

# **Independent Terminal Evaluation**

## **Environmentally Sustainable Management of Medical Wastes in China**

UNIDO Project No.: GF/CPR/07/008 - 104036  
GEF Project ID: 2927



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

# **UNIDO INDEPENDENT EVALUATION DIVISION**

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## ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
APR	Annual Project Report
APW	Annual Project Workplan
BAT	Best Available Technique
BEP	Best Environmental Practice
CAEP	Chinese Academy for Environmental Planning
CIO	Convention Implementation Office
CP	Clean Production
EIA	Environmental Impact Assessment
EPB	Environmental Protection Bureau
ESM	Environmentally Sound Management
FECO	Foreign Environmental Cooperation Office
GEF	Global Environmental Facility
GPS	Ground Positioning System
HCW	Health Care Waste
IHEP	Institute of High Energy Physics
M&E	Monitoring and Evaluation
MEP	Ministry of Environmental Protection
MOH	Ministry of Health
MTE	Mid Term Evaluation
MW	Medical Waste
NEX	National Execution
NGO	Non-Governmental Organization
NIHA	National Institute of Hospital Administration
NIP	National Implementation Plan of the Stockholm Convention
NO <sub>x</sub>	Nitrogen Oxide
NPHMW	National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste
PCDDs/PCDFs	Poly Chlorinated Dibenzo Dioxins / Poly Chlorinated Dibenzo Dioxin Furans
PIR	Progress Implementation Report
PMO	Project Management Office
PMT	Project Management Team

<b>Acronym</b>	<b>Meaning</b>
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PPP	Public Private Partnership
QPR	Quarterly Project Report
QPW	Quarterly Project Workplan
R&D	Research and Development
SARS	Severe Acute Respiratory Syndrome
SCR	Selective Catalytic Reduction
SMART	Specificity, Measurability, Achievability, Relevance, Time Bound
TE	Terminal Evaluation
Teq	Toxicity equivalent
TOR	Term of Reference
UNIDO	United Nations Industrial Development Organization
VOC	Volatile Organic Compound

## GLOSSARY OF EVALUATION-RELATED TERMS

Term	Definition
Baseline	The situation, prior to an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results-based management) principles.
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies.
Risks	Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.



## EXECUTIVE SUMMARY

### 1. Project Key Data:

GEF Project ID	2927
Project Number	GF/CPR/07/008 - 104036
Funding Source	GEF Trust Fund
Project Name	Environmentally Sustainable Management of Medical Waste in China
Country	People's Republic of China
Region	Asia and the Pacific
Focal Area	Persistent Organic Pollutants
GEF Period	GEF-4
Received by	14/10/2005
PPG approved	07/02/2006
Approval Date	01/06/2007
Project Closed	31/12/2016
Executing Agency	MEP/FECO (previously FECO/SEPA)
Description	The objective of the project is to minimize the generation and emissions of unintentionally produced POPs (principally PCDDs/PCDFs) from the medical waste treatment sector.
Project Preparation Grant	350,000 USD
GEF Project Grant	11,650,000 USD
Co-financing Total	USD
Project Cost	USD
GEF Agency Fees	465,080 USD
GEF Project (at endorsement.)	11,650,000 USD
Co-financing Total (at endorsement)	33,157,140 USD
Project Cost (at endorsement)	45,157,140 USD
GEF Agency Fees (at endorsement)	1,200,000 USD

## 2. Brief introduction to the project

After the SARS outbreak in 2003, the Government of China issued the National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste National Plan for the Construction of Hazardous and Medical Waste Disposal Facilities, People Republic of China, 2004. The plan was issued only few months before the ratification of the Stockholm Convention on POPs. At that time, one of the main concerns was to reduce the health risk associated to the ineffective disposal of infectious medical waste in small, substandard facilities, therefore the plan promoted the shifting from small and local treatment to centralized disposal plants but did not include recommendations or indications concerning the adoption of practices or technologies aimed at reducing the secondary environmental pollution caused by the incineration processes.

In 2004, China ratified the Stockholm Convention on Persistent Organic Pollutants. The first NIP developed in compliance with the Convention National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutant People Republic of China, 2007, made clear that the incineration of medical waste was one of the most important sources of PCDD/F.

The reduction of PCDD/F from the incineration of medical waste was therefore identified as one of the priorities for the implementation of the Stockholm Convention under the NIP.

It is in this framework that the Government of China, with the support of UNIDO, developed and submitted a project aiming at the “Environmentally Sustainable Management of Medical Wastes in China”, with the main objective to “*minimize the generation and emissions of unintentionally produced POPs (principally PCDDs/PCDFs) from the medical waste treatment sector*”. The PDF-B document was approved by the GEF in October 2005, whilst the project document was approved for implementation on 31/07/2007 and officially closed in June 2017 (although some activities, including this evaluation, were completed only later in 2017).

The project is expected to lead to the a direct PCDD/F release reduction of 1.94 g TEQ per year from implementation of BAT at incineration facilities, 2.59 g TEQ from the demonstration of disposal processes alternative to incineration, and 47.88g TEQ/year as result of replication activities.

With a GEF grant of 11,650,000 USD this is the largest national project on medical waste management ever implemented with the GEF financial support.

The project is structured in 7 technical components and one monitoring and evaluation (M&E) component. The first 2 project components aimed at improving the regulatory framework, including pollution performance standards for HCW disposal facilities, and strengthening the institutional capacity on HCW management at national and local level; the third component aimed at the improvement of the management of HCW at source, i.e. by implementing Best Environmental Practices (BEP) for the management of HCW in hospitals; this included a development of a new classification system for medical waste, and better practices for waste prevention and segregation. The 4<sup>th</sup> and 5<sup>th</sup> project components intended to demonstrate Best Available Techniques (BAT) for combustion and non-combustion disposal technologies. Component 6<sup>th</sup> of the project was designed to demonstrate the integrated management of medical waste at both municipal and provincial level, addressing also the very complex issue of HCW management in remote areas; component 7<sup>th</sup> aimed at identifying financial and social strategies for enhancing the sustainability of the Environmentally Sound Management of Medical waste in the country, including fee policies, innovative financing scheme, etc. Finally, component 8<sup>th</sup> was about Monitoring, Evaluation and project management.

The project faced many delays for a number of reasons, which are explained in detail in the section related to the project efficiency. However, after almost 10 years of implementation, the project achieved most of the planned goals, including:

- 1) a reduction of PCDD/F release in line (or potentially exceeding) the project target, achieved through the demonstration and replication of BAT in combustion and non-combustion disposal facilities;
- 2) the upgrading of the regulatory framework on medical waste, including several BAT and BEP guidelines, and emission standards for disposal plant and a more sustainable classification of Health Care Waste (however the process of promulgation of some of these regulations, although in its final stage, is still ongoing);
- 3) a massive training on all the aspects of HCW management (regulatory, disposal, segregation etc.) implying both classroom and on-duty training, involving the establishment of 3 training centers on HCW disposal, 7 training centers on BEP in healthcare waste facilities, one technology transfer center and around 50,000 people trained;
- 4) implementation of integrated system for HCW management at provincial and municipal level;
- 5) an improvement of the management of HCW in remote and rural areas;

The project benefitted from the fast development of PCDD/F monitoring capacity which increased substantially during project implementation. Today, more than 20 national PCDD/F laboratories have the capacity to test the release of dioxin from the stack of incinerators, thus making possible the enforcement of PCDD/F emission standards, as well as the routine monitoring of the environmental performance of large incinerators. The project also benefitted from the improvement of the regulatory framework on waste management.

At the same time, some of the most complex issues China is facing in the field of healthcare waste management are not completely resolved, either because they are beyond the project scope or because the project has not the power to speed up the regulatory process. These are:

- The management of healthcare waste coming from small hospitals in remote areas of the country;
- The issue of waste management fee, which, as demonstrated by the discussion on the charging fee policy, need to be improved;
- Some key regulations, like the setting of the Stockholm Convention compliant emission standards for PCDD/F and the new HCW classification, reached their final stage of approval but have not been officially endorsed yet.
- The management of mercury devices and mercury waste (which however was envisaged only as a co-financed activity with limited scope) is still at its initial stage.

### **3. Key Findings and Conclusions**

#### **3.1 Reduction of U-POPs releases**

As a direct benefit of project implementation, the release of PCDD/F from demonstration plant amounted to 2.17gTEQ/yr (As proved by the analytical certificates released by the laboratories in charge of PCDD/F monitoring (which were shown to the evaluator in all the incineration facilities visited), the project was able to directly reduce by 2.17gTEQ/yr the release of PCDD/F through the

implementation of BAT/BEP in the six demonstration plants (1.47 g TEQ/yr for the incinerators and 0.70 g TEQ/yr for the non-combustion facilities, in total rating 84% of the expected reduction of 2.59 g TEQ/yr), as summarized in the following **Error! Reference source not found.**

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The project was effective in establishing a large number of replication of BAT/BEP already in the course of project implementation. The list of the replication plants is reported in Annex IV "List of replication facilities". Through replication, the project achieved an additional reduction of 13.19 gTeq/year (from incineration plants, measured through sampling and laboratory analysis of PCDD/F) and of 31.34 gTeq/year from the non-combustion facilities (estimated assuming a reduction factor equal to 0.05 gTeq/yr for each ton of waste processed through a non-combustion facility)

Therefore, totally the project achieved a reduction of PCDD/F release equivalent to 46.7gTeq/yr, against an expected overall reduction of 52.41 gTeq/yr. This achievement however does not include the reduction achieved through the replication of BEP and minimisation of plastic waste in the hospitals, which may be substantial considering that over 1500 hospitals were involved in the replication stage.

Based on the above, the PCDD/F reduction target has been achieved or potentially exceeded by the project.

### 3.2 Technology testing

The project represented an important platform not only for testing of advanced technologies for the disposal of medical waste, but also for promoting the research in the field of air pollution treatment (both for incineration and non-incineration plants) and for establishing the Chinese BAT for a number of disposal technologies, as following:

- Achievement of BAT recommended emission limit for PCDD/F was demonstrated in one rotary kiln incinerator (the Changchun and in pyrolytic plants (the Nanchang and Huaihua plants). In Nanchang and Changchun, the project also demonstrated the use of Selective Catalytic Reduction equipment for the simultaneous abatement of NO<sub>x</sub> and PCDD/F (see As proved by the analytical certificates released by the laboratories in charge of PCDD/F monitoring (which were shown to the evaluator in all the incineration facilities visited), the project was able to directly reduce by 2.17gTEQ/yr the release of PCDD/F through the implementation of BAT/BEP in the six demonstration plants (1.47 g TEQ/yr for the incinerators and 0.70 g TEQ/yr for the non-combustion facilities, in total rating 84% of the expected reduction of 2.59 g TEQ/yr), as summarized in the following **Error! Reference source not found.**
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- Demonstration of BAT in non-incineration facilities was directly demonstrated in Chemical Disinfection plant (Xinxiang), in one autoclave steam disinfection plant (Xiaogan), and in one combined microwave and steam-disinfection plant. (Pingliang) (see As proved by the analytical certificates released by the laboratories in charge of PCDD/F monitoring (which were shown to the evaluator in all the incineration facilities visited), the project was able to directly reduce by 2.17gTEQ/yr the release of PCDD/F through the implementation of BAT/BEP in the six demonstration plants (1.47 g TEQ/yr for the incinerators and 0.70 g TEQ/yr for the non-combustion facilities, in total rating 84% of the expected reduction of 2.59 g TEQ/yr), as summarized in the following **Error! Reference source not found.**

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The replication was conducted in 18 incineration facilities and around 140 non-incineration facilities (see ANNEX III: List of replication facilities). The replication did not envisage the project support on plant upgrading / procurement, but only a limited financial and technical support aimed at facilitating the compliance with the BAT target.

In addition to that, the project demonstrated 2 technologies for the reduction of PCDD/F

- A technology, based on a combined photocatalytic, biological and adsorption filter, for the abatement of VOCs and odors. The technology was developed by the School of Chemical Engineering of the University of Tianjin. The technology proved successful (VOC removal in the order of 99.5%) and is currently in the commercial stage.
- Research and Development concerning SCR Technology for the abatement of Dioxins/NOX Emitted from Flue gases (Developed by the Zhejiang University). The research proved successfully and the 2 technologies for NOx and PCDD/F abatement have been demonstrated at pilot (NOx) and full (PCDD/F) scale.

Finally, based on a research conducted by BASIC and SAES on the specific Chinese needs on the side of disposal technology, BAT and standards have been established for a number of HCW disposal technologies, like incineration, pyrolysis, high temperature steam disinfection, chemical disinfection, microwave.

### **3.3 Training and capacity building**

Training has been one of the pillar of the project. 3 training centers on HCW disposal and 7 training centers on the BEP practices in healthcare facilities have been established. Totally, more than 50,000 persons have been trained. Capacity building on the implementation of BEP in the healthcare facilities envisaged a massive training which involved demonstration and replication hospitals, improved segregation, training and implementation of the updated waste catalogue. Details on training are reported in section 3.4.2, (Attainment of outcome 7.5)

## **4. Key recommendations and lessons**

### **4.1. Development of POPs related regulation and guidance**

As communicated by FECO, a number of POPs related regulation and guidance were developed or indirectly supported by project. Some of these regulations have been already issued by the government; others are in the pipeline for being issued. Some of the guidance officially developed under the project and adopted by the demonstration and replication facilities will be passed to the regulatory body for issuance. This is the case, among others, of the guideline on the “medical waste categories”, prepared by National Health and Family Planning Commission, which already underwent several revisions and is now at final stage for approval. A list of are the governmental documents from the 6 demonstration Cities, is reported in ANNEX IV: List of regulations/guidance.

### **4.2. Sustainability and replicability**

It is very likely that the project results will be sustained after project end, due to the very high ownership of the Chinese government who integrated the project into national plans and objectives,

like the National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste, People Republic of China, 2004. Demonstration cities and provinces played a pioneering and exemplary role for the 13<sup>th</sup> five-year plan period for environmental protection, so that their experience can be scaled up and replicated at national level. The increased coordination among relevant entities on the medical waste issues will also ensure that the regulation developed under the project is more practical and comprehensive and can be more easily enforced. At the replication stage of the project, several workshops (domestic and international) and field visits were conducted to disseminate the achievement and experience.

At the same time, there are a couple of key issues which, if not addressed, will constitute a significant risk for the sustainability of some of key project outcomes:

- 1) if the BAT level of 0.1 ngTeq/m<sup>3</sup> would not be endorsed soon, incineration plants will be back to the previous level of 0.5 ngTeq/m<sup>3</sup> as there are no incentives to fulfil a stricter and more expensive limit.
- 2) if the HCW new waste catalogue is not approved, there will be no other options for the healthcare facilities but to revert to the previous HCW waste catalogue which does not support the extended segregation of waste. However, the final version of the health care waste categories has been prepared and verified by the National Health and Family Commission and is currently in the pipeline for endorsement by the regulatory body. It has to be remarked that NIHA and FECO reported that the HCW catalogue has been adopted during the project implementation in over 1500 replication hospitals.
- 3) Meanwhile, a “Circular of the Promotion of Medical Institutions for Classified Management of Domestic Garbage”, which establishes the work to be carried out for implementing the classification of domestic waste in the hospitals, and establishes the recycling objective of at least 40%, has been issued.

#### **4.3. Follow-up of the recommendation proposed at MTE**

Most of the recommendation proposed at MTE were followed, with the exception of the issuance of regulations on BAT and HCW catalogue which is however in the pipeline for endorsement after the final revision has been released, and the improved participation of the UNIDO country office (see section 3.2.5) The project ensured the replication of BAT and BEP approaches in 15 incineration plants, 140 non-incineration plant, and in 1500 healthcare institutions; followed up until completion the research on SCR; completed the activities related to the demonstration of Environmentally Sound HCW management in remoted / rural areas; and ensured the involvement of NGOs.

#### **4.4. Linkage with new or ongoing GEF projects on POPs**

The project provided some basic data in medical institutions and the cooperation basis with NIHA to develop a new GEF project concerning mercury.

No links with ongoing GEF projects on POPs were reported in the course of the evaluation or emerged from the documentation made available to the evaluators, including the project document. For this purpose, it should have been useful to establish exchange of information and exchange of experience with the ongoing similar project on the environmentally sound of medical waste in India, which is currently being implemented by UNIDO.



## I. DESCRIPTION OF THE EVALUATION METHODOLOGY

The evaluation has been conducted by Mr. Carlo Lupi and Mr. Zhu Jiangxin, Evaluation Consultants, carried out both as a descriptive assessment and on the basis of a scoring system.

The evaluation required meetings with almost all relevant stakeholders involved in project implementation, review of most of the technical and administrative documents, mission reports, meeting minutes produced in the course of project activities, and visits to several project implementation sites (Institutions, Healthcare facilities, waste management facilities). The list of the meetings and the agenda of the Terminal Evaluation mission are reported in the Annex I.

In few cases, when it was not possible to arrange meetings, the interviews were arranged by means of Skype or telephone calls.

Concerning ranking, the following six level scores proposed for project outcomes and outputs, as recommended by the GEF Terminal evaluation guidance, has been adopted, with the numeric values associated to each level.

Rating criteria	Associated numeric value
<b>Highly satisfactory (HS).</b> The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	5
<b>Satisfactory (S).</b> The project had minor shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	4
<b>Moderately satisfactory (MS).</b> The project had moderate shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	3
<b>Moderately unsatisfactory (MU).</b> The project had significant shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	2
<b>Unsatisfactory (U).</b> The project had major shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	1
<b>Highly unsatisfactory (HU).</b> The project had severe shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	0

All the project outcomes / outputs have been evaluated using three separate scores with assigned values ranging from 0 to 5 based respectively on the criteria of relevance (R), Efficiency (Eff) and Effectiveness (Ect).

