on the market which have not been considered in the project.
    - ⇒ Train staff on the use and benefits of needle cutters
D. There was a tendency for people to prefer the option that they were most familiar with, which could have skewed the conclusions of the study
    - ⇒ Careful studying design to avoid bias
    - ⇒ Proper training on how to use new needle management strategies
    - ⇒ Study should continue long enough for staff to get used to new needle management strategies

7.2 Madagascar: Autoclave operation and maintenance videos

A set of videos on the autoclave operation and maintenance were made. The video was produced for both English and French speaking audiences. It should be noted that the shots for the videos were taken when the autoclaves were installed and the training given by MEDICLAVE's technicians. Consequently, the videos presented the different phases of operation and maintenance in a detailed manner.

A. Since the speaker is an English-speaking person, it was more difficult to understand technical terms used and to put the subtitling in French. The production of the video took much longer.

- ⇒ Programming an exchange session between the producer of the video and the user of autoclave after the transcription of the script to validate the terms used.
- ⇒ Working with a translator with a basic knowledge of the autoclave and the technical terms used.
- ⇒ Giving the translator time to become familiar with the technical terms by ensuring that the autoclave's technical manuals are available in advance.

B. Absence of a section treating general information on autoclaves or autoclaving in the operational or maintenance videos.
   - ⇒ Including an introduction section with general principles of autoclaving (temperature, pressure, autoclaving time, tests to be carried out...) and general information on autoclaves.

7.3 Tanzania: Operation and evaluation of the applicability of a bio-digester

A biodigester was established at two Hospitals in 2018 and 2020. The digesters are fed with wastewater, placenta from the maternity ward, kitchen waste and food leavings and have proved successful.

A. Need for expert design. The highly experienced designer was able make designs considering quantities of waste (especially balance between food and placenta waste), sources of water and other factors specific to the facility to reach a design that will work well
   - ⇒ Choose designers who have proven expertise in bio-digestion
   - ⇒ Add designers to expert rosters

B. Identification of the space for installation: Space can be a serious constraint in urban hospitals, and location can influence gas consumption.
   - ⇒ Consider the available space include space in choice of hospitals
   - ⇒ Select experienced designers and constructors who are able to adapt to the available space

C. Availability of a local company which has the necessary knowledge to construct a biodigester as the digester need to be water and gas tight.
   - ⇒ Available experience in building biodigester needs to be a priority during the tendering process.

D. Segregation of waste is important as non-biodegradable materials can block pipes.
   - ⇒ Ensure design does not include narrow pipes that could be blocked by accidentally included biodegradable materials such as plastics
   - ⇒ Ensure design includes access hatches for essential maintenance

E. In one hospital there was not sufficient areas to utilize/consume the produced biogas (methane). This poses a risk, if the gas is released without burning it.
   - ⇒ The amount of generated biogas needs to be estimated already in the design phase and sufficient areas of gas consumption in the hospital must be identified.

F. Monitoring was limited, which prevents longer term demonstration of the value of the waste treated and gas produced, which could be an important incentive to continue use.
   - ⇒ Include monitoring strategies and tools for the hospital

G. Maintenance needs are minimal, but like any mechanism, it needs some routine maintenance and troubleshooting
   - ⇒ Include long term contact with bio-digester and ongoing skill-sharing with hospital maintenance staff

7.4 Zambia: Applied recycling

One healthcare waste stream of special concern in Zambia is the so called "sharp waste". The healthcare facilities in Zambia mainly use, if at all, imported safety boxes made from corrugated cardboard for the collection of sharp waste. These safety boxes do not allow the separation of needles and syringes and therefore do not allow the recycling of syringes (plastic). The safety boxes are mainly provided from immunization campaigns so shortcomings for the daily produced sharps exist.

Due to the non-separation of needles and sharps the safety boxes quickly fill, typically per 5l safety box up to 100 sharps (syringes with needles) can be collected (up to 20 sharps per litre). An alternative solution would be to introduce plastic sharp containers are equipped with a needle remover device to separate needle and syringe and with a blade remover for scalpels. Only the sharp part of the item is collected, thus allow a more efficient collection of sharps and the recycling of the syringes and scalpel handles.

The overall aim of the flagship project in Zambia was to improve the healthcare waste management system by the introduction of an improved way on the safe collection of sharp items. The main objective of investigation was the transfer of knowledge, technologies, skills and good practice to the healthcare sector in Zambia on:

- The local production of high-quality sharp containers for the safe collection of sharp waste
- The introduction of proven standards for quality assurance during sharp container production
- The creation of a cost-efficient alternative on otherwise to be imported sharp waste solutions

Furthermore, the focus was given to stipulate the recycling of plastic waste created by the healthcare sector as a source of raw material for the production of sharp containers. To ensure the interest of the private sector, a guaranteed purchase of 12,500 sharp was tendered. Despite direct contact with several local producer of plastic products, no private company showed interest on the local production.