The three criteria were evaluated considering that:

1. Relevance implies close logical relationship with, and importance to, the matter under consideration. As the main objective of the project is to *“minimize the generation and emissions of unintentionally produced POPs (principally PCDDs/PCDFs) from the medical waste treatment sector”*, a high relevance score was assigned to these activities which if correctly implemented are directly related to the objective, whilst a lowest relevance score has been assigned to activities which are only indirectly related to the achievement of the U-POPs reduction objective.



2. Effectiveness is the degree to which objectives are achieved and the extent to which targeted problems are solved. In contrast to efficiency, effectiveness is determined without reference to costs and, whereas efficiency means "doing the thing right," effectiveness means "doing the right thing". Therefore, a high value of effectiveness has been assigned to outputs/outcome which reached their original objective, whereas low value has been assigned to outputs/outcome which reached only partially their intended objective.
3. Efficiency is the comparison of what is actually produced or performed with what can be achieved with the same consumption of resources (money, time, labour, etc.). Efficiency is an important factor in determination of productivity, therefore a high value has been assigned to activities which have been carried out in due time with the assigned budget

The three scores obtained with the criteria summarized above were averaged within each outcome, and then the average score was averaged within outcomes among all the outputs of each outcome. Finally, the numeric values were translated in to the nearest rating criteria.

An important consideration has also to be made to the methodology for cross-verification of information. In general, it was not possible, for the evaluation team, to meet separately all the project stakeholders during the evaluation missions. The national execution agency (MEP/FECO) provided an outstanding support to the evaluation time by arranging a large number of site visits and meetings during the two weeks of the evaluation mission. The evaluators in addition asked for a number of face-to-face meetings and interviews and performed a limited questionnaire survey to verify the effectiveness of training, to ensure at least a limited cross-check of information. (FINO A QUI)

### **1.1. Purpose and scope of the evaluation**

The terminal evaluation has been performed in compliance with the objectives and requirements listed in the TOR for the Terminal Evaluation Consultant. The following evaluation activities were therefore carried out:

1. An analysis of the attainment of objectives, outcomes, impacts, project objectives and delivery and completion of project outputs (based on indicators);
2. An analysis to what extent the overall global project has achieved;
3. An evaluation of project achievements according to following GEF Project Review Criteria:
  - a. Implementation approach;
  - b. Country ownership/driven;
  - c. Stakeholder participation/Public involvement;
  - d. Sustainability;
  - e. Replication approach;
  - f. Financial planning;
  - g. Cost-effectiveness;
  - h. Effectiveness of Monitoring and evaluation.

### **1.2. Specific evaluation questions for terminal evaluation**

The following specific evaluation questions were considered during the terminal evaluation:

- Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels?
- Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?
- Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?
- Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?
- Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?

## II. PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

### 2.1. Project start and duration

The official starting date of the project (as reported in the GEF website) was June 2007. The implementation starting date as from the last available UNIDO PIR UNIDO ANNUAL PROJECT IMPLEMENTATION REPORT (PIR) Fiscal Year (FY) 2016 (1 July 2015 – 30 June 2016), was October 31<sup>st</sup>, 2007. The project inception meeting was held on March 2008 “Inception Workshop of Environmentally Sustainable Management of Medical Wastes in China, MEP/FECO, 2008”. The proposed implementation end for the project was December 2012. However, the project was concluded on June 2017, 52 months later than the deadline set in the project document, around 10 years after the official starting date.

### 2.2. Expected results

The key objective of the project is to minimize the generation and emissions of unintentionally produced POPs (principally PCDDs/PCDFs) from the medical waste treatment sector. In the project document this objective is quantified as following:

Reduction in releases of PCDD/F by means of BAT/BEP demonstration and adoption in incineration facilities within the project areas and time frame: 1.94 g TEQ per year as result of project implementation and 47.88g TEQ/year as result of project replication;

Avoided releases of PCDD/F by means of BAT/BEP demonstration and adoption of alternative treatment processes: 2.59 g TEQ per year

To achieve the key objective, the project document identifies 7 technical outcomes and one management outcome to be achieved, as following:

**Outcome 1** National, provincial and local regulatory framework for MW management strengthened. Expected activities include the adaptation and application of laws and regulations relating to MW management and upgrading and establishing pollution performance levels associated with BAT for MW disposal.

**Outcome 2** Nationwide institutional capacity for integrated MW management at national and local levels in support of the Nationwide Investment Plan strengthened. This entails the establishment of a National Steering Group addressing all relevant institutions and stakeholders and through this coordination mechanism, the capacity for monitoring, supervision and evaluation of medical institutions and dedicated MW treatment and disposal facilities of relevant authorities will be strengthened.

**Outcome 3** Systems management and application of BEP demonstrated in 20 medical institutions covering such aspects as good procurement practices, waste segregation at source, waste reduction/minimization, reuse and recycling, intermediate storage, transportation, traceability and staff training.

**Outcome 4** BAT for MW disposal using thermal combustion demonstrated in one existing rotary kiln facility and two pyrolysis incinerators. These demonstration activities were also intended support the development of specifications for the engineering design and construction of such facilities by adopting BAT as well as operational safety.

**Outcome 5** BAT/BEP demonstrated in MW thermal non-combustion, chemical treatment or other appropriate non-combustion treatments that may also be suitable for remote rural areas. In order to demonstrate the replacement of incineration disposal methods, the objective was to procure and install one autoclave facility, one microwave facility and one chemical disinfections facility Similarly to outcome 4, this outcome was also intended support the development of specifications for the engineering design and construction of such facilities by adopting BAT as well as operational safety.

**Outcome 6** Spatially integrated and coordinated MW management and disposal systems in geographically defined clusters that include medical institutions and dedicated treatment and disposal facilities demonstrated in three provinces.

**Outcome 7** A national strategy and action plan of BAT/BEP for MW and disposal based on the experience gained through the demonstration activities of the project will be developed and formulated, encompassing:

- Formulation of techno-economic policies that promote the adoption of BAT/BEP.
- Demonstration and promotion of different commercial models (e.g. BOT, BOO, TOT<sup>1</sup>, etc.) for the construction and operation of MW treatment and disposal facilities.
- Strengthening of national capacity to develop new MW treatment technologies appropriate to China's socio-economic context.
- Development and implementation of a MW treatment equipment certification and labelling program.
- Establishment of training and accreditation systems for lifecycle management of MW that support BAT/BEP.
- Extensive stakeholder awareness raising, including a series of national and international workshops.

**Outcome 8** will establish and utilize the necessary tools to facilitate effective monitoring and evaluation on progress of project implementation and achievement of results. A series of training programs will be conducted to improve the managerial and technical capabilities for effective project implementation and management.

The detailed analysis of attained versus expected results is reported in section 3.4 of this document.

### **2.3. Problems that the project sought to address**

The project has been designed to address the following barriers, which are directly or indirectly related to the main objective to reduce the release of PCDD/F in the environment:

- a) Traditionally, in hospitals, medical waste is disposed without treatment or with poorly designed treatment processes.
- b) The China National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste does not take into account the need to adopt BAT/BEP or non-combustion technologies.
- c) The existing laws and regulations are too general and lack of detailed rules to support their implementation.
- d) The pollution control standards for incineration plant are not in line with the Stockholm Convention BAT, whilst the pollution control standards for non-incineration treatment are still missing.
- e) There is limited coordination among relevant ministries, with specific reference to cross- sectoral policy and implementation issues.
- f) There is a potential conflict of interests of key stakeholders in the management of HCW.
- g) The institutional capacities for supervision and inspection of medical institutions and dedicated disposal facilities in the areas of pollution monitoring are low.
- h) There is a need to demonstrate, incentivize and certify BAT/BEP for the management of HCW
- i) There is a huge need for training personnel in both the field of BAT of disposal facilities and BEP in healthcare facility
- j) An effective personnel training system to provide qualified human resources for BAT/BEP based lifecycle management of MW is lacking.
- k) Stakeholder awareness on the matter of HCW is limited.
- l) Effective mechanisms to promote research, development and application of technically feasible and locally affordable processes, techniques and equipment are lacking.

## **2.4. Immediate and development objectives of the project**

The project document declared the following immediate objectives for the project:

- Review, revision, and recommendation of appropriate changes of the regulatory and policy enabling environment.
- Institutional strengthening through the use of targeted technical transfer activities to apply and disseminate BEP in the lifecycle management of medical waste.
- Application of BAT in six targeted municipalities within the project implementation period.
- Design and implementation of economic and financial systems that can sustainably support the medical waste management sector.
- Support for the development of an industrial base that promotes a precautionary and preventive approach to domestic goods, services and the appropriate adaptation of technologies.
- Identification, demonstration and promotion of appropriate medical waste management systems and technologies applicable to remote rural areas.
- Coordination of medical waste management with an effective transfer system in 3 targeted provinces.
- Formulation of a nationwide replication program to disseminate BAT/BEP as part of a national strategy and action plan.

As far as the development objectives are concerned, these are not explicitly stated in the project document. However, it may be assumed, based also on what has been observed after the implementation of similar projects, that the adoption of Best Environmental Practice for the management of healthcare waste would also reduce the risk of infection for the healthcare staff and for the patients, with reduced associated costs and a better quality of life for the community; at the same time, the implementation of BAT for the disposal of medical waste may have a beneficial impact on the public acceptance of disposal facilities, the promotion of green business, and a better environment with less healthcare waste being improperly disposed or unsafely abandoned in landfills. The achievement of these development objectives will have to be assessed in the medium-long term after the project closure, as their extent will also depend on how much the project actions have been sustained after project end.

## **2.5. Baseline indicators established**

In the project Logical Framework, the baseline values and the targets were reported only for the key indicators (Table 1) at the level of project objectives. These baseline and target values are therefore the ones against which the project performance should be assessed. It is worth noticing that the baseline and the target indeed is missing for some key indicator, like 4 (Quantitative reduction of MW produced by medical institutions through BEP application). Some key indicators are difficult to measure although a target level has been provided (for instance: indicator 8, Level of stakeholder awareness as well as 10 – Social and economic benefits).

The project document also lists a number of objectively verifiable indicators by outcome / outputs, without however providing the associated baseline value. As a first consideration, these indicators are simply too many (130) to be easily monitored on a regular basis. Several indicators are even not easily measurable, like for instance, indicator 35, 43, 52, 60, 67 (Skills of operators improved), indicators 36, 44, 53, 61, 68 (Overall management level improved); in some cases, the indicators are not verifiable due to the lacking of a baseline (for instance, all the indicators under component 3, except indicator 22

concerning Booklet of BEP Application in Medical Institutions. On the other side, some of the indicators reported at the outcome / outputs level should be included among the key indicators. These are **in bold and underlined** in Table 2 below. In summary, the indicators proposed for monitoring the project performance are too many, in some cases unclear or not verifiable, however the existence of a restricted list of key indicators facilitated the project monitoring and the quantification of project performance. Considering the above, the project has been assessed mainly taking into account the project key indicators reported in Table 1 plus some of the indicators reported in Table 2.

**Table 1: List of the key verifiable indicators for the project**

Objectives	Objectively Verifiable Indicators (in bold, the ones for which a baseline value is provided)
<p>The project aims to reduce and ultimately eliminate the releases of unintentionally produced POPs and other globally harmful pollutants into the environment and assist China in implementing its relevant obligations under the Stockholm Convention.</p>	<ol style="list-style-type: none"> <li><b>1. Number of medical institutions adopting BEP (baseline: 0; target: 20 for demonstration and 1500 for replication)</b></li> <li><b>2. Number of dedicated MW disposal facilities adopting BAT (baseline: 0; target: 3 for demonstration and 15 for replication)</b></li> <li><b>3. Number of dedicated MW treatment facilities adopting non-incineration as BAT/BEP (baseline: 0; target: 3 for demonstration and 120 for replication)</b></li> <li>4. Quantitative reduction of MW produced by medical institutions through BEP application</li> <li>5. Reduction in the manufacture and use of medical care products containing hazardous substances such as Hg and PVC containing phthalates</li> <li><b>6. Reduction of PCDD/PCDF releases from MW incineration disposal (baseline: 0; target: 9.7g)</b></li> <li><b>7. Avoided releases of PCDD/PCDF releases from MW treatment (baseline: 0; target: 12.95g)</b></li> <li><b>8. Level of the stakeholder awareness of and participation in environmentally sound MW management in high-risk exposure areas (baseline: very low; target: 60%)</b></li> <li>9. Levels of PCDD/PCDF in biological organisms in the vicinity of dedicated MW treatment and disposal facilities (baseline and target to be determined in the first year of project implementation)</li> <li><b>10. Social and economic benefits from the adoption of BAT/BEP (baseline: 0; target to be determined in the middle and terminal stages of project implementation)</b></li> </ol>

**Table 2: Exhaustive list of project indicators by output**

<b>Outputs</b>	<b>Objectively Verifiable Indicators (without baseline value)</b>
Output 1.1 Strengthen the regulatory framework for MW management	<ol style="list-style-type: none"> <li>1. Adopted Detailed Rules to Implement Measures on MW Operating License Management</li> <li>2. Adopted Measures on MW (as Hazardous Waste) Consignment Management</li> <li>3. <b><u>Adopted Classification System of MW</u></b></li> </ol>
Output 1.2 Upgrade or establish pollution performance levels for dedicated MW disposal facilities	<ol style="list-style-type: none"> <li>4. Technical standards upgraded or established regarding: <ol style="list-style-type: none"> <li>a. <b><u>Pollution control for incineration of MW</u></b></li> <li>b. <b><u>Pollution control for non-incineration treatment of MW</u></b></li> </ol> </li> <li>5. PCDD/PCDF release in pilot provinces meeting upgraded performance levels</li> <li>6. Other pollutants release in pilot provinces meeting established performance levels</li> </ol>
Output 2.1 Establish a long-term national coordination mechanism for integrated MWs management	<ol style="list-style-type: none"> <li>7. A national inter-ministerial coordination mechanism for integrated MW management</li> <li>8. Local inter-departmental coordination mechanism for integrated MW management</li> <li>9. Improved coordination of MWs management at national and local levels</li> </ol>
Output 2.2 Strengthen supervision and inspection on medical institutions in MW management	<ol style="list-style-type: none"> <li>10. Specifications for Health Departments to supervise Medical Institutions in adoption of BEP on MW Management</li> </ol>
Output 2.3 Strengthen the monitoring and supervision capacity on MW treatment and disposal	<ol style="list-style-type: none"> <li>11. Methods on monitoring and supervision of pollutants release from MW facilities</li> <li>12. <i>Municipal monitoring and inspection capacity improved</i></li> <li>13. <i>On-line monitoring network connected with the environmental authorities established</i></li> <li>14. <i>Monitoring data publishing and reporting systems established</i></li> </ol>
Output 2.4 Strengthen the environmental impact assessment on disposal facilities	<ol style="list-style-type: none"> <li>15. Guideline for Environmental Impact Assessment on MW Disposal Facilities</li> <li>16. Number of environmental impact assessors having received the training</li> <li>17. Number of disposal facilities assessed with the guideline, including number of accepted or rejected proposals.</li> </ol>
Output 2.5 Strengthen the capacity to audit the operation of disposal facilities	<ol style="list-style-type: none"> <li>18. Methodology to audit disposal facilities</li> <li>19. Measures on Accreditation and Management of Auditing Institutions for MW Facilities</li> <li>20. New facilities checked and accepted</li> <li>21. Existing facilities operation risk evaluated</li> </ol>
3.1 Demonstrate BEP in medical care institutions for the management of medical waste	<ol style="list-style-type: none"> <li>22. Booklet of BEP Application in Medical Institutions</li> <li>23. <b><u>Reduced MW amount</u></b></li> <li>24. Reduced use of disposable medical products</li> <li>25. <b><u>Reduced use of Hg contained products</u></b></li> <li>26. Reduced use of PVC products</li> <li>27. Reduced injuries to MW working staff</li> <li>28. Improved personnel capacity for MW management and improved awareness</li> <li>29. Established MW management system</li> <li>30. Specifications on MW Management in Medical Institutions</li> <li>31. Number of occupational injuries and accidents in healthcare facilities caused by handling and treatment of medical care</li> </ol>
4.1 Demonstrate BAT for incineration	<ol style="list-style-type: none"> <li>32. Booklet of BAT Application for Incineration Process of MW</li> <li>33. Specification for Construction and Operation of MW Disposal Facility Using Incineration Process</li> <li>34. Demonstration implementation plan</li> <li>35. Skills of operators improved</li> <li>36. Overall management level improved</li> </ol>

Outputs	Objectively Verifiable Indicators (without baseline value)
	37. PCDD/PCDF releases consistent with performance level associated with BAT 38. Releases of other pollutants meeting the limits 39. Solid residues to landfill meeting the limits for safe disposal
4.2 Demonstrate the BAT for Pyrolysis process	40. Booklet of BAT Application in Pyrolysis Process for MWs Disposal 41. Specification for Construction and Operation of MW Disposal Facility Using Pyrolysis Process 42. Demonstration implementation plan 43. Skills of operators improved 44. Overall management level improved 45. PCDD/PCDF releases consistent with performance level associated with BAT 46. Release of other pollutants within permitted limits 47. Solid residues to landfill meeting the standards of safe disposal
5.1 Demonstrate the BAT in autoclaving processes.	48. Booklet of BAT Application in Autoclaving Process for MW Treatment 49. Specification for Construction and Operation of MW Disposal Facility Using Autoclaving Process 50. Testing methods for emissions and discharges 51. Demonstration implementation plan 52. Skills of operators improved 53. Overall management level improved 54. Emission of VOCs and other pollutants meeting the performance levels 55. Validation of sterilization process 56. Treated waste meeting standards for safe disposal to landfill
5.2 Demonstrate BAT in other non-incineration processes	57. Booklet of BAT Application in Non-Incineration Processes for MW Treatment 58. Specification for Construction and Operation of MW Disposal Facility Using Other Non-Incineration Process 59. Demonstration implementation plan 60. Skills of operators improved 61. Overall management level improved 62. Emission of VOCs and other pollutants meeting the limits 63. Validation of sterilization process 64. Treated waste meeting standards for safe disposal to landfill
5.3 Demonstrate BAT/BEP for treatment and disposal of medical wastes in remote rural areas	65. Booklet of BAT/BEP Application for Treatment and Disposal of MW in remote rural areas 66. Operation and pollutant release indicators of the demonstrated facilities meeting BAT achievable limits 67. Skills of the facility operators improved 68. Overall MW management capacity improved 69. Established policies and management systems 70. Treated waste meeting standards for safe disposal to landfill
6.1 Demonstrate the application of integrated MW management among institutions at the municipal level	71. Municipal-level Integrated MW Management Plan 72. Municipal Integrated MW Management Coordination Mechanism 73. Municipal integrated MW management information system 74. Established municipal policies, regarding MW treatment charge, taxation, financial support, market orientation and other incentives
6.2 Demonstrate coordinated MW treatment among the dedicated MW facilities	75. Better social, economic and environmental benefits achieved by disposal technologies: 76. Different MW streams treated by different way 77. Effective response to emergencies 78. Co-building between neighboring municipalities 79. Co-building MW treatment facility with hazardous waste treatment facility
7.1 Formulate techno-economic policies that promote the adoption of BAT/BEP	80. Techno-economic policies promoting adoption of BAT/BEP in MW management 81. MW treatment fee-based system 82. Policies encouraging investment in MW treatment from the private sector 83. Policies encouraging commercialization of MW treatment



Outputs	Objectively Verifiable Indicators (without baseline value)
	84. Measures of Franchised Operation of MW Treatment
7.2 Demonstrate and promote different commercial models for the construction and operation of MW treatment and disposal facilities	85. Specifications on investment models to facilitate MW treatment and disposal 86. List of trained municipal staff 87. Investment amount from non-governmental sources 88. More than 20 municipal MW management steering groups established 89. Dedicated MW treatment facilities operation meeting pollutant release levels 90. Dedicated MW treatment facilities operating on a financially sustainable basis 91. Established technical consulting institutions providing technical services in options for private investment
7.3 Strengthen national capacity to develop new MW treatment technologies appropriate to China's socio- economic context	92. Program of research, development and application of key technical processes, techniques, and equipment 93. National investment on R&D of the needed technical processes, techniques and equipment 94. Key equipment locally available and affordable 95. Joint ventures established and operated profitable
7.4 Develop and implement a MW treatment equipment certification and labelling programme	96. Technical requirements for Certification and Labelling of MW Treatment and Disposal Equipment for processes of: a. Incineration b. Pyrolysis c. Autoclaving d. Microwaving e. Chemical disinfections 97. Procedures on Certification and Labelling of MW Treatment Equipment 98. Number of accredited laboratories and testing institutions 99. Number of accredited equipment certification institutions 100. Number of enterprises and products successfully certified and in certification pipeline
7.5 Establish training and accreditation systems for the lifecycle management of MW that support BAT/BEP	<b>101. Number of trainers receiving training</b> 102. Regulations and Resources Requirements for MW Management Training Institutions 103. Personnel training systems for lifecycle management of MW <b>104. 7 training bases established for training of high- level managerial and technical staff in health agencies and medical institutions</b> <b>105. 3 training bases established for training of central MW treatment staff</b> <b>106. Number of medical institution staff receiving BEP trainings</b> <b>107. Number of dedicated MW treatment staff receiving BAT/BEP trainings</b> 108. Number of management systems certified
7.6 Extensive stakeholder awareness raising including a series of national and international workshops	109. Plan for stakeholder awareness and education on MW management 110. Number or percentage of the stakeholders receiving information 111. Improved stakeholder awareness levels 112. BAT/BEP extended to medical product manufacturing enterprises 113. Reduced use of hazardous and toxic substances in manufacturing medical products 114. Improved medical product design considering easier recycle and reuse 115. Experience, lessons, results and impacts summarized 116. National experience presented, and international experience learned
Output 8.1 Establish the project management structure	117. Steering group established 118. National Project Management Team established with necessary office equipment procured 119. National project expert team established 120. 3 local PMOs established 121. Project management capabilities improved at national and local levels
Output 8.2 Design and	122. Inception Workshop held

Outputs	Objectively Verifiable Indicators (without baseline value)
implement an M&E mechanism according to GEF M&E procedures	123. Detailed work plans prepared 124. Data and information against indicators input into the MIS 125. Non-compliances identified and corrected 126. Technical and political guidance from the Steering group 127. Experience summarized and recommendations raised 128. Problems identified and recommendations provided by field visits 129. MIS established and made functional 130. Project information, experience and lessons disseminated through website

## 2.6. Main stakeholders

The following key stakeholders were identified in the project document:

- National Development and Reform Commission (NDRC):
- Ministry of Finance (MOF):
- Ministry of Science and Technology (MOST):
- General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ):
- State Environmental Protection Administration (SEPA, now MEP)
- Ministry of Health (MOH, now NHFPC)
- National Institute of Hospital Administration (NIHA)
- Research Institute of Hospital Management (RIHM)
- Local Environmental Protection Bureaus (EPB) at the county level and above:
- Local health bureaus at the county level and above:
- Pricing Bureaus:
- Other government functional departments:
- Technical support institutions:
- Medical and health institutions,
- Dedicated MW disposal units
- Non-governmental organizations (NGOs):

Most of the stakeholders listed above were subsequently involved in project implementation, some of them with active and coordinating role (CIO, under MEP/FECO and NIHA, under MOH being the most active players of the project), others in the framework of formal obligations (like the MOF, which is the GEF focal point in China).

The local institutions (Local Environmental Protection Bureaus (EPB), the Local health bureaus, hospital administration) also played a key role in the coordination and implementation of the project at the level of provinces and municipalities.

### III. FINDINGS

#### 3.1. Project design / formulation

##### 3.1.1. General considerations on project structure

**Articulation in outcomes / Output.** The project is structured in 7 technical project outcomes plus one Monitoring and Evaluation outcome. From the logical standpoint, the structure of the project is sound. However, this level of subdivision reflects likely in an unnecessary administrative complexity: for the sake of simplicity, all the outcomes (Outcomes 4 and 5) related to the demonstration of technology could have been merged in only one Outcome and 2 outputs. Similarly, Outcome 6.1 (Demonstrate the application of integrated MW management among institutions at the municipal level) and Outcome 6.2 (Demonstrate coordinated MW treatment among the dedicated MW facilities) could have been merged in only one Outcome related to the integrated waste management, and indeed were discussed jointly during the meeting in the demonstration provinces / cities. The over detailed and somehow redundant structure of the project was however quite common for GEF 4 projects, whilst the experience currently suggests to have much simpler design (maximum of 3-4 outcomes) to facilitate the management and evaluation of the projects.

**Indicators.** The issue of indicators has been already discussed in the previous section. At project design, the relevant key indicators were identified and the target properly established. The number of indicators established at output level is however too high and difficult to manage. The large number of indicators (over 130) however testifies the big effort undertaken by the project design team to anticipate and identify all the possible quality criteria for the project.

##### 3.1.2. Relevance of the project, project output and indicators to the GEF strategic objectives, UNIDO indicators and to the national priorities.

**GEF 4 strategic objectives and indicators:** the following Table 3 lists the GEF 4 strategic objective, outcomes and indicators under the POPs focal area, which are relevant to this project. Although the strategic objective of GEF 4 POP focal area was “To reduce and eliminate production, use and releases of POPs”. It was mostly focused on DDT and PCBs (i.e. POPs stockpiles) and did not include a specific indicator for U-POPs reduction.

**Table 3: Project relevance against the main GEF 4 strategic objectives and indicators**

GEF 4 Strategic Objective	Expected impacts	Main Indicators	Project relevance
<b>To reduce and eliminate production, use and releases of POPs</b>	GEF-supported countries have strengthened capacity for POPs management and consequently strengthened capacity for the general sound management of chemicals	Regulatory and enforcement capacity in place	Outcome 1 (Strengthened regulatory framework for MW management and upgraded/established pollution performance levels for dedicated MW disposal facilities) and Outcome 2 (Strengthen institutional capacity for integrated medical waste management at national and local levels in support of Nationwide Investment Plan) are very relevant with this GEF 4 indicator.
	The risk of adverse health effects from POPs is decreased for those local	Reduced risk of exposure to POPs of project-affected people	Although no specific reference is made to U-POPs, the project outcomes 3 (Demonstrate BEP based management including measurement and monitoring)

GEF 4 Strategic Objective	Expected impacts	Main Indicators	Project relevance
	communities living in close proximity to POPs wastes that have been disposed of or contained		4 and 5 (Demonstrate BAT for thermal combustion and non-combustion) are very relevant with this indicator as they all aim at reducing the U-POPs emission at different stage of waste management and hence the exposure of people to POPs.
	The basis for the future implementation of the Stockholm Convention is established through the demonstration of innovative alternative products, best practices, and environmentally sound processes to the generation, use, or release of POPs	Knowledge management packages developed; the viability and cost-effectiveness of alternatives to POPs, in particular DDT, are demonstrated in a number of settings	The project envisages a large effort on training, awareness raising and knowledge management, and in this sense, although the GEF indicator does not explicitly mention U-POPs, it is very relevant with this indicator.

**UNIDO indicators for POPs.** The following Table 4 lists the indicators, relevant to this project, established under the UNIDO evaluation system of project performance

**Table 4: Project relevance against UNIDO strategy indicators**

	UNIDO strategy indicator	Project relevance
1	Quantity of the following eliminated/discontinued:	
	u-POPs	The reduction of U-POPs is the main objective of the project.
	Mercury	Phasing out of mercury devices is a co-financed activity
	Other hazardous substances of global concern (tonnes).	The project does not explicitly envisage the reduction/elimination of other chemicals, however a better management of HCW will have as result the reduction of the release PAH, heavy metals, as well as a reduction of infectious diseases associated with HCW.
3	Equivalent CO2 pollution prevented (tonnes)	The demonstration of non-combustion technologies (component 5) will have as a consequence the reduction of CO2 releases.
4	# of countries receiving GEF support for soundly managing POPs and phasing out the use and production of POPs	Relevant (China receiving GEF support)
6	# of environment policies, strategies, laws, regulation approved/enacted	Relevant, as the project envisages a significant effort on the development and issuance of new policies and standards
7	# of training participants/trainees (male/female)	Relevant, as the project envisages the development of 10 training centers and a large number of training events
8	# of companies adopting best practices	Component 3 envisages the demonstration of BEP in healthcare institutions.

	<b>UNIDO strategy indicator</b>	<b>Project relevance</b>
9	# of new businesses	Indirectly relevant (demonstration of technologies may lead to the development of new business)
10	Amount of incremental investment (USD)	
11	# of jobs created (male/female)	No indicators / target on the development of new jobs included in the project
12	# of new businesses with (male/female) as top management	No such indicator / target included in the project
13	Materials recycled or reused (tonnes)	Relevant as this one of the objectives of component 3 – indicators also included in component 7.
14	Commercial value of materials recycled or reused (USD)	As above.

**National priorities.** The national priorities relevant to this project are, as a minimum, the ones identified in the first NIP of the Stockholm Convention, and the priorities established under the National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste. Based on the estimates provided in the NIP, Incineration of medical waste accounted for 1176 gTeq, i.e. around 11% of the overall annual release estimated in the NIP. The NIP identified the adoption of BAT/BEP to control Dioxin releases in key industries as one of the key priority areas, with objectives in 2015 and in the long term.

Concerning the National Plan, its objective was to improve and rationalize the disposal of hazardous waste, including medical waste, by promoting the shifting from small size, substandard disposal facilities toward centralized and modern facilities. With this respect, the national plan promoted rotary kilns and pyrolytical plants, but also encouraged the adoption of new technologies like plasma.

Based on the above, the project, its outcomes and associated indicators are obviously very relevant from all the viewpoints of the UN agency strategy, the GEF 4 strategy and the National policies and plans. The project moreover is not limited to the demonstration of disposal technologies which can reduce the release of PCDD/F but also envisages an intensive training on the management of medical waste as well as the development and implementation of policies, legislation and practices aimed at improving the management of medical waste

### **3.1.3. Analysis of Logical Framework (Project logic /strategy; Indicators)**

The project logical framework was subjectively assessed output by output by the evaluators by using the SMART (Specificity, Measurability, Achievability, Relevance, Time Bound). The average results at project outcome level are reported in Table 6. The SMART criteria were applied as from Table 5.

**Table 5: Criteria for the application of the SMART analysis**

Score	Specific	Measurable	Achievable	Relevant	Time bound
HS	Very specific and detailed	Quantitatively and easily measurable	Easily achievable	Very relevant	Associated to a realistic deadline
S	Indirectly specific	Qualitative, measurable	Achievable	Relevant	Associated to a deadline
U	Not specific	Not easy measurable	Hardly achievable	Indirectly relevant	Associated to a challenging deadline
HU	Very vague	Not measurable	Unrealistic	Not relevant	Not associated to any deadline

**Table 6: Summary of SMART analysis results**

Outcome	S	M	A	R	T	Average
1. Strengthened regulatory framework for MW management and upgraded/established pollution performance levels for dedicated MW disposal facilities	HS	S	HS	S	S	S
2. Strengthen institutional capacity for integrated medical waste management at national and local levels in support of Nationwide Investment Plan	S	S	HS	S	HS	S
3. Demonstrate BEP based management including measurement and monitoring	HS	S	HS	HS	HS	HS
4. Demonstrate BAT for medical waste disposal using thermal combustion including air pollution monitoring	HS	S	HS	S	S	S
5. Demonstrate BAT/BEP for MW thermal non-combustion treatment or other appropriate non-combustion treatment	HS	S	HS	HS	S	S
6. Demonstrate spatially integrated and coordinated MW management and disposal systems in geographically defined clusters.	S	S	HS	S	S	S
7. Develop and implement a strategy for the adoption of BAT/BEP for MW management and disposal.	S	S	S	S	S	S

### 3.1.4. Assumptions and Risks

The project document identified a number of risks and related mitigation measures. The risks were associated to project objectives rather than to specific outcomes / outputs. Some of the identified risks were indeed realistic, and the countermeasure were effective to address the anticipate risk. This applies specifically to the risk associated to the application of BAT in 6 targeted municipalities, as follow:

Application of BAT in 6 targeted municipalities within the project implementation period	Lack of cooperation from municipalities coupled with lack of necessary physical, technical and human resources at demonstration site; shortcomings in the collection and transportation systems leading to shortage of waste and intermittent operational time	Low	Selection of demonstration on the basis of nationwide competitive bidding backed up with comprehensive capacity building
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The project identified properly the risk associated to the difficulty to demonstrate BAT/BEP in remote areas although the countermeasures adopted were vague.

Identification, demonstration and promotion of appropriate MW management systems and technologies applicable to remote rural areas	Lack of infrastructure and geographical remoteness coupled with human resources pressure impede the demonstration projects in remote rural areas	Moderate	Develop specific plans and methodologies that take into account these challenges
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In the project document, it's also acknowledged that the delay of project completion is a risk, however the causes of the possible delay and associated countermeasures were not clearly identified.

**3.1.5. Lessons from other relevant projects (e.g., same focal area) incorporated into project design**

The lessons from other relevant projects incorporated into project design were limited, as at the time of project drafting no similar projects were ongoing or completed. The UNDP Global Project for Demonstrating and Promoting Best Techniques and Practices for Reducing MW to Avoid Environmental Releases of Dioxins and Mercury, mentioned in the project document, was still far from completion when the project was approved by the GEF for implementation.

**3.1.6. Planned stakeholder participation**

The project envisaged the involvement of quite a significant number of stakeholders. Among them, SEPA (now MEP); local EPBs, MOH and local department of health, NIHA and NDRC were also key project partners; MW disposal facilities, technology vendors, hospital facilities were the main project beneficiaries.

The planned stakeholder participation was confirmed in the course of project implementation for the key stakeholders. In addition, the role of NGOs was better specified in the course of project implementation.

As reported during the wrap-up meeting, there was involvement of the infection control committee of China Hospital Association, and of the infection control committee from the China Preventive Medicine Society, who carried out a large-scale survey of the injuries caused by sharps (*A large-scale survey on sharp injuries among hospital-based healthcare workers in China, Xiaodong Gao1, 2016*). Another NGO who was involved was the Environment Protection Industry Association. They provided support on the development the technical and standard certification for the medical waste disposal. The China Association of Environmental Science undertook the certification of Environmental Technical Verification. Their role is to carry out the evaluation of equipment and technology and to provide

certification as a third party. The Hunan province established a strategic alliance on medical waste management, dedicated to promoting the integrated management and recycling of medical waste.

### **3.1.7. Replication approach**

The replication strategy envisaged by the project document was outstanding. Although apparently overambitious, the envisaged replication strategy was indeed fully implemented in the course of the project, testifying the commitment of the government since the very early stage of project design.

The replication strategy envisaged:

- the adoption of BAT/BEP by 15 incineration disposal facilities in addition to the 3 facilities directly funded by the project;
- the replication of BEP approach in 1500 hospital facilities in addition to the 20 facilities directly funded under the project
- the replication approach in 120 dedicated MW non-incineration facilities in addition to the 6 facilities directly funded by the project.

The list of replication facilities is provided in ANNEX III: List of replication **facilities**.