A. One main barrier was the necessary initial investment to be carried out by the private sector for the construction of the moulds for the container production.
   - ⇒ Increasing of the guaranteed purchase of sharp container (assumed 25.000) to ensure the re-financing of the investment cost by the private sector
   - ⇒ Motivation of international sharp containers companies to form Joint-Ventures with local companies

B. Low trust of the private companies in the procurement procedures of the governmental health sector and the sustained purchase of sharp containers.
   - ⇒ Bundling of different buyers (e.g. donor organizations, private healthcare facilities) to ensure long-term purchase from the private sector
   - ⇒ Checking of the availability of sharp containers in the healthcare facilities as part of the national healthcare sector monitoring program

8 UNDP GEF Project Planning and Management

A. Some project activities are not in line with the project plan as during the project planning the long processes of UNDP and country authorities (MOH) have been underestimated. Project delay by long procurement process of equipment due to the necessary approvals by the stakeholders in preparing/confirming the Bill of Quantities (BoQs), customs clearance etc.
   - ⇒ Assessing and clarifying of UNDP and country processes at the beginning of the project and adaptation of the project plan accordingly.
   - ⇒ For preparation of multi country projects with sizeable and staged equipment procurement components UNDP should plan minimum 5-years implementation period.
   - ⇒ More attention and budget allocation to monitoring and data collection, including steps to establish a national monitoring system

B. In the second phase of the project data like treated waste amounts and operation costs could not be collected on long term. This led also to inadequate monitoring of the equipment usage based on the late commissioning of the equipment.
   - ⇒ Initiation of data collection at the start of the project.
   - ⇒ Conducting workshops on data collection – outlining the importance and highlight the relevance of reliable data.
   - ⇒ Providing of simple collection templates for the users.
   - ⇒ Presenting results of the data collection to emphasis the important of data collection.

C. During the development of the GEF project document the planning and implementation of the project activities did not sufficiently consider the ways of final disposal of waste from the project activities: i) The disposal of the decontaminated waste after autoclaving on the existing landfills / dumpsites not accepted by the countries. ii) Decontaminated waste is burned on the landfill / dumpsite (no reduction of UPOPs). iii) The final disposal of mercury-containing devices has not been incorporated in the project activities.
   - ⇒ Considering of the cradle to grave strategy of waste management in the Project Document by including final disposal of decontaminated waste on public landfills / dumpsites and final disposal of mercury containing equipment.
   - ⇒ Discussing and clarification of possible challenges on the disposal with the relevant national stakeholder already in the inception workshops of the project to identify challenges and prepare for mitigation measures.

D. The high turn-over of trained staff in the pilot facilities became a problem within the project time which results in decrease of project efficiency and results.
   - ⇒ Developing of an incentive strategy for trained staff to keep them working in their designated jobs.
   - ⇒ Ongoing training and monitoring of autoclave operator.

E. During the project it turned out that mercury containing equipment is still donated by international organizations.
   - ⇒ Supporting the government to monitor and set up rules and standards for donations.

F. Although there was some success, the recycling program for plastic proposed in the Project Document has proven difficult to implement in some countries, as there is

little or no market for the recovered plastic in the communities where the project facilities are situated.

- ⇒ Assessment of the available recycling sector in the target countries in order to ensure that project activities can be implemented.

G. The Project Document underestimated project's need for communication and knowledge management (KM) activities, therefore, the project initially had challenges in responding KM related requests. Although the project has established an online shared folder with key technical guidance and training documents, it has been agreed that there is a need for a central repository space (website) would be needed to ensure access to key technical KM products, more specifically for post-project closure.

- ⇒ Initiation of the set-up of a project webpage in the first months of the project to ensure a strong platform which provides all relevant documents, guidelines and results available to all stakeholders.
- ⇒ Providing of one webpage of all UNDP GEF projects which were including HCWM interventions to have all project documents available.

9 Unexpected events during project implementation

9.1 COVID-19 response

The following areas are recommended as short-term responses, which can be supported by UNDP and projects which are currently implemented:

- Making Personal Protective Equipment (PPE) available to the COVID effort. This is an occasion to raise the importance of having proper PPE which is essential to waste handlers.
- Outreach key guidelines and information
- Advertise availability of equipment already provided by the projects (as opposed to immediately plan for new equipment, see below). Increase the use of this equipment to full capacity
- Provide links to experts, including national technical reference person, and all key background documentation

Note: UNDP experts working in the project do not recommend envisaging addition of new waste treatment equipment (particularly new type of equipment) in health care facilities immediately during pandemic, epidemic or other crisis. Reasons are multiple and have been demonstrated in previous sanitary crisis situations. Installing new equipment requires time and additional training which cannot be provided in emergency mode. The current context of expert inability to travel and import restrictions, as well as shortages of specific parts, makes manufacturing and delivery of equipment extremely difficult. However, the provision of new waste equipment can be planned in the medium run, as a second step in the response.