### **3.1.8. Linkages between project and other interventions within the sector**

Since the design stage, the project is strictly interlinked with the National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste (NPHMW), which constitutes at the same time the largest co-financing source and the baseline project. Under the NPHMW, which was established in 2003, China committed to establish 332 dedicated MW disposal facilities across the country. The NPHMW, which was issued one year before the ratification of the Stockholm Convention by China, envisaged the adoption of incineration as the technology of choice for most of these facilities. Faced with an urgent public health crisis, the government quickly established emergency incineration facilities to safely dispose of MW. The urgent expansion of the incineration program did not however fully take into account China's obligations under the Stockholm Convention.

In this sense, it may be affirmed that the National Plan and the project are perfectly complementary each other, as whilst the first ensured enough resources at national and local level for the large scale establishment of centralized facilities for the disposal of medical waste, the second provided the necessary incremental budget for the demonstration and replication of techniques and practices for the environmentally safe management of medical waste, with specific reference to BAT for the waste disposal and BEP for the proper management and segregation at source.

At project design, no linkages with other interventions in the sector were identified. However, in the course of project implementation, the project was also included into the 12th National Five-Year Program for Hazardous Waste Management, in the 12th Five-Year programs on POPs pollution control in major industries, in Guiding Opinions on Strengthening Dioxins Pollution Prevention and Control, in National Hazardous Wastes Catalogue -2016, in Inventory of industrial structure adjustment, in the state encouraging development catalogue of environmental protection technologies -2013, in the Inventory of industrial structure adjustment, in the Inventory of Value-added Taxes Discounts on Comprehensive utilization of resources products and service, and finally the achievements applied in the 13th five-year plan for ecological and environmental protection by State Council.



Linkages with the preparation and promulgation of relevant regulatory instrument may be also identified in the following:

- Circular of the Promotion of Medical Institutions for Classified Management of Domestic Garbage and Issuance of Notification for Further Strengthening Medical Waste Management jointly issued by NHFPC and MEP in 2017 and 2013 respectively, and the interpretation of several issues concerning the application of law for the handling of criminal cases of environmental pollution -2013 and 2016 jointly issued by
- The supreme people's court and the supreme people's procuratorate, which requires strict compliance with the Regulations for Medical Waste Management and imposes strict supervision and penalty over illegal disposal of medical waste.
- Technical Guidelines for Completion Check and Acceptance of Environmental Protection for Construction Projects in Medical Institutions
- The updated catalogue of hazardous wastes (2016)

### **3.1.9. Management arrangements**

At project design, the project management was structured as following:

- UNIDO is the GEF implementing agency. A project focal point is established at UNIDO.
- The MEP/FECO is the national executing agency (NEA) and represents MEP (previously SEPA) and the CIO in the management and completion of contracts for project implementation.
- The Convention Implementation Office (CIO) under MEP/FECO is assigned with regular project monitoring and enforcement inspections.
- The National, Provincial and Municipal Steering Groups are in charge of providing the project team with political guidance and inter-ministerial coordination support. The National Steering Group encourage and assist provincial and municipal governments in the establishment and operation of their own corresponding steering groups.
- The National Project Management Team, composed of staff from relevant agencies, is responsible for the day-to-day management and execution of the project, and oversees local project management offices.
- The project Expert Team (including and international CTA and a NTA) plus other national and international experts, is intended to provide technical assistance to CIO and NPMT on specific project matters.
- Provincial PMOs (totally 3) in charge of coordinating supervising activities at provincial and municipal level in the provinces where demonstration of coordinated planning that will spatially cluster incineration and non-incineration facilities will be carried out;
- Municipal PMOs (totally 6) in charge of coordinating supervising activities at provincial and municipal level in the municipalities where there will be extensive demonstrations of BAT/BEP for integrated medical management

There were the following deviations from the original project design, as following:

- Key agencies were subcontracted to undertake specific projects component: for instance, NIHA (National Institute of Hospital Administration) was subcontracted as co-executive agency with FECO, in charge of general coordination and supervision of BEP demonstration and training in the demonstration and replication facilities, development of the new catalogue of Healthcare Waste, draft training materials and booklets;

- academic or research institution (like SAES, CAEP, BASIC) were in charge of other specific outputs like preparation of BAT/BEP guidance and regulation drafting of the regulation concerning the certification for medical waste, drafting and implementation of coordination and assessment of BAT implementation.
- National and international experts were recruited for the whole implementation period, covering the required function of CTA and NTA. More specifically, A NTA (WU Shunze and SUN Ning as successor), a CPA (CHEN Yang) and an ICE were recruited covering the whole project implementation period.

### **3.2. Project implementation**

#### **3.2.1. Adaptive management (changes to the project design and project outputs during implementation)**

After examination of the inception report minutes (*Inception Workshop of Environmentally Sustainable Management of Medical Wastes in China MEP/FECO, 2008*), of the MTE report (UNIDO Evaluation Group, 2011), and consultation with the project stakeholders along the TE mission in China, it was found that no major changes to the project design or project outputs during the implementation were needed. Although the project lasted 4 years beyond the planned deadline, all the project key outputs and outcome were considered necessary until the end and were completed.

The only exceptions concerned the following two Outcomes:

- Outcome 2.4 (Strengthen the environmental impact assessment of disposal facilities). Based on information provided by MEP/FECO, that outcome was co-financially supported by MEP because indeed the government, through MEP, is taking care of the improving and upgrading of the Environment Impact Assessment law beyond the specific needs of the project. That includes also the Impact Assessment of waste disposal facilities. The EIA was trained in regular training system by MEP annually and applied in the incentive plan for over 160 disposal facilities.
- Outcome 2.5 (Strengthen capacity to audit the operation of disposal facilities). This outcome was combined into the incentive plan for 15 incinerators.

#### **3.2.2. Partnership arrangements**

The project, through MEP/FECO and NIHA as co-executive agency, established a sound partnership with key relevant agencies, provincial and municipal institutions, and hospital administrations.

FECO has established a regular exchange mechanism with relevant divisions of the Ministry of Health to provide coordination and guidance on key issues, and ensured the coordination technical support and in some case financial support to the activities carried out by provincial EPBs.

NIHA ensured an effective coordination with the hospital administration of the demonstration provinces and municipalities. In addition, NIHA developed and implemented a program for the replication of BAT/BEP experience from the 20 pilot medical institutions, with an aim to promote the adoption of BAT/BEP by 1,500 medical institutions in the 6 pilot provinces and nationwide

A sound partnership was also established with the entities in charge of setting up the 3 BAT training centers and the 7 BEP training centers.

Key academic and research institutes were assigned to undertake some of the most important project outputs, namely:

- Shenyang Academy of Environmental Sciences (BAT guidance, technical specification) (*Medical waste disposal and disposal engineering technical specifications- revised work report, Chen Yang, IHEP, 2017*);
- Chinese Academy for Environmental Planning (Economic models for BAT/BEP financing) (Chinese Academy For Environmental Planning, MEP, 2017).
- Institute of High Energy Physics of Chinese Academy of Sciences (BAT guidance, technical specification for disposal equipment, certification scheme) (Chen Yang, IHEP, 2017),
- Beijing Normal University (*Technical Specifications for Operation Supervision and Management of Centralized Incineration Disposal Facilities of Medical Wastes (HJ519-2009)*, People Republic of China, 2009)
- Tianjin Research Institute of Environmental Science (guidelines for emergency preparedness) (Tianjin Hejiaveolia environmental services Co.,Ltd, 2017)
- Zhejiang University (Research on SCR technology) (Yang Hangsheng, Zhejiang University, 2017)
- School of Chemical Engineering of Tianjin University (Research and Development of VOC and odors treatment technologies) (Wang Fumin, Tianjin University , 2017)
- Research Institute of Standards and Norms (Guidelines for Estimating Costs for Construction and Building of Medical Waste Disposal Facilities)
- China CDC
- Zhongchi Emerging Env. Tech. Ltd.
- State Hazardous Waste Engineering Technology Center (Tianjin)
- The Chinese Association of Environmental Protection Technologies
- Main technical supporters from Healthcare facilities

### **3.2.3. Role of UNIDO and of international consultants**

UNIDO mobilized a number of international consultants, short term consultants and UNIDO staff resources with various tasks, ranging from project coordination to technical consultancy on specialized fields, project evaluation and project drafting.

The UNIDO senior officers had the role to facilitate the project on all issues relevant to international procurement, preparation of PIRs, organisation and participation on missions in the Chinese provinces with the task to verify the status of project implementation.

The UNIDO administrative staff supported all the administrative and organizational tasks relevant to the project components being executed by UNIDO HQ.

The international consultant provided technical assistance on the development of technical guidance and access to specialised international expertise supporting the technical and regulatory feasibility assessment of medical waste plastic recovery, reuse and recycling in China, as well as monitoring and provision of periodic status reports of international developments in medical waste management.

From the Project Document budget, 54 working months were allocated for international and short-term consultants, out of which 16 were allocated to an international CTA and 14 to the international experts to work under the monitoring and evaluation section, including drafting of this report. Based on the data provided by UNIDO, most of this resource have been actually utilized. It has to be considered that due to the establishment of the SAP system in 2012, it was not possible to retrieve detailed information

on the budget allocated by output. UNIDO however provided a worksheet containing the time allocated for international consultant, leading to an overall figure very close to the budget originally allocated.

Based on UNIDO information, the international consultant was recruited since 2009 to work as a “de-facto” CTA. Beside his contribution in the drafting of the project document, he was subsequently involved in the arrangement of visits in Ireland, Italy, and other countries, including Austria, Sri Lanka, India and Laos.

The international consultant provided technical assistance on the development of technical guidance and access to specialised international expertise supporting the technical and regulatory feasibility of both combustion and non-combustion medical waste management systems. He also provided valuable information and technical support for the assessment of medical waste plastic recovery, reuse and recycling in China, which may be considered one of the project good practices.

#### **3.2.4. M&E: design at entry and implementation (\*)**

The Monitoring and Evaluation component followed the standard GEF and UNIDO rules and are described in detail in the project document. In summary, the Monitoring and Evaluation approach is based on the following:

- 1) Clear assignment of monitoring responsibilities among the National Project Management Team, the National Coordinator, the project Manager, the National Technical Advisor and the Chief Technical Advisor;
- 2) Preparation of Annual Work Plan, Annual Progress Report, Project Implementation Review reports
- 3) Conduction of inspections in project implementation sites (disposal facilities applying BAT and healthcare facilities applying BEP)
- 4) Conduction of a Tripartite Project Review and periodic meetings of the
- 5) Independent Mid Term Evaluation and Terminal Evaluation

The M&E activities are clearly budgeted in the project document.

The consultants received the following M&E documents, certifying that the M&E activities have been carried out as scheduled:

- The Project Implementation Review reports (year 2014, 2015 and 2016)
- The meeting minutes of the Inception Workshop
- The Final Report of the 5<sup>th</sup> Tripartite Meeting , without annex
- The Mid Term Evaluation Report
- Some of the annual workplans and the annual progress report.

The consultants were informed during the meeting in Beijing that the last project audit was still ongoing. As for the effectiveness of M&E actions, it has to be observed that notwithstanding delay causes were already identified in the PIR 2014, (specifically on the side of procurement of BAT equipment and issuance of the BAT and waste catalogue legislation), countermeasures to solve these issues were not implemented or effective, so that the promulgation of the BAT regulation and the HCW catalogue were not completed yet, although the BAT level of 0.1ngTeq/Nm<sup>3</sup> was voluntarily adopted in the pilot and replication incinerators and the HCW catalogue, demonstrated in over 1500 replication healthcare facilities, passed several revision stages and is currently in the final stage of approval.

The project did not recruit an International Chief Technical Advisor as envisaged in the M&E. Therefore, some of the M&E originally assigned to the CTA were taken over by the international expert who worked as a “de-facto” CTA.

**3.2.5. Feedback from M&E activities used for adaptive management**

Feedback from M&E activities occurred at different stages:

1. Starting from the inception workshop (held on March 19-20 2008), which, among others, had the objective of *“assist the project team in understanding and assimilating the goals and objectives of the project, as well as to finalize the preparation of the project's first annual work plan on the basis of the project's logframe matrix. This work will include reviewing the logframe (indicators, means of verification, assumptions)”*.
2. Continuously, in the course of project implementation, through the preparation of Annual Work plans, Quarterly Progress reports and/or Progress Implementation Reports (PIRs);
3. Through the mid-term evaluation (UNIDO Evaluation Group, 2011)
4. By means of the current terminal evaluation.

**3.2.6. Feedback from project inception**

The inception was attended by 112 representatives and experts from various institutions: the MEP, Ministry of Health (MOH), local environmental protection bureaus (EPB), local health bureaus (HB), related industries, enterprises and scientific research institutions, UNIDO, Sino-Italian cooperation program and the United States Embassy. During the inception the overall design of the project was introduced, as well as the key actions to be undertaken and the procedures, management rules, selection criteria, M&E steps for successful project implementation. Suggestions on the implementation of the project were provided among which the most relevant were:

1. Need to improve the classification of medical waste based on their material to facilitate segregation and disposal;
2. Suggestion on the better design for the management and disposal of HCW coming from small clinics and rural areas;
3. Improve the exchange of information and development of guidance for incineration;
4. Explore the opportunity to deploy mobile disinfection facilities for solve the issue of small hospitals.

**3.2.7. Follow up from MTE recommendation**

At MTE, a number of recommendations were proposed by the evaluation team. The Terminal Evaluation consultants verified these recommendations through consultation of relevant documents, interviews/meetings and outcomes and supervision meetings.

In general, it may be affirmed that most of the recommendations were accepted and followed in the second stage project implementation, as follows:

**MTE Recommendations related to Replication / Sustainability:**

<p>It will be essential that China continue to benefit from the Convention’s financial support mechanism to ensure replication and sustainability of the MW project in other provinces in addition to the 6 provinces demonstrated by the project. Effort should be made to mobilize funding from authorities, private sector, international agencies and bilateral donors to ensure replication of BAT / BEP in other provinces. Outcome and experience should be summarized for replication program in other provinces. Sustained effort for promotion of MW project in other</p>	<p>MEP/FECO is now one of the accredited GEF agencies. Its mandate is to coordinate and manage project funds in cooperation with international financial organizations for the implementation of multilateral environmental agreements and bilateral assistance, as well as other foreign cooperation activities in the field of environmental protection.</p>
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provinces is encouraged at central and provincial level.	
CIO/FECO and PMOs should ensure that each participating demonstration centre that has developed a given technology for disposal of MW in the context of the project should strictly do as stated in the respective TORs of the subcontract signed for successful replication in other provinces and municipalities. The PMT, CIO and UNIDO should closely monitor those activities and provide guidance if needed until completion.	Replication of BEP and BAT has been ensured in 15 incinerator facilities, 140 non-incineration facilities and 1500 medical institutions (see ANNEX III: List of replication facilities)

### MTE Recommendations related to BAT / BEP implementation and PCDD/F reduction.

As the MW disposal centres operating on incineration technology are not at BAT standard CIO/PMT should explicitly monitor the progress of the research activities on SCR and ensure that BAT standard is reached.	The research of SCR activity has been completed, although the Chinese SCR did not enter a commercial stage yet. The BAT ensuring the compliance with the 0.1ngTeq/m <sup>3</sup> level has not been officially endorsed yet.
Project management should ensure that implementation and enforcement of BEP / BAT regulations, policies, standards and guidelines developed in the context of the project as well as their proper monitoring is being done adequately in provinces and municipalities where the project is being run.	Several laboratories capable to undertake PCDD/F monitoring were established in China since the project starting, thanks to national and international support. Sufficient capacity to monitor centralized incineration facilities therefore exist. All the demonstration facilities accepted to comply with the Stockholm Convention BAT, even if these have not been officially issued.
For the minimization of wastes, it is recommended to explore possible CP initiatives for medical waste management and disposal.	This recommendation has not been followed during project implementation, however it would be important to consider the synergy between CP and minimization of waste in the future. Some of the hospital undertaken recycling of plastic waste.

### MTE Recommendations related to Management

So far there is no involvement of UNIDO regional office in project implementation or monitoring. UNIDO should increase efficiency of its supervisory and management functions either by installing relevant capacity (e.g. a technically specialized staff) at the regional office in Beijing or by delegating some activities to the regional office in Beijing.	This recommendation has not been followed during project implementation. Apparently the local UNIDO office is not in charge of the implementation or monitoring project. This is mostly the mandate of UNIDO chemical branch in HQ.
It is recommended that as soon as possible / feasible even if the demonstration subprojects are not completed, the PMT should take actions for the output relative to remote rural areas to start. For example, as the selection process is quite lengthy, the PMT should as soon as possible start procedures for the bidding exercise to select the demonstration remote rural area.	Procurement of the activity for the demonstration of BAT/BEP in rural area was completed (see the Shennongjia case).
It is recommended that follow up actions are taken to ensure that subcontracts are signed and that activities start the earliest possible to avoid or minimize delays for the completion of the project.	The project indeed underwent a significant delay, of which one of the main reason was the time required by the competitive bidding.
The national monitoring system should be replicated at the provincial level to ensure sustainability across the country.	Based on the outcome of site visits, meetings and interviews, the provinces established supervision program in hospital facilities.

An adequate monitoring mechanism needs to be set up to ensure that a fair and transparent business collaboration occur amongst the different stakeholders.	Except from what is specifically established under the contract among central and local administration and project partners, the TE evaluators believe that the verification of fair and transparent business collaboration among stakeholders is already regulated by the Chinese law.
CIO and PMOs should consider the participation of NGOs in the project	During the TE meeting and interviews, it was clarified that several NGOs were involved in project implementation (see chapter 3.2.2)

### 3.3. Project finance:

In the following Table 7, the project expenditures for the GEF grant budget are reported. When the UNIDO SAP system started in 2012, the data from the old system were transferred to the new SAP system, and all outputs within the same outcome were transferred into a single output in SAP, therefore a budget arranged by project output cannot be exported anymore from the existing SAP system.

UNIDO signed three contracts with FECO: a main contract, and two contracts related to procurement of equipment. In these three contracts, the budget for each output also was clearly required according to the project document, except for the international consultants, international travel and international meeting, as fund related with these three activities were managed by UNIDO. The GEF grand budget and co-finance budget listed below were not checked by the evaluators, as the financial audit is not part of the evaluation tasks and is currently ongoing. Only a limited cross-checking of the budget allocated for international consultants has been carried out in the course of the evaluation (see section 3.2.3).

**Table 7: GEF Grant budget (source: UNIDO Project, 2017)**

Item	Disbursement (expenditure, incl. commitment) up to 2012	Disbursement in 2013	Disbursement in 2014	Disbursement in 2015	Disbursement in 2016	Disbursement in 2017	Total disbursement (in USD) *(2012-Oct. 2017)
Contractual Services (21)	6,861,030	0	13,755	410,001	2,021	280	7,287,087
Equipment (45)	3,229,570	0	0	0	0	0	3,229,570
Internat. Cons/Staff (11)	324,015	74,801	31,450	88,956	136,664	56,624	712,509
Local Travel (15)	97,964	83,434	20,064	12,110	50,961	16,092	280,625
Nat. Consult./Staff (17)	19,315	16,806	1,564	15,404	39,726	13,549	106,364
Other Direct Costs (51)	0	38	552	- 82	0	318	825
Train/Fellowsh./ Study (30)	28,280	564	0	0	- 1,242	0	27,602
<b>Total (in USD)</b>	<b>10,560,172</b>	<b>175,643</b>	<b>67,385</b>	<b>526,389</b>	<b>228,130</b>	<b>86,863</b>	<b>11,644,582</b>

**Table 8: Co-financing budget for the project (source: FECO)**

Outcome/ Co-finance (USD)	UNIDO	USA	MOF		MOH		SEPA		Enterprises		Co-financing - Total USD	
	Expected	Expected	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual
Outcome 1. Strengthen the regulatory framework for MW management and upgrade or establish performance levels for dedicated MW disposal facilities					73,819	214,583	440,476	580,645			514,295	795,228
Outcome 2. Strengthen the institutional capacity for integrated MW management at national and local levels in support of the nationwide investment program		30,000	1,260,125	1,316,303	1,031,713	1,165,449	1,168,348	1,823,000			3,490,185	4,334,752
Outcome 3. Demonstrate systems management and the application of BEP		50,000	51,100	127,837	1,595,275	3,421,887			1,696,375	1,589,000	2,324,500	5,188,724
Outcome 4. Demonstrate BAT for MW disposal using thermal combustion including air pollution monitoring		40,000					5,399,800	6,356,000	5,359,800	10,086,000	10,799,600	16,482,000
Outcome 5. Demonstrate BAT for MW thermal non-combustion, chemical treatment or other appropriate non-combustion treatment							3,667,523	3,668,500	3,932,928	4,406,200	7,600,450	8,074,700
Outcome 6. Demonstrate spatially integrated and coordinated MW management and disposal systems in geographically defined clusters that include medical institutions and dedicated treatment and disposal facilities					272,850	805,272	827,388	5,469,000	186,963	1,968,600	1,287,200	8,242,872
Outcome 7. Develop and implement a strategy for the adoption of BAT/BEP for MW management and disposal			730,495	778,892	1,526,344	2,087,842	3,496,466	3,730,900	77,450	244,500	5,830,755	6,842,134
Outcome 8. Project management, monitoring and evaluation	100,000		1,758,280	1,758,389							1,858,280	1,858,389
<b>TOTAL CO-FINANCING</b>			<b>3,800,000</b>	<b>3,981,421</b>	<b>4,500,000</b>	<b>7,695,033</b>	<b>15,000,000</b>	<b>21,628,045</b>	<b>9,557,140</b>	<b>18,294,300</b>	<b>33,077,140</b>	<b>51,818,799</b>



### 3.4. Project results

#### 3.4.1. Key result – avoidance of PCDD/F release

As stated in the Project Document, the key objective of the project was to carry out “the demonstration and replication of best available techniques and best environmental practices (BAT/BEP) in the environmentally sound management of medical waste to continuously reduce PCDD/PCDF releases by upgrading the incineration equipment and air pollution control system to the BAT level and replacing outdated or over-capacity incineration facilities with alternative, non-incineration techniques that avoid the release of PCDD/PCDF”

As stated in paragraph 229 of the project document, section “Global Environmental Objective” (GEF Project - Environmentally Sustainable Management of Medical Waste in China, 2017) , The target amount of PCDD/F to be directly reduced in the demonstration stage by adoption of BAT in incineration facilities is set in the project at 1.94 g TEQ per year. The avoided releases of PCDD/F by means of BAT/BEP demonstration and adoption of alternative treatment processes was set at 2.59 g TEQ per year. The national replication promoted by the project was expected to lead to a reduction of 47.88g TEQ/year.

The calculation of the amount of PCDD/F reduced through direct demonstration or replication was carefully examined and discussed in several meetings during the mission of the evaluators, as that represented the core objective of the project. The final elaboration carried out by FECO in the course of the evaluation mission has been therefore verified by the evaluators, who agreed on the baseline assumptions and on the reduction calculated either through emission factors or sampling and analysis data.

One of the key difficulties found during the evaluation of the dioxin reduction was to assume, for the incineration plant, a “baseline” level equal to the Chinese regulation of 0.5 ngTeq/m<sup>3</sup>. In the view of the evaluators the baseline selected did not completely reflect the actual reduction and therefore it was somehow pessimistic, however it was adopted by FECO as official baseline because it was not possible to demonstrate an higher baseline.

As proved by the analytical certificates released by the laboratories in charge of PCDD/F monitoring (which were shown to the evaluator in all the incineration facilities visited), the project was able to directly reduce by 2.17gTEQ/yr the release of PCDD/F through the implementation of BAT/BEP in the six demonstration plants (1.47 g TEQ/yr for the incinerators and 0.70 g TEQ/yr for the non-combustion facilities, in total rating 84% of the expected reduction of 2.59 g TEQ/yr), as summarized in the following **Error! Reference source not found.**

**Table 9: Calculation of the avoided PCDD/F release from the 6 demonstration disposal plants**

(source: FECO, 2017).

	facility location	Nanchang	Huaihua	Changchun	Xiaogan	Pingliang	Xinxiang	Total
	Technique	Continuous feeding Pyrolysis	By-batch feeding Pyrolysis	Rotary Kiln	Autoclave Disinfection	Microwave Disinfection	Chemical Disinfection	-
Baseline	Disposal Capacity (t/d)	15	8	20	5	3	6	57
	Annual Operation Days (d)	300	280	300	300	300	300	-
	Annual Disposal Amount (t)	4500	2240	6000	1500	900	1800	16940
	Designed Flue Gas Flow (Nm <sup>3</sup> /t)	11000	9000	13000	-	-	-	-
	PCDD/F Emission Conc.	11.06	18.60	7.17	-	-	-	-

	facility location	Nanchang	Huaihua	Changchun	Xiaogan	Pingliang	Xinxiang	Total
	(ng TEQ/Nm <sup>3</sup> )							
	Converted Emission Factor (μg TEQ/t)	122	167	93	167	167	167	-
	Annual PCDD/F Emission (g TEQ)	0.55	0.37	0.56	0.25	0.15	0.30	2.18
BAT/BEP	Disposal Capacity (t/d)	15	12	20	5	3	6	61
	Annual Operation Days (d)	350	330	330	330	330	330	-
	Annual Disposal Amount (t)	5250	3960	6600	1650	990	1980	20430
	Flue gas Flow (Nm <sup>3</sup> /t)	11000	9000	13000	-	-	-	-
	PCDD/F Emission Conc. (ng TEQ/Nm <sup>3</sup> )	0.081	0.087	0.032	0	0	0	-
	Converted Emission Factor (μg TEQ/t)	0.89	0.78	0.42	0	0	0	-
	Annual PCDD/F Emission (g TEQ)	0.005	0.003	0.003	0.000	0.000	0.000	0.011
	Annual PCDD/F Reduction (g TEQ)	0.54	0.37	0.56	0.25	0.15	0.30	2.17
	PCDD/F Reduction Factor (g Teq/t)	0.036	0.046	0.028	0.050	0.050	0.050	-
PCDD/F Reduction Factor (g Teq/t) = Annual PCDD/F Reduction (g TEQ)/Disposal Capacity (t/d) As a substitution, the baseline converted emission factors of non-incineration are assigned as the by-batch feeding pyrolysis's.								

The project was effective in establishing a large number of replication of BAT/BEP already in the course of project implementation. More specifically, 15 incinerator facilities and 140 non-incineration facilities were supported by the project through a program of incentives and technical assistance (see for instance the Shanghai incentive plan (Shanghai Solid Waste Disposal Center, 2017)). The list of the replication plant is reported in ANNEX III: "List of replication facilities". Through replication, the project achieved an additional reduction of 13.19 gTeq /year (from incineration plants, measured through sampling and laboratory analysis of PCD/F) and of 31.34 gTeq /year from the non-combustion facilities (estimated assuming a reduction factor equal to 0.05 gTeq /yr for each ton of waste processed through a non-combustion facility)

Therefore, totally the project achieved a reduction equivalent to 46.7gTeq/yr, against the expected overall reduction of 52.41 gTeq/yr. This result, corresponding to 90% of the project target, is very likely an underestimation of the real achievement for the following reasons:

- the evaluators were informed that the pre-BAT level of some of the demonstration and replication plants was much higher than the value adopted as baseline in the evaluation. Certificate of analysis of such high level of dioxin releases, although introduced during the meetings, were not officially released to the evaluators due to confidentiality and legal issues, therefore it was agreed with PMO that the calculation of PCDD/avoidance must be based on the available official data.
- the evaluation of the PCDD/F reduction did not take into account the reduction of plastic waste generation (including PVC) deriving from minimization and recycling activities. Minimization of the

use of reusable plastic devices and recycling of non-infectious plastic was demonstrated by several demonstration hospitals and replicated in many replication hospitals.

Based on the above, it can be affirmed that the objective of the reduction of PCDD/F release was achieved and very likely surpassed through the implementation of the project.

### 3.4.2. Overall results (attainment of the expected outcomes and outputs) (\*)

A summary analysis of the project achievement against the key indicators is reported in Table 10.

**Table 10: Summary of the attainment of project results by key indicators**

Number of medical institutions adopting BEP (baseline: 0; target: 20 for demonstration and 1500 for replication)	Achieved. The list of demonstration hospitals is reported in ANNEX III: List of replication facilities The complete list of replication institution is reported in a separate attachment. It was not possible to directly assess the level of implementation of BEP in the 1500 replication hospitals. This effort is coordinated by NIHA who hold the data concerning the BEP implementation in all the replication facilities.
Number of dedicated MW disposal facilities adopting BAT (baseline: 0; target: 3 for demonstration and 15 for replication)	Achieve. 3 facilities demonstrated incineration technologies; the list of replication facilities is reported in ANNEX III: List of replication facilities)
Number of dedicated MW treatment facilities adopting non-incineration as BAT/BEP (baseline: 0; target: 3 for demonstration and 120 for replication)	Achieved. 3 facilities demonstrated non-incineration technologies. The list of 140 facilities is reported in ANNEX III: List of replication <b>facilities)</b>
Quantitative reduction of MW produced by medical institutions through BEP	Achieved. Although in some cases an analysis of the reduction of MW generation through the adoption of BEP has been reported from some demonstration hospitals (Report on the Reduction of Medical Waste in Pilot Medical Institutions, NIHA, 2017), a sound baseline was never established under the project, therefore the quantitative reduction directly achieved by the project or expected as a result of replication cannot be accurately measured. Some provinces (for instance, Henan, Jilin, Xinxiang) provided however quantitative information concerning the trend of the relevant indicators (Department of Environmental Protection of Henan Province, 2017), (NIHA, 2017) (Xinxiang municipal government, 2017). The First Hospital of the Jilin University reported a decrease in the number of mercury thermometers and sphygmomanometers after project implementation (Jilin University First Hospital, 2017). There are constraints in the measurement of the amount of waste produced due to the fact that the weight of waste is normally not measured.
Reduction in the manufacture and use of medical care products containing hazardous substances such as Hg and PVC containing phthalates	Partially achieved. There were no baseline concerning the manufacture or use of such products, and only limited evidence has been provided that activities related to the reduction of this kinds of products has been undertaken. Data concerning the reduction of the use of mercury devices have been provided by the First Hospital of the Jilin University (Jilin University First Hospital, 2017).In 2011 the NRDC listed the mercury containing healthcare devices among the “limited development category”
Reduction of PCDD/PCDF releases from MW incineration disposal (baseline: 0; target: 9.7g)	Achieved and potentially exceeded. See point 4.4 in the Executive summary.
Avoided releases of PCDD/PCDF releases from MW treatment (baseline: 0; target: 12.95g)	Achieved and potentially exceeded. See point 4.4 in the Executive summary.

Level of the stakeholder awareness of and participation in environmentally sound MW management in high-risk exposure areas (baseline: very low; target: 60%)	Achieved. Under the project, over 50,000 people from medical and administration institution were trained, 1500 hospital institutions, 15 incineration plants and 140 non-incineration plants adhered to the replication program. A limited questionnaire survey among trainees has been carried out during the evaluation.
Levels of PCDD/PCDF in biological organisms in the vicinity of dedicated MW treatment and disposal facilities (baseline and target to be determined in the first year of project implementation)	Not measured. This is likely a project design rather than an implementation issue, as there are no project outputs or activities dedicated to such monitoring Only a scientific research was found on the soil in vicinity of MW incinerator (Xiao-dong Li, 2010).
Social and economic benefits from the adoption of BAT/BEP (baseline: 0; target to be determined in the middle and terminal stages of project implementation)	Not measured. Only the incremental operational and investment cost for the demonstration facilities was estimated. However, the social and economic benefit for the population were not assessed either at the baseline or as a consequence of project implementation

A detailed analysis of the project results in term achievements of project outcome and outputs is reported in the Table 11 below. The analysis is based on interviews, meetings, information provided by FECO/CIO and consultation of relevant technical documents. In addition to technical reports, quarterly reports and annual reports available for the whole project duration were analysed.

**Table 11: Rating of the Relevance, Efficiency and Effectiveness of Project Outcome and Outputs**

**Component 1: "Strengthened regulatory framework for MW management and upgraded/established pollution performance levels for dedicated MW disposal facilities"**

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 1.1 Strengthen the regulatory framework for medical waste management</b></p> <p><i>Output 1.1.1. Investigate, analyse and evaluate the laws and regulations on MW s and their implementation</i></p> <p><i>Output 1.1.2 Adapt the related regulations to the BAT/BEP requirements</i></p> <p><i>Output 1.1.3 Hold workshop to discuss the revised drafts</i></p> <p><i>Output 1.1.4 Circulate the drafts among governmental agencies, enterprises, academia, international community, and the public for comments</i></p> <p><i>1.1.5 Promulgate the adapted regulations, and introduce and implement enforcement mechanisms</i></p>	<p>Based on the information provided during the meetings and interviews, 22 polices and 13 guidance documents were drafted in the course of the project (see chapter 4). The number and content of the regulations and guidance documents which were drafted and promulgated under the project testifies the high commitment of the country to move toward and beyond the implementation of the Stockholm Convention. Specific information was also provided for the new classification of medical waste developed during the project. Notices and local regulation on a number of aspects were promulgated at local (provincial, municipal) level, and information concerning the increased enforcement of the regulation was given, with specific reference to the number of supervision activities conducted at hospital facilities and at waste disposal facilities. In Gansu, 5 management regulations were issued during the implementation of the project.</p> <p>Concerning the development of BAT/BEP guidelines suitable for China, the project experts visited plants in Tianjin, Shanghai, Hangzhou, Beijing, Changchun, Nanchang, Xiaogan, Pingliang, Yiyang, Anshan.to gather information on the technology status and improvement needs, A BAT/BEP report on incineration, pyrolysis, high temperature steam disinfection, chemical disinfection, microwave has been drafted (Research on Pollution Control Standard and Performance Testing Techmologic Specificaitons for Medical Waste Disposal and Treatment, Chen Yang, IHEP, 2017). BAT/BEP guidelines for incineration, pyrolysis, high temperature steam disinfection, chemical disinfection, microwave have been drafted (Guidelines for Best Available Techniques on Medical Waste Treatment and Disposal (BAT-HJ-8-2011), Peoples Republic of China, 2011). Under the project the Medical Waste Classification Catalogue has been developed. After several revisions,</p>	<ol style="list-style-type: none"> <li>1. Adopted Detailed Rules to Implement Measures on MW Operating License Management</li> <li>2. Adopted Measures on MW (as Hazardous Waste) Consignment Management</li> <li>3. Adopted Classification System of MW</li> </ol>	<p>Relevance: HS  Efficiency: MS  Effectiveness: S  Sustainability: S</p> <p>Overall rating: S</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
	<p>the Classification Catalogue passed the review of the hospital infection standards in the National Family and Health Committee and now is in the pipeline for final endorsement. Part of its function has realized by some supporting regulations and standards, like the Circular of the Promotion of Medical Institutions for Classified Management of Domestic Garbage, released in 2017, promoting the reduction of medical waste containing PVC, PP and PE. The new classification has been piloted and replicated in more than 1500 hospitals</p>		
<p><b>Outcome "1.2 Upgrade or establish pollution performance levels for dedicated MW disposal facilities"</b></p> <p><i>Output 1.2.1 Investigate and analyse feasibility to upgrade or establish new pollution performance levels</i></p> <p><i>Output 1.2.2 Draft the upgraded pollution control levels for the incineration of MW to the BAT achievable performance level</i></p> <p><i>Output 1.2.3 Draft the pollution performance levels for non-incineration treatment of MW</i></p> <p><i>Output 1.2.4 Hold a workshop with representatives from international organizations, governments, academia, enterprises, and the public to review the proposed performance levels</i></p> <p><i>Output 1.2.5 Select 3 provinces for first pilot implementation of the upgraded performance</i></p>	<p>Research has been carried out by IHEP and Shenyang Academy of Environmental Science on the feasibility of different technologies for the achievement of the pollution performance level established under the SC BAT (Medical waste disposal and disposal engineering technical specifications- revised work report, Chen Yang, IHEP, 2017). The upgraded pollution control level for incineration and non-incineration technologies were proposed.</p> <p>Currently, only non-incineration pollution performance standards were officially issued by the government of China, whilst the incineration standards were elaborated but not yet promulgated. In any case, all the demonstration and replication plants complied, on a voluntary basis with the proposed BAT standards, which are in line with the Stockholm Convention BAT/BEP limit of 0.1 ngTeq/Nm<sup>3</sup>. Officially however the previous pollution control standard of 0.5 ngTeq/Nm<sup>3</sup> is still in force.</p> <p>Based on information provided by FECO, the emission standard for incinerators passed the consulting public comments process in 2015 and is included among the standard to be issued in 13th five-year plan for state environmental protection.</p> <p>6 plants in different provinces were selected as demonstration plant. Three incineration plants were selected for demonstration: Changchun (Jilin Province), Huaihua (Hunan province), Nanchang (Jiangxi province), whilst the selected non-combustion plants were located in Xinxiang (Henan Province), Xiaogan (Hubei province), and Pingliang (Hangsu Province). The evaluators visited the plants in Changchun, Nanchang and Xingxiang, and had a meeting with representatives of the Huaihua disposal facility. All the plants visited were operational. The two incineration facilities visited made available to the evaluator the analytical certificate proving the compliance</p>	<p>4. Technical standards upgraded or established regarding:</p> <ul style="list-style-type: none"> <li>• Pollution control for incineration of MW</li> <li>• Pollution control for non-incineration treatment of MW</li> </ul> <p>5. PCDD/PCDF release in pilot provinces meeting upgraded performance levels</p> <p>6. Other pollutants release in pilot provinces meeting established performance levels</p>	<p>Relevance: HS Efficiency: MS Effectiveness: S Sustainability: MS</p> <p>Overall rating: S</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
	of the plants with the PCDD/F emission standard of 0.1ngTeq/m <sup>3</sup>		