During the project implementation, experts adapted their advice to response to the emergency, preparing a Frequently Asked Questions (FAQ) document available to all. This was considered as very useful. On this FAQ, the project team / experts focused on having the advice out quickly, considering that it was essential for the HCF staff on the ground. Efforts were also made to reach out to other organisations (WHO, UNEP, Global Fund…) to harmonise the messages on HCWM and avoid diverging guidance. UNDP succeeded in this convening and coordination effort.

The following lessons learned could be experienced during COVID-19 short term response of the project target countries in 2020 (2nd phase of the project):

A. Due to the COVID-19 outbreak, the project activities could not be finalised within the project timeline. Preventing and controlling of the COVID-19 outbreak was the priority of the international and national project team and stakeholders. Furthermore, travel restrictions slowed down all project activities.
   - ⇒ The project timeline was extended for 8 months.
   - ⇒ The international and national UNDP project team supported the national stakeholders with additional PPE, waste logistic equipment, key guidance, and additional training on HCWM.

B. During the COVID-19 pandemic the lack of PPE and waste logistic equipment was a huge problem in all target counties.
   - ⇒ Project money was used to procure and distribute additional PPE (safety goggles, working gloves, working overall, safety boots, safety mask, working gloves etc.), waste logistic equipment (waste bins, wheelie bins, trolleys, chemical transport bins etc.) and locally produced hand rub disinfectants.

C. There was a lack of knowledge and awareness how to segregate, collect, store, treat and dispose waste generated in health facilities during the COVID-19 crisis.

- ⇒ Providing of additional IPC training for staff in the pilot HCFs including healthcare waste.
- ⇒ Providing guideline and FAQs on COVID-19 crisis response.
- ⇒ Making webinars available for national staff on safe HCWM during COVID-19 pandemic (UNDP, WHO, HCWH).

D. An urgent need of additional waste treatment technologies was identified, due to increasing amounts of infectious waste by additional use of PPE. The project had already procured additional autoclaves for phase 2 of the project, but these could not be installed due to the travel restriction of international technicians.
   - ⇒ Remote installation of the autoclave by local technicians with the support of technicians in South Africa using the platforms: Zoom, Skype and WhatsApp.

E. The remote installation of autoclaves was a challenge due to different cultures, language problems and lack of sufficient experience of the national technicians. The solutions were to agree on:
   - ⇒ Exact following of the instructions of the international technicians were to be followed without any varieties by the national technicians, to avoid any risk of failed installation.
   - ⇒ Language problems have been solved by being patient and respectful.

9.2 Measles outbreak in Madagascar

A. Between October 2018 and January 2019, the Ministry of Public Health of Madagascar reported 19,539 cases of measles, including 39 deaths in health facilities (case-fatality rate: 0.2 per cent) and launched vaccination campaign into three phases. The third phase of the measles vaccination campaign in Madagascar was held from 1 to 5 April 2019. Nearly 4 million children under 6 months to 10 years of age are affected. Due to a lack of logistical resources and technical support, CSBs (basic health centers) are used to burn waste in the open air. Some CSBs have already incinerated their waste before the collection agents arrived.
   - ⇒ Vaccine waste of third phase in four districts such as Ankazobe, Mandoto, Anjozorobe and Betafo was transported for the treatment in the centralized autoclave treatment facility in the "Centre Hospitalier Universitaire - Joseph Ravoahangy Andrianavalona" (CHU-JRA) Ampefiloha, Antananarivo.
   - ⇒ Two vehicles, provided by the project, were made available to go to the CSB - places where used syringes and vials are collected. The support agents of main university hospitals, CHU-JRA and CHU-JRB have been appointed to carry out the missions.
   - ⇒ Compensation payments of staff that carried out the autoclave operations and the costs of water and electricity consumption for the autoclave operations were also covered by the project.
   - ⇒ Adonis Company located in Ambatomirahavavy – 20 km east of Antananarivo – carried out shredding of the disinfected waste for the landfilling.
   - ⇒ In total, 200 kg of waste were treated from the Basic Health Centres - CSB II of the four districts, mainly used syringes and vials.

B. Some CSBs are located in isolated areas. The transport of waste seemed difficult at the time.
   - ⇒ In most of cases, waste collection teams travelled by bicycle, motorcycle, canoe or on foot to bring the waste from the vaccination campaign.