**Component 2: Strengthen institutional capacity for integrated medical waste management at national and local levels in support of Nationwide Investment Plan**

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 2.1 Establish a long-term national coordination mechanism for integrated MW management</b></p> <p><i>Output 2.1.1 Establish a national MW management steering group led by SEPA and MOH and composed of other relevant ministries for coordination of integrated MW management</i></p> <p><i>Output 2.1.2 Regularly hold coordination meetings to provide guidance and coordination on issuance of laws, regulations, standards and policies and other important issues</i></p> <p><i>Output 2.1.3 Provide guidance to the establishment and operation of local steering groups on MW m.</i></p>	<p>The project promoted the coordination between the relevant ministries mostly SEPA/MEP and MOH/NHFPC) for a better management of Medical Waste.</p> <p>The Ministry of Environmental Protection through FECO and Ministry of Health through NIHA have been working closely during the project implementation period. The two parties signed a memorandum of agreement on the division and collaboration of the project components and subcomponents, and held regular meetings to review project plans, progress and results.</p> <p>Based on PMU final report (Final Report of the 5th Tripartite Meeting and the Relevant Reports for 2014, 2015, 2016 and 2017, MEP/FECO, 2017), FECO established a regular exchange mechanism with relevant divisions of the Ministry of Health to provide coordination and guidance on key issues. Seven guidance meetings have been held in the course of the project.</p> <p>Several municipal and provincial governmental documents were jointly issued by the local EPB and Department of Health.</p> <p>Two inception meetings were held in different places. 6 large meetings and 18 major expert discussion meetings were also hold. All together there were 60 expert meetings. 54 documents were distributed.</p> <p>The PIR for the year 2016 (UNIDO ANNUAL PROJECT IMPLEMENTATION REPORT (PIR) Fiscal Year (FY) 2016 (1 July 2015 – 30 June 2016), states that "China has established a national coordination group for the Stockholm Convention which meets regularly for decision making on important matters." - which however was established independently from this project, and which is in</p>	<p>7. A national inter-ministerial coordination mechanism for integrated MW management</p> <p>8. Local inter-departmental coordination mechanism for integrated MW management</p> <p>9. Improved coordination of MWs management at national and local levels</p>	<p>Relevance: HS Efficiency: MS Effectiveness: S Sustainability: HS</p> <p>Overall rating: S</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
	<p>charge of the management of all the project related to the Stockholm Convention.</p> <p>An excellent coordination and cooperation on MW management has been observed both at local level (with the establishment rules and actions for the integrated management of waste) and national level (with the effective cooperation between ministries on the issues of medical waste under the PMU).</p>		
<p><b>Outcome 2.2 Strengthen supervision and inspection of medical care institutions in medical waste management</b></p> <p><i>Outcome 2.2.1 Based on Output 3.1, develop specifications for Health Agencies to supervise Medical Institutions in the adoption of BEP on MW Management</i></p> <p><i>Outcome 2.2.2 Organize health departments to have trainings on the specifications based on the staff training system established by Output 7.4</i></p> <p><i>Outcome 2.2.3 Establish and implement a MW data reporting system between medical institutions and authorities</i></p> <p><i>Outcome 2.2.4 Establish a mechanism for the local environment and health departments to regularly inspect the implementation of BEP for MW management</i></p>	<p>Guidelines for inspection and supervision of the management of medical waste in medical institutions were developed taking into account the requirements of Stockholm Convention and Regulations for Medical Waste Management. Indicators and procedures for inspection and supervision were also established to support the effective use of the guidelines. (Technical Specifications for Operation Supervision and Management of Centralized Incineration Disposal Facilities of Medical Wastes (HJ519-2009), People Republic of China, 2009). Based on the PMU final report, an IT company has been contracted by NIHA to develop a medical waste management information system for use by hospitals. The system can record the source, weight, and location of medical waste from generation till handover to the authorized collectors and can generate statistical data that can be compared with the data at the disposal end. Further discussion during TE meetings revealed however that the system was too expensive to be fully implemented.</p> <p>Another automated data reporting system has been described to the evaluators during the meeting in Zhengzhou, for the Henan province. 27 provincial level supervision visits were held. Each demonstration province established a MW committee</p>	<p>10. Specifications for Health Departments to supervise Medical Institutions in adoption of BEP on MW Management</p>	<p>Relevance: HS Efficiency: S Effectiveness: S Sustainability: HS</p> <p>Overall rating: HS</p>
<p><b>Outcome 2.3 Strengthen the monitoring and supervision capacity of medical waste treatment and disposal</b></p>	<p>Output 2.3.1 the “Technical Guideline of Monitoring on Dioxins Emission from Hazardous Waste (including Medical Waste) Incinerators” (HJ/T365-2007)” have been developed under the project.</p>	<p>11. Methods on monitoring and supervision of pollutants release from MW facilities</p> <p>12. Municipal monitoring and</p>	<p>Relevance: HS Efficiency: MS Effectiveness: S Sustainability: S</p>



Outcome / Output	Results achieved	Relevant indicators	Rating
<p><i>Output 2.3.1 Develop monitoring and supervision standard norms"</i></p> <p><i>Output 2.3.2 Train the municipal monitoring and supervision staff on the application of the methods</i></p> <p><i>Output 2.3.3 Develop and implement monitoring data publishing and reporting system</i></p> <p><i>Output 2.3.4 Undertake formal quarterly inspections in pilot MW disposal facilities during the project implementation period</i></p>	<p>For Output 2.3.2. This was part of the general training conducted. A supervision committee was established.</p> <p>Concerning output 2.3.3. The data publishing and reporting system was established, and the online monitoring data are reported to the administration (between plants and EPBs)but not to the public..</p> <p>The frequency of the regular inspection on the facilities at municipal or county level the local environmental monitoring divisions was quarter according to the relevant technical norms. Reportedly, the inspections in course of project implementation of the demonstration cities and provinces are far beyond this number. (e.g.: In Huaihua city, there were 426 person-times in 38 joint inspection of health authorities and EPB on the MW management during 2 years—from the summary report of Huaihua demonstration city)</p> <p>Based on the information provided, the inspections were carried out around twice a year (BEP Management Demonstration and Promotion of Medical Waste in Medical Institution, NIHA, 2017) in the demonstration facilities, and less frequently in the replication facilities.</p>	<p>inspection capacity improved</p> <p>13. On-line monitoring network connected with the environmental authorities established</p> <p>14. Monitoring data publishing and reporting systems established</p>	<p>Overall rating: S</p>
<p><b>Outcome 2.4 Strengthen the environmental impact assessment of disposal facilities</b></p> <p><i>Output 2.4.1 Develop Guideline for Environmental Impact Assessment on MW Disposal Facilities to include related existing or new engineering design standards and other related standards</i></p> <p><i>Output 2.4.2 Hold a training workshop on the implementation of the guideline to a qualified number of certified environmental impact assessors</i></p> <p><i>Output 2.4.3. Issue and implement the guideline nationwide on disposal facilities</i></p>	<p>As reported by MEP/FECO, outcome 2.4.1 was developed independently by the MEP during the PPG stage of the project. Training on the EIA guidelines were regularly held by MEP in environmental protection system: for example, one training workshop was held in 2012 in Tianjin for over 100 EIA staffs under the support of the project. The EIA was required and applied in the demonstration and incentive plan for over 160 disposal facilities, including 18 incinerations and over 140 non-combustion facilities.</p>	<p>15. Guideline for Environmental Impact Assessment on MW Disposal Facilities</p> <p>16. Number of environmental impact assessors having received the training</p> <p>17. Number of disposal facilities assessed with the guideline, including number of accepted or rejected proposals</p>	<p>Relevance: HS</p> <p>Efficiency: HS</p> <p>Effectiveness: S</p> <p>Sustainability: S</p> <p>Overall rating: S</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 2.5 Strengthen capacity to audit the operation of disposal facilities</b></p> <p><i>Output 2.5.1 Design and disseminate a methodology to audit disposal facilities</i></p> <p><i>Output 2.5.2 Develop accreditation and management measures for the establishment of national audit services</i></p> <p><i>Output 2.5.3. Support and encourage the existing institutions for the audit of the operation of disposal facilities</i></p>	<p>The outcome 2.5.1 was not developed directly under the project as inspection and monitoring mechanisms are already in place. As concurred by UNIDO and MEPFECO, the audit requirement and specifications were combined into the incentive plan (Application of Best Available Techniques for Medical Waste Incinerators Action Program of Demonstration, Promotion and Incentive Plan, MEP/FECO, April 2014)</p>	<p>18. Methodology to audit disposal facilities</p> <p>19. Measures on Accreditation and Management of Auditing Institutions for MW Facilities</p> <p>20. New facilities checked and accepted</p> <p>21. Existing facilities operation risk evaluated</p>	<p>Relevance: N/A</p> <p>Efficiency: N/A</p> <p>Effectiveness: N/A</p> <p>Sustainability: N/A</p> <p>Overall rating: N/A</p>

### Component 3. Demonstrate BEP based management including measurement and monitoring

Outcome / Output	Results achieved	Relevant indicators	Rating
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Outcome / Output	Results achieved	Relevant indicators	Rating																				
<p><b>3.1 Demonstrate BEP in medical care institutions for the management of medical waste</b></p> <p><i>Output 3.1.1 Develop Specifications on MW Management in Medical Institutions</i></p> <p><i>Output 3.1.2. Develop booklet for BEP Application in Medical Institutions for pilot application based on the previously achieved experience</i></p> <p><i>Output 3.1.3 Select 20 representative medical institutions for the demonstration program</i></p> <p><i>Output 3.1.4 Develop the demonstration program, covering purchasing practices, reduction, reuse, waste segregation, intermediate storage, transportation and traceability</i></p> <p><i>Output 3.1.5 Establish MW management systems and carry out staff trainings on BEP application at the demonstration institutions</i></p> <p><i>Output 3.1.6 Monitor, record and evaluate the implementation process and results</i></p> <p><i>Output 3.1.7 Validate the draft booklet by incorporating lessons and experience from the evaluations, issue and disseminate the validated booklet</i></p>	<p>Booklets for the BEP application in medical institutions were developed and distributed.</p> <p>The only issue in the evaluation of this component was the fact that a baseline was not clearly developed. Therefore, the results in term of reduced use of PVC products, Hg products, injuries, or the improved personnel capacity for MW cannot be accurately measured against a baseline value.</p> <p>However, some provinces (for instance, Henan, Jilin, Xinxiang) provided some quantitative information concerning the trend of the relevant indicators (Department of Environmental Protection of Henan Province, 2017, NIHA, 2017; Xinxiang municipal government, 2017). The First Hospital of the Jilin University reported a decrease in the number of mercury thermometers and sphygmomanometers after project implementation (The Checking and Acceptance Report on Sustainable Management of Medical Waste in China, Jilin University First Hospital, 2017).</p> <p>The list of demonstration hospitals is reported in the table below. In addition to the direct demonstration of BEP in healthcare facilities, NIHA has developed and implemented a program for the replication of BAT/BEP by 1,500 medical institutions in the 6 pilot provinces and nationwide. The complete list of replication institution is available at NIHA.</p> <table border="1"> <thead> <tr> <th>Demonstration province</th> <th>Demonstration medical institutions</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Jilin</td> <td>The First Hospital of Jilin University</td> </tr> <tr> <td>The Second Hospital of Jilin University</td> </tr> <tr> <td>Jilin Tumor Hospital</td> </tr> <tr> <td>Changchun Central Hospital</td> </tr> <tr> <td rowspan="4">Jiangxi</td> <td>Jiangxi Children's Hospital</td> </tr> <tr> <td>The First Affiliated Hospital of Nanchang University</td> </tr> <tr> <td>The First Hospital of Nanchang</td> </tr> <tr> <td>The Ninth Hospital of Nanchang</td> </tr> <tr> <td rowspan="3">Henan</td> <td>Xinxiang Central Hospital</td> </tr> <tr> <td>Xinxiang Infectious Disease Hospital</td> </tr> <tr> <td>The First People's Hospital of Xinxiang</td> </tr> <tr> <td rowspan="3">Hubei</td> <td>Xiaogan Central Hospital</td> </tr> <tr> <td>The First People's Hospital of Xiaogan</td> </tr> <tr> <td>Hanchuan People's Hospital</td> </tr> </tbody> </table>	Demonstration province	Demonstration medical institutions	Jilin	The First Hospital of Jilin University	The Second Hospital of Jilin University	Jilin Tumor Hospital	Changchun Central Hospital	Jiangxi	Jiangxi Children's Hospital	The First Affiliated Hospital of Nanchang University	The First Hospital of Nanchang	The Ninth Hospital of Nanchang	Henan	Xinxiang Central Hospital	Xinxiang Infectious Disease Hospital	The First People's Hospital of Xinxiang	Hubei	Xiaogan Central Hospital	The First People's Hospital of Xiaogan	Hanchuan People's Hospital	<p>22. Booklet of BEP Application in Medical Institutions</p> <p>23. Reduced MW amount</p> <p>24. Reduced use of disposable medical products</p> <p>25. Reduced use of Hg contained products</p> <p>26. Reduced use of PVC products</p> <p>27. Reduced injuries to MW working staff</p> <p>28. Improved personnel capacity for MW management and improved awareness</p> <p>29. Established MW management system</p> <p>30. Specifications on MW Management in Medical Institutions</p> <p>31. Number of occupational injuries and accidents in healthcare facilities caused by handling and treatment of medical care</p>	<p>Relevance: HS</p> <p>Efficiency: S</p> <p>Effectiveness: S</p> <p>Sustainability: HS</p> <p>Overall rating: HS</p>
Demonstration province	Demonstration medical institutions																						
Jilin	The First Hospital of Jilin University																						
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	Jilin Tumor Hospital																						
	Changchun Central Hospital																						
Jiangxi	Jiangxi Children's Hospital																						
	The First Affiliated Hospital of Nanchang University																						
	The First Hospital of Nanchang																						
	The Ninth Hospital of Nanchang																						
Henan	Xinxiang Central Hospital																						
	Xinxiang Infectious Disease Hospital																						
	The First People's Hospital of Xinxiang																						
Hubei	Xiaogan Central Hospital																						
	The First People's Hospital of Xiaogan																						
	Hanchuan People's Hospital																						

Outcome / Output	Results achieved	Relevant indicators	Rating								
	<table border="1"> <tr> <td rowspan="3">Hunan</td> <td>Yiyang Central Hospital</td> </tr> <tr> <td>Yiyang People's Hospital</td> </tr> <tr> <td>People's Hospital of Taojiang County</td> </tr> <tr> <td rowspan="3">Gansu</td> <td>Pingliang People's Hospital</td> </tr> <tr> <td>Pingliang Hospital of Chinese Medicine</td> </tr> <tr> <td>The Second People's Hospital of Pingliang</td> </tr> </table> <p>           More than 200 trainings have been held to train over 50,000 persons.            The TE evaluation team visited the demonstration hospitals in the Henan province, Jilin Province, Jiangxi province in the course of the Terminal Evaluation mission. In all the facilities, a segregation system compliant with the Waste Classification was in place.            In general, the work which has been done in the demonstration hospital looks very good and complete. Evidence that staff training was intensive with both class and on-duty training was provided. In most of the hospital visited evidence of plastic recycling was provided (Department of Environmental Protection of Henan Province, 2017) (Report on the management and disposal of infusion bags (in Chinese), "Leadership Group of the Jiangxi Province Medical Waste Management Project, 2017". The demonstration hospitals in general apply the upgraded classification system developed by NIHA.            The demonstration hospitals established supervision and in some cases incentive procedures            Booklet have been developed and, in some cases, shared with the TE consultants.         </p>	Hunan	Yiyang Central Hospital	Yiyang People's Hospital	People's Hospital of Taojiang County	Gansu	Pingliang People's Hospital	Pingliang Hospital of Chinese Medicine	The Second People's Hospital of Pingliang		
Hunan	Yiyang Central Hospital										
	Yiyang People's Hospital										
	People's Hospital of Taojiang County										
Gansu	Pingliang People's Hospital										
	Pingliang Hospital of Chinese Medicine										
	The Second People's Hospital of Pingliang										

#### Component 4. Demonstrate BEP based management including measurement and monitoring

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 4.1 Demonstrate BAT for incineration</b></p> <p><i>4.1.1 Develop a draft Booklet of BAT Application for Incineration Process of MW</i></p> <p><i>4.1.2 Develop a draft Specification for Construction and Operation of MW Disposal Facility Using Incineration Process</i></p> <p><i>4.1.3 Select one representative existing facility for demonstration</i></p> <p><i>4.1.4 Carry out the feasibility study and EIA of the demonstrative facility and develop the demonstration implementation plan</i></p> <p><i>4.1.5 Retrofit and optimize the operation of the modified facility, including on-line PCDD/PCDF sampling system, and train the relevant managerial and operation staff</i></p> <p><i>4.1.6 Validate the modified facility, monitor, record and evaluate the implementation process and results</i></p> <p><i>4.1.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</i></p>	<p>A BAT guidance document on medical waste disposal technology covering combustion (Pyrolysis, Incineration, Autoclave, Chemical disinfection, Autoclave) was released in 2012.</p> <p>Most of the demonstration disposal facilities were selected through competitive bidding. EIA and demonstration implementation plan were developed and submitted to FECO.</p> <p>The selected demonstration plant for Outcome 4.1 was the Changchun rotary kiln incinerator (List of MW disposal facilities, FECO, 2017; Work report of BAT/BEP demonstration sub project of Changchun medical waste disposal center, Changchun sanitation medical waste treatment Co., Ltd., 2017).</p> <p>This incinerator was the first in Jilin province to deal with medical waste in a professional manner and one of the pioneers of large-scale incinerators in China. It was reported that the incinerator made enormous contribution during the SARS outbreak.</p> <p>The incinerator has a processing capacity of 20 tons. It was built in 2001 and operated for 13 years before it was relocated in 2014.</p> <p>In June 2012, the Changchun EPB approved the impact assessment for the new plant, which was completed in 2014. The Incineration components were built by the Beijing Machinery and Electrical institute.</p> <p>The project supported the incremental expenditure needed to ensure the compliance of this incinerator with EU and Stockholm Convention BAT/BEP. That included the advanced bag filter from the US Gore company, the bag filter protection system, the adoption of BEP procedures for the classification and management of feed waste based on their calorific value.</p> <p>The plant undergoes at least 2 PCDD/F monitoring every year, showing compliance with the SC convention limit of 0.1 ngTeq/Nm<sup>3</sup>.</p> <p>Around 12000 tons of MW have been disposed since the second half of 2014. Additional information on the amount of PCDD/F reduced through the improvement of this plant have been provided in point 4.1 of the Executive summary.</p>	<p>32. Booklet of BAT Application for Incineration Process of MW</p> <p>33. Specification for Construction and Operation of MW Disposal Facility Using Incineration Process</p> <p>34. Demonstration implementation plan</p> <p>35. Skills of operators improved</p> <p>36. Overall management level improved</p> <p>37. PCDD/PCDF releases consistent with performance level associated with BAT</p> <p>38. Releases of other pollutants meeting the limits</p> <p>39. Solid residues to landfill meeting the limits for safe disposal</p>	<p>Relevance: HS Efficiency: S Effectiveness: HS Sustainability: HS</p> <p>Overall rating: HS</p>

**Component 5. Demonstrate BAT/BEP for MW thermal non-combustion treatment or other appropriate non-combustion treatment**

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 4.2 Demonstrate the BAT for Pyrolysis process</b></p> <p><i>4.2.1 Develop a Booklet of BAT application in pyrolysis process of MW</i></p> <p><i>Output 4.2.2 Develop a draft Specification for Construction and Operation of MW Disposal Facility Using Pyrolysis Process</i></p> <p><i>Output 4.2.3 Select 2 representative existing facilities for demonstration</i></p> <p><i>Output 4.2.4 Carry out the feasibility study and EIA of the demonstrative facility and develop the demonstration implementation plan</i></p> <p><i>Output 4.2.5 Retrofit and optimize the operation of the modified facility, including on-line PCDD/PCDF sampling system, and train the relevant managerial and operation staff</i></p> <p><i>Output 4.2.6 Validate the modified facility, and monitor, record and evaluate the implementation process and results</i></p> <p><i>Output 4.2.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</i></p>	<p>The disposal facilities selected for Outcome 4.2 were the Nanchang pyrolysis incinerator (Fang Pingping, Nanchang medical waste disposal center, 2017). and the Huaihua pyrolysis incinerator (Huaihua Tianyuan Environmental Science and Technology Co.,Ltd and Huaihua Medical Waste Disposal Center, July 2017)</p> <p>The Nanchang incinerator is the only disposal plant authorized by the municipal government to dispose medical waste.</p> <p>The plant disposes an amount of waste in the order of 5800 tons / year.</p> <p>The staff received a training on medical waste disposal and on the principle and operation of pyrolysis.</p> <p>The project supported the incremental expenditure needed to ensure the compliance of this incinerator with EU and Stockholm Convention BAT/BEP. That included the provision of an SCR for the reduction of PCDD/F emission (reference to the final report). Furthermore, the project also supported the power station and the transformer substation for the plant.</p> <p>The evaluators visited the Nanchang and noticed that the SCR was operational and working. The SCR was equipped with a bypass duct so that it can be switched off and bypassed in case of maintenance. The plant manager informed the evaluator that the need for bypassing the SCR usually last for few hours per year.</p> <p>The Nanchang plant owns 25 trucks for the transportation of medical waste, out of which 15 for large hospital and 10 for small clinics. All these trucks are equipped with GPS.</p> <p>The test at the stack demonstrated the compliance of the emission with the Stockholm Convention BAT level. Dioxin sampling were carried upstream and downstream the SCR, therefore it was possible to directly measure the cost effectiveness of the SCR equipment in term of mass of PCDD/F destroyed over mass of waste burnt. Summary of the performance results in term of PCDD/F emission compared to the baseline are reported in point 4.1 of the Executive summary.</p> <p>The Huaihua Tianyuan Environmental Protection Science and Technology LLC is the only legal unit in the city that engages in the centralized disposal of medical wastes. The company is in charge of the construction, operation and management of Huaihua medical waste disposal center with 66 existing staffs. The company is equipped with 16 special transport vehicles for the collection,</p>	<p>40. Booklet of BAT Application in Pyrolysis Process for MWs Disposal</p> <p>41. Specification for Construction and Operation of MW Disposal Facility Using Pyrolysis Process</p> <p>42. Demonstration implementation plan</p> <p>43. Skills of operators improved</p> <p>44. Overall management level improved</p> <p>45. PCDD/PCDF releases consistent with performance level associated with BAT</p> <p>46. Release of other pollutants within permitted limits</p> <p>47. Solid residues to landfill meeting the standards of safe disposal</p>	<p>Relevance: HS</p> <p>Efficiency: S</p> <p>Effectiveness: HS</p> <p>Sustainability: HS</p> <p>Overall rating: HS</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
	<p>transportation and disposal of medical wastes in all 13 counties (cities, districts) belonging to Huaihua.</p> <p>The project supported -through co-financing and GEF grant -the upgrading of the Huaihua incinerator through improvement of combustion equipment, air pollution control system, storage, transportation vehicles. As demonstrated by analytical reports, the plant successfully fulfilled the 0.1ngNm<sup>3</sup>/Teq BAT level at the stack. The evaluators had a meeting with the Huaihua staff at FECO premises, in Beijing.</p>		
<p><b>Outcome 5.1 Demonstrate the BAT in autoclaving processes.</b></p> <p><i>Output 5.1.1 Develop Booklet of BAT Application in Autoclaving Process of MW</i></p> <p><i>Output 5.1.2 Develop a draft Specification for Construction and Operation of MW Disposal Facility Using Autoclaving Process</i></p> <p><i>Output 5.1.3 Select one representative existing facility for demonstration</i></p> <p><i>Output 5.1.4 Carry out the feasibility study and EIA of the demonstration facility and develop the demonstration implementation plan</i></p> <p><i>Output 5.1.5 Procure, retrofit, and operate the modified facility and train the relevant managerial and operation staff</i></p> <p><i>Output 5.1.6 Validate the modified facility, and monitor, record and evaluate the implementation process and results</i></p> <p><i>Output 5.1.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and</i></p>	<p>Due to time constraints, the evaluators did not have the opportunity to visit the demonstration autoclave plants, therefore the information received was provided by the PMO. Based on this information, upon selection of the facility through competitive bidding, the autoclave facility owned by the Xiaogan Medical Waste Disposal Company Ltd was selected for demonstration (27/04/2009). The demonstration plan was submitted to FECO, and after revision, approved.</p> <p>The project supported the following equipment, for the upgrading of the facility: (1) an automatic waste feeding and unloading system, (2) a waste compacting system, (3) a waste gas scrubber, and (4) a waste tracing system. The procurement of all the equipment underwent a formal procurement process, in compliance with UNIDO and FECO rules, and the Wuhan Xinda Chuangxin Water Treatment Technology Co., Ltd. was selected as the bid winner and contracted (April 2013). The equipment was commissioned in June 2014. Therefore, more than 5 years were spent from the selection of the facility to the commissioning of the equipment. Based on the final report (Final Report of the 5th Tripartite Meeting and the Relevant Reports for 2014, 2015, 2016 and 2017, MEP/FECO, 2017), “with the waste gas collection and treatment system put in operation, all the pollutants are controlled well in compliance with the requirements specified in the pollutant emission standard for such industrial facility and the ambient air quality standard for such industrial premise.”</p> <p>The final report also describes the use of the GPS tracking system for the online monitoring of medical waste transportation. “the transporter uses a personal digital assistant to record the waste type, amount, and source, and transmit the data in real time through the public communication network. The GPS will guide the truck driver to ride in due course. The waste amount is verified when the waste is accepted in the storage house of the medical waste disposal facility to ensure that all waste collected has arrived without leakage</p>	<p>48. Booklet of BAT Application in Autoclaving Process for MW Treatment</p> <p>49. Specification for Construction and Operation of MW Disposal Facility Using Autoclaving Process</p> <p>50. Testing methods for emissions and discharges</p> <p>51. Demonstration implementation plan</p> <p>52. Skills of operators improved</p> <p>53. Overall management level improved</p> <p>54. Emission of VOCs and other pollutants meeting the performance levels</p> <p>55. Validation of sterilization process</p> <p>56. Treated waste meeting standards for safe disposal to landfill</p>	<p>Relevance: HS Efficiency: U Effectiveness: HS Sustainability: S</p> <p>Overall rating: S</p>



Outcome / Output	Results achieved	Relevant indicators	Rating
<p><i>disseminate the validated Booklet and Specification</i></p>	<p><i>or loss. It is also reported that the GPS has helped the disposal facility management to supervise their collectors in real time. "</i></p> <p>Some inconsistencies have been observed between the actual practice and the technical specifications for autoclave developed by the project, as autoclave plants exceeding the threshold of 10t/day established under the technical specification already exists in China and are produced by a factory located in Chongqing. Reportedly (MEP/FECO) these inconsistencies are being considered in the revision of the technical specifications For the sake of calculation of PCDD/F reduction, it should also be considered that in some case autoclaving was the selected process even before project implementation.</p>		
<p><b>Outcome 5.2 Demonstrate BAT in other non-incineration processes</b></p> <p><i>5.2.1 Develop Booklet of BAT Application in Other Non-Incineration Processes of MWs</i></p> <p><i>5.2.2 Develop a draft Specification for Operation of MW Disposal Facility Using Other Non-Incineration Process</i></p> <p><i>5.2.3 Select 2 representative existing facilities for demonstration of microwave irradiation, chemical disinfection or combination</i></p> <p><i>5.2.4 Carry out the feasibility study and EIA of the demonstrative facilities and develop the demonstration implementation plan</i></p> <p><i>5.2.5 Procure, retrofit and operate the modified facility and train the relevant managerial and operation staff</i></p> <p><i>5.2.6 Validate the modified facility and monitor, record and evaluate the implementation process and results</i></p> <p><i>5.2.7 Validate the Booklet and the</i></p>	<p>The evaluators visited the UE Envirotech waste chemical disinfection plant in Xinxiang, which was selected as demonstration plant for this outcome. Based on the information provided by PMU, the plant was selected in March 2010.</p> <p>In summary, the disposal process was the following: after loading, the waste are subjected to a first shredding process and a pre-screening down to 8cm size. Disinfection chemicals (Calcium oxide + lime + proprietary disinfectant) are added after this stage. Due to chemical reaction, the temperature increases after the addition of chemicals up to 85°C. During the second shredding stage, the temperature further increases over 100°C. 75 kg of reagent are needed for each kg of waste.</p> <p>The project supported the following equipment: (1) an auto loading and slag-out twisting system, (2) a transfer box cleaning system, and (3) a medical waste transportation system. The commissioning of the equipment was completed in December 2013. The evaluators had the opportunity to check the operation of the plant, confirming that the automatic washing system for containers and the automatic loader were effective in reducing the exposure of workers to the medical waste and disinfection chemicals. However, after upgrading, a significant increase of the operational cost was reported.</p> <p>Technically, the upgrading of this facility did not allow for the reduction of any PCDD/F as the plant was already operational before project upgrading. The PCDD/F saving derives mostly from the increased capacity of the plant, preventing the disposal of waste in small, substandard disposal facilities. In term of sustainability, the internalization of environmental costs (higher environmental sustainability) was compensated an increase of the actual operational cost (reduced economic sustainability).</p> <p>During the TE meeting in Xinxiang, it was reported that the amount of waste treated by the facility increased from 540t/y at the beginning of the project up</p>	<p>57. Booklet of BAT Application in Non-Incineration Processes for MW Treatment</p> <p>58. Specification for Construction and Operation of MW Disposal Facility Using Other Non- Incineration Process</p> <p>59. Demonstration implementation plan</p> <p>60. Skills of operators improved</p> <p>61. Overall management level improved</p> <p>62. Emission of VOCs and other pollutants meeting the limits</p> <p>63. Validation of sterilization process</p> <p>64. Treated waste meeting standards for safe disposal to landfill</p>	<p>Relevance: HS</p> <p>Efficiency: S</p> <p>Effectiveness: S</p> <p>Sustainability: S</p> <p>Overall rating: S</p>



Outcome / Output	Results achieved	Relevant indicators	Rating
<p><i>Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</i></p>	<p>to 2400 t/y. Although this increase demonstrated the success of the viability of the technology, at the same time it represents a risk in case of malfunctioning or unavailability of the equipment. For this reason, the Xinxiang municipality established a cooperative agreement with nearby cities which were also using non-incineration processes, to be sure that in case of emergency all the healthcare waste generated can be timely disposed of.</p>		
<p><b>Outcome 5.3 Demonstrate BAT/BEP for treatment and disposal of medical wastes in remote rural areas</b></p> <p><i>Output 5.3.1 Develop Booklet of BAT/BEP Application for Treatment and Disposal of MW in remote rural areas</i></p> <p><i>Output 5.3.2 Select representative remote rural areas for demonstration of the recommended BAT/BEP of the Booklet</i></p> <p><i>Output 5.3.3 Develop the demonstration implementation plan</i></p> <p><i>Output 5.3.4 Procure, install and operate the facilities and train the relevant managerial and operation staff</i></p> <p><i>Output 5.3.5 Monitor, record and evaluate the implementation process and results</i></p> <p><i>Output 5.3.6 Validate the Booklet by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet</i></p>	<p>Since 2003, the regulation establishes that hospitals are not anymore allowed to build and operate their own site disposal facility less than one ton per day. From one side, this provision prevents the emission of a large amount of dioxin from small, sub-standard incinerators. From another side, this has created issue in the treatment of the waste generated from small “grassroot” clinics and hospitals in rural areas which have difficult access to centralized disposal facilities.</p> <p>Research have been carried out in the Henan demonstration province, Zhengzhou University deployed a research on the management mode of medical waste in rural area; In Changchun and Huaihua demonstration city, the government formulated policies to solved the collection problem in the surrounding counties. BASIC (Study on remote area medical waste treatment technologies and management model, Chen Yang, IHEP, 2017) performed a study to identify methods aimed at prolonging the storage of medical waste, so that the logistic aspect may be facilitated.</p> <p>In 2012, FECO organized a team of project management staff and consultants to visit Lichuan for identifying the project activities and the implementing model. In August 2013, Lichuan People’s Government and Lankun Medical Waste Disposal Company prepared the project implementation plan, scheduling time and responsibility for each project component and activity with budget. Based on the implementation plan, a tripartite project agreement was signed by FECO, Lichuan People’s Government, and Lankun Medical Waste Disposal Company in September 2014.</p> <p>According to the project implementation plan and the project agreement, FECO will be responsible for the procurement of the cold storage refrigerator, medical waste containers, medical waste transportation vehicles, and the GPS monitoring system. FECO received and approved the technical specifications with Lankun Medical Waste Disposal Company.</p> <p>Land acquisition however proved a very complex and time-consuming process. Almost 1 year was spent by the local government to process the land acquisition, before eventually turning out to be a failure. Hubei Provincial</p>	<p>65. Booklet of BAT/BEP Application for Treatment and Disposal of MW in remote rural areas</p> <p>66. Operation and pollutant release indicators of the demonstrated facilities meeting BAT achievable limits</p> <p>67. Skills of the facility operators improved</p> <p>68. Overall MW management capacity improved</p> <p>69. Established policies and management systems</p> <p>70. Treated waste meeting standards for safe disposal to landfill</p>	<p>Relevance: HS Efficiency: U Effectiveness: MS Sustainability: MS</p> <p>Overall rating: MS</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
	<p>Environmental Protection Bureau recommended therefore Shennongjia County as a candidate for consideration.</p> <p>In March 2016, FECO organized experts to visit Shennongjia and concluded that it met the criteria as a pilot area to demonstrate BAT/BEP for medical waste management in remote rural areas.</p> <p>To speed up the procurement process, FECO signed a performance-based contract with the County Government.</p> <p>The facility owner has procured autoclaving equipment from Chongqing Zhide Thermal Engineering Company. The equipment has a capacity of 1 ton per day.</p> <p>The facility owner has contracted qualified companies for the civil works. f 1 ton per day.. In July 2017, the demonstration construction was completed, filling the gap of the medical waste sound disposal onsite in the area and providing a pilot case.</p>		