10 Cooperation with partners and projects

One important lesson learnt was the importance to actively search for cooperation possibilities with other projects and partners. Some examples have been outlined below.

In October 2019, a meeting of several global health professionals was convened at the Global Health Campus in Geneva, Switzerland. This meeting followed on from different bilateral and multilateral conversations about streamlining activities and technical advice on HCWM, to avoid the duplication of efforts and resources. This initial meeting set the foundation for **inter-organisational coordination** on HCWM for the COVID-19 pandemic. As it became evident in the early part 2020 that the emergence of the virus which causes COVID-19 would pose a threat to global health, the group of HCWM professionals, from a dozen[1] organisations once again convened a (virtual) meeting. These meetings, held fortnightly and later monthly, have been used to coordinate a response on a number of issues:

- This inter-organisational platform has led to the coordinated dissemination of HCWM tools developed by several experts working across different regions and organisations. This has increased the consistency of the publicly available advice.
- Information sharing on where different agencies and organisations are implementing various activities, has allowed opportunities for synergies to be spotted early.
- In addition to these, the platform has allowed for lessons to be shared, problem shooting across different organisations and the development of strategic and longer term thinking about how best to position the HCWM sector within broader health system strengthening investments. Advice being given to in-country practitioners facing an increase in waste generated from increasing PPE usage by front line workers and the general public, advice on the risk from various COVID-19 related waste streams as well as the perceived threat from non-COVID-19 waste more broadly.
- Products which have been developed with inputs from the group include a publicly accessible drive with resources on HCWM, including a decision tree to guide health care waste disposal decisions on the front lines and answers to questions frequently asked by those managing and handling healthcare waste.
- Further cooperation within the group has included documents circulated prior to publication, expert inputs on activities such as the UNDP "Health Care Waste Management in the Context of COVID-19", a rapid assessment coordinated the Sustainable Procurement in the Health Sector team.
- One of the countries included in the assessment was Ghana. As a result of the existing taskforce cooperation, there were inputs from UNIDO and WaterAid experts as well as this project's HCWM experts.

To promote intra UNDP implementation support and sustainability of project activities, the project formed strategic partnership with the HIV, Health and Development through **Sustainable Health in Procurement Project (SHiPP**) in 2018, named as such to emphasize its intention, to strengthen sustainable procurement of health products within the UN system, in selected countries and through the Global Green and Healthy Hospitals (GGHH) network and to build capacity among strategic manufacturers and suppliers and waste management in the health sector. SHiPP is funded by the Swedish International

[1] The organisations include: BRS Secretariat, US CDC, GAVI, GEF Secretariat, GFTAM, HCWH, UNEP, UNDP, UNICEF, UNIDO, WaterAid, WHO

Development Agency (Sida) and is co-managed by UN Sustainable Procurement in the Health Sector Secretariat and HCWH. This was aimed at promoting the sustainability of the two UNDP projects, ensuring joint programming at all levels of project management and the following was in place:

- **Project Oversight**: The project Boards for the two projects involved experts from the two clusters, including sharing international consultants recruited for technical oversight. This provided an opportunity for cross technical oversight to the two projects (GEF UPOPS and SHIPP).
- **Annual Planning and Review:** Joint project oversight, planning and review meetings were held to ensure leveraging of resources and man hours. At these events, both projects presented on key focus areas to ensure synergies and reduce duplication were possible. Planning at country level involved stakeholders from the same sectors in providing the integrated country level multi stakeholder support thereby ensuring sustainability of initiatives. This was well received by stakeholders and they viewed these two as complementary projects.
- **Leveraging Resources:** In Zambia, both projects used the same Focal Point Person thereby facilitating smooth partnerships with stakeholders especially the ministry of health who had to deal with one technical officer from UNDP as they were the custodians of both initiatives. The Country office focal point was from the Environment country office team and this enabled cross teamwork with the health focal point. Additionally, some field missions where jointly planned and executed ensuring savings on both projects as projects did not have to pay for meetings at different times. A good example is when a Health Systems Strengthening opportunity arose to undertake the Rapid HCWM Assessment related to COVID19, the HHD and the GEF teams initiated this as a joint assignment and provided joint oversight mechanism for this consultancy. The Engineers without Boarders consultancy hired to conduct the assessment benefitted from the expertise from both GEF and HHD teams.
- **Project Implementation:** In Tanzania the two projects pursued related projects to ensure maximum impact. For example, the SHiPP supported research around energy saving devices, efficient water management and elimination of toxic products from the health sector. This has an indirect relationship to the amount of waste being generated by the health sector, a theme closely pursued by the GEF funded project. Additionally, the 2020 SHiPP workplans in Tanzania and Zambia prioritized some of GEF initiated interventions such as Biodigesters.