**Component 6. Demonstrate spatially integrated and coordinated MW management and disposal systems in geographically defined clusters.**

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 6.1 Demonstrate the application of integrated MW management among institutions at the municipal level</b></p> <p><i>Output 6.1.1 Select 3 demonstrations municipalities</i></p> <p><i>Output 6.1.2 Participation of project stakeholders to international symposia and undertake field visits to learn international experience in integrated MW management among institutions</i></p> <p><i>Output 6.1.3 Establish inter-departmental mechanism for policy consultation and coordination for integrated MW management among institutions at municipal level</i></p>	<p>Xinxiang (Henan province), Nanchang (Jiangxi province), Huaihua (Hunan province), Pingliang (Gansu province), Changchun (Jilin province), Xiaogan (Hubei province) were selected as demonstration municipalities for this component.</p> <p>Based on the meetings outcome during the TE, it was evident that sound cooperation among EPB and Health department have been established in all the demonstration cities visited (Xinxiang, Nanchang, Changchun) or met (Huaihua), with higher effectiveness of the Xinxiang demo city compared to the others.</p> <p>MIS is still at the demonstration stage and implemented and developed only in Zhengzhou. All the demonstration cities implemented a coordination and reporting mechanism</p> <p>In all the provinces visited / met, a coordination system to allow the integration of Healthcare Waste Disposal technologies was ensured, by establishing steering groups, and through the issuance of the relevant local regulation.</p> <p>For instance, in Henan, the following relevant local regulation was issued and enforced:</p>	<p>71. Municipal-level Integrated MW Management Plan</p> <p>72. Municipal Integrated MW Management Coordination Mechanism</p> <p>73. Municipal integrated MW management information system</p> <p>74. Established municipal policies, regarding MW treatment charge, taxation, financial support, market orientation and other incentives</p>	<p>Relevance: HS</p> <p>Efficiency: MS</p> <p>Effectiveness: S</p> <p>Sustainability: HS</p> <p>Overall rating: HS</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><i>Output 6.1.4 Develop municipal-level integrated MW management information system</i></p> <p><i>Output 6.1.5. Monitor, record and evaluate the implementation process and results</i></p>	<ul style="list-style-type: none"> <li>• Notice on Establishment of the Leading Group for the Integrated Medical Waste Management and Co-disposal Subproject in Henan Province (YHW [2014] No. 15).</li> <li>• Henan Provincial Implementation Program of Integrated Medical Waste Management and Co-disposal Demonstration Province Project (YHW [2014] No. 130).</li> <li>• Notice on Implementation of Medical Waste Environmental Supervision (YHW [2014] No. 16).</li> <li>• Notice on Issuing Main Points of Henan Provincial Solid Waste Environmental Supervision in 2015 (YHB [2015] No. 21).</li> </ul> <p>In Henan, the Zhengzhou University was assigned with the preparation of the Research Report on the Medical Waste Co-Disposal Program of Henan Province. The research included the integrated disposal between medical waste incineration and non-incineration disposal facilities, the integrated disposal between medical waste disposal facilities and hazardous waste disposal centers and the cooperation of medical waste disposal facilities pertaining to different administrative divisions and proposed eight co-disposal programs.</p> <p>In Changchun, in 2011 the Municipal EPB and the municipal Health Bureau jointly signed the “Integrated Management Plan for Medical waste in Changchun City”. In 2012 a joint inspection was conducted by municipal EPB and HB together with a number of key medical and health institution to identify key issues to be addressed (mainly on the storage side). A UNIDO international delegation visited the municipality in 2013 to provide technical assistance and check project implementation. In 2015 a “Changchun city medical waste emergency plan” was established. The Changchun incineration facility established in 2014 a cooperation with the Tsinghua university in the field of PCDD/F monitoring. Changchun municipality launched several awareness raising, training and inspection initiatives to promote the integrated management of medical waste under the project.</p> <p>In Gansu province, the: Environmental protection departments of the Pingliang and Qingyang cities signed a coordinated and emergency response disposal plans. In the same province, a similar agreement was also signed between the cities of Jiayuguan and Jiuquan.</p> <p>In Nanchang the following activities were undertaken: survey on the medical waste management situation; establishment of a cooperative disposal across</p>		

Outcome / Output	Results achieved	Relevant indicators	Rating
	<p>the province; demonstration of BAT disposal facilities; improvement of the fee charging system; standardization of waste collection and disposal based on the revised catalogue; strengthening the supervision mechanism; improvement of the coordination mechanism; promote segregation; setup a training system and strengthening public awareness. A GEF inspection was held in September 2014. The Jiangxi Health and Family Committee Issued 10 notices and regulations on the management of medical waste.</p> <p>Furthermore, similar initiatives were adopted in the other demonstration municipalities.</p> <p>Indeed, it was reported during the meetings that the demonstration cities and provinces played a pioneering and exemplary role for the 13th Five-Year Plan for Eco-Environmental Protection, so that their experience can be scaled up and replicated nationally. The project results have been already incorporated into this plan. The plan was issued by the State Council in November 2016 (13th Five-Year Plan for Eco-Environmental Protection, People Republic of China, 2016)</p>		

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>Outcome 6.2 Demonstrate coordinated MW treatment among the dedicated MW facilities</b></p> <p>Output 6.2.1 Select 3 demonstration provinces for coordinated MW management and treatment</p> <p>Output 6.2.2 Assist the selected provinces establish provincial MW management steering groups</p> <p>Output 6.2.3 Hold a coordinating workshop among the provincial and municipal departments and the dedicated MW treatment facilities</p> <p>Output 6.2.4 Develop and carry out a logistics plan for the coordinated activities</p> <p>Output 6.2.5 Promulgate and implement supporting policies by the local government</p> <p>Output 6.2.6 Monitor, record and evaluate the implementation process and results</p>	<p>This outcome should be evaluated together with outcome 6.1, as</p> <ul style="list-style-type: none"> <li>the demonstration municipalities (outcome 6.1) were selected upon selection of the demonstration provinces</li> <li>the integration among MW facilities was indeed also addressed under Outcome 6.1</li> <li>several activities (training, issuance of local regulations, fee policies, emergency planning) required the coordinated efforts of provinces and municipalities;</li> </ul> <p>Noticeably, the provinces (and hence the municipalities) selected under Outcomes 6.1 and 6.2 were 6 instead of 3. The additional 3 were supported by co-financing.</p>	<p>75. Better social, economic and environmental benefits achieved by disposal technologies:</p> <p>76. Different MW streams treated by different way</p> <p>77. Effective response to emergencies</p> <p>78. Co-building between neighboring municipalities</p> <p>79. Co-building MW treatment facility with hazardous waste treatment facility</p>	<p><i>N/A (to be scored together with outcome 6.1)</i></p>

**Component 7. Develop and formulate a national strategy and action plan of BAT/BEP for MW management and disposal based on the experience gained through the demonstration activities of the project.**

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><b>7.1 Formulate techno-economic policies that promote the adoption of BAT/BE</b></p> <p>Output 7.1.1 Investigate and analyse the needs of techno-economic policies according to the</p>	<p>Basically, this was the subject of research contracts assigned to CAEP. They studied the possibility of different financing model for running HW disposal facilities (PPP, DBO, etc), as well as the impact of different fee policies. The result of this research has been summarized in 3 presentations:</p> <ul style="list-style-type: none"> <li>Business Mode for Centralized Medical Waste Disposal in China</li> </ul>	<p>80. Techno-economic policies promoting adoption of BAT/BEP in MW management</p> <p>81. MW treatment fee-based system</p>	<p>Relevance: HS Efficiency: S Effectiveness: S Sustainability: MS</p> <p>Overall rating: MS</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
<p>requirements of BAT/BEP and the Convention</p> <p>Output 7.1.2 Draft the needed techno-economic policies</p> <p>Output 7.1.3 Hold a policy dialogue workshop attended by representatives from governments, international and domestic experts, enterprises, and the public</p> <p>Output 7.1.4 Circulate the policy texts for comments</p> <p>7.1.5 Incorporate the comments into the final policy texts</p> <p>7.1.6 Submit the policies to SEPA and other related ministries for promulgation</p>	<ul style="list-style-type: none"> <li>• Economic Policies for Centralized Medical Waste Disposal in China</li> <li>• Plan for the Construction of Medical Waste Disposal Facilities in China and Implementation Updates</li> </ul> <p>Although the policies developed have still a very limited application, the research and draft policies represented however an useful starting point for the revision of the charging policies, undertaken by the Environmental Planning Department of the Ministry of Environmental Protection and the demonstration provinces of Henan, Hunan and Hubei. The move toward a more “market oriented” based charging policy reached the level of the State Council which issued Several Opinions on Promoting the Price Mechanism Reform on October 12, 2015, and pointed out that “all prices that can be formed by markets should be submitted to the market.</p> <p>The results of the discussions, during evaluation meetings, concerning the fee mechanism in all the demonstration provinces confirmed that the actual fee policy, based on the bed number instead of the actual amount of waste (volume or mass based) presents several shortcomings and in many cases, is not enough to sustain the disposal cost .It was also found that there is not enough staff available to ensure a proper measurement of the weight or volume of waste generated by the healthcare facilities.</p>	<p>82. Policies encouraging investment in MW treatment from the private sector</p> <p>83. Policies encouraging commercialization of MW treatment</p> <p>84. Measures of Franchised Operation of MW Treatment</p>	
<p><b>7.2 Demonstrate and promote different commercial models for the construction and operation of MW treatment and disposal facilities</b></p> <p>7.2.1 Develop investment models to facilitate MW treatment and disposal</p> <p>7.2.2 Conduct trainings for government officials and enterprises managers from at least 60 municipalities in the realization and management of MW management projects</p>	<p>Based on the final report (Final Report of the 5th Tripartite Meeting and the Relevant Reports for 2014, 2015, 2016 and 2017, MEP/FECO, 2017) and its annex 28, “<i>recommendations regarding the optimization of the industrial structure through financial instruments such as venture capitals, private equities, merge and acquisition as well as stock market listing have been proposed. The study results have been lectured at the training workshops organized by the 3 training centers, respectively targeting incineration facility owners, non-incineration facility owners, and governmental inspectors.</i>” That was a research activity whose impact was exerted mainly within the boundaries of the project.</p> <p>Most of the indicators listed for these activities (with specific reference to indicators 87, 88, 89, 91 in Table 2) are indeed more relevant to other project components (for instance, component 4, component 5, component 6). In</p>	<p>85. Specifications on investment models to facilitate MW treatment and disposal</p> <p>86. List of trained municipal staff</p> <p>87. Investment amount from non-governmental sources</p> <p>88. More than 20 municipal MW management steering groups established</p> <p>89. Dedicated MW treatment</p>	<p>Relevance: MS Efficiency: S Effectiveness: S Sustainability: U</p> <p>Overall rating: MS</p>

Outcome / Output	Results achieved	Relevant indicators	Rating
<p>7.2.3 Assist at least 20 municipalities in establishing MW management steering groups</p> <p>7.2.4 Provide technical assistance to the municipalities with MW management steering group in adopting BOT, BOO, TOT models, etc.</p> <p>7.2.5 Provide incentives to facility owners to purchase certified equipment</p> <p>7.2.6 Establish technical consulting institutions to provide technical services in options for p</p>	<p>summary, this component seems redundant and indeed at least partially covered by other project components.</p>	<p>facilities operation meeting pollutant release levels</p> <p>90. Dedicated MW treatment facilities operating on a financially sustainable basis</p> <p>91. Established technical consulting institutions providing technical services in options for private investment</p>	
<p><b>Outcome 7.3 Strengthen national capacity to develop new MW treatment technologies appropriate to China's socio- economic context</b></p> <p><i>Output 7.3.1 Identify, evaluate and establish the catalogue of processes, techniques and equipment in great demand while not yet made locally available and affordable in China</i></p> <p><i>Output 7.3.2 Hold 3 workshops attended by representatives from national and local governments, international technology vendors, domestic research institutes, equipment manufacturers, and treatment operators to discuss technology supplies and demands for incineration, autoclave and other non-incineration technologies</i></p> <p><i>Output 7.3.3 Establish incentives to encourage joint development of market needed technologies and</i></p>	<p>Detailed information were provided on the activities conducted in 2 important research areas:</p> <ul style="list-style-type: none"> <li>• Non-incineration equipment for medical waste VOCs and odour pollution control technology (conducted by the School of Chemical Engineering of the University of Tianjin). (R&amp;D and demonstration of medical waste non incineration treatment facilities VOCs and odor pollution control technology (in Chinese), Wang Fumin, Tianjin University , 2017) This activity aimed at addressing one of the main shortcoming of the autoclave technology (the release of odours and VOC) through a filter which combines photocatalytic destruction, adsorption and microbial degradation. The technology proved successful (VOC removal in the order of 99.5%) has been demonstrated in several disposal facilities, and is currently commercialised</li> <li>• Research and Development concerning SCR Technology for the abatement of Dioxins/NOX Emitted from Flue gases (Developed by the Zhejiang University) (R&amp;D of SCR Technology for the abatement of Dioxins/NOX Emitted from Flue gases, Yang Hangsheng, Zhejiang University, 2017). The research approach was based on the synergy between adsorption and catalysis + O3 promotion for PCDD/F reduction and on the equilibrium between sulfate deposition and decomposition for the NOx abatement.</li> </ul>	<p>92. Program of research, development and application of key technical processes, techniques, and equipment</p> <p>93. National investment on R&amp;D of the needed technical processes, techniques and equipment</p> <p>94. Key equipment locally available and affordable</p> <p>95. Joint ventures established and operated profitable</p>	<p>Relevance: HS Efficiency: S Effectiveness: HS Sustainability: HS</p> <p>Overall rating: HS</p>



Outcome / Output	Results achieved	Relevant indicators	Rating
<p><i>equipment by international vendors and domestic research entities</i>  <i>Output 7.3.4 Establish incentives for successful application of advanced feasible technologies and equipment</i></p>	<p>The research proved successfully and the 2 technologies for NOx and PCDD/F abatement have been demonstrated at pilot (NOx) and full (PCDD/F) scale. There is now the need to develop a commercial device based on the research stage.</p> <p>The evaluators visited the Tianjin university where a meeting with the researchers and a visit to the laboratory were held; and had a meeting with the researchers in charge of the SCR R&amp;D activity in Beijing, at the FECO/CIO premises.</p> <p>The two researches are extremely relevant for the project. The VOC and odour treatment technology, by addressing one of the main shortcomings of the autoclave technology, facilitates the promotion of that technology, with the associated reduction in the emission of PCDD/F achieved by its increased use of auto.</p> <p>The development of a Chinese SCR technology, not affected by the cost of intellectual properties or royalties, has also the potential to significantly reduce the cost of PCDD/F abatement, thus facilitating the adoption of PCDD/F reduction devices in existing or new incinerators.</p>		
<p><i>Outcome 7.4 Develop and implement a MW treatment equipment certification and labelling programme</i></p> <p><i>Output 7.4.1 Develop technical requirements for Certification and Labelling of MW Treatment Equipment</i>  <i>Output 7.4.2 Develop procedures on Certification and Labelling of MW Treatment Equipment</i>  <i>Output 7.4.3 Strengthen the capacity of certification institutions</i>  <i>Output 7.4.4 Strengthen the capacity of the testing institutions and</i></p>	<p>A voluntary certification scheme was developed by the China Environmental Protection Industrial Association and IHEP.</p> <p>The rules on certification have been released in 2015. (Medical waste disposal environmental protection product certification and disposal technology assessment system, Chen Yang, IHEP, 2017). Four guidelines for certification were drafted and adopted by EPIA (Beijing) Certification center.</p> <ul style="list-style-type: none"> <li>• Technical requirements for the environmental protection certification of medical waste incineration equipment.</li> <li>• Technical requirements for the environmental protection certification of equipment for the processing of medical waste through chemical disinfection</li> <li>• Technical requirements for the environmental protection certification of equipment for the processing of medical waste through microwave</li> </ul>	<p>96. Technical requirements for Certification and Labelling of MW Treatment and Disposal Equipment for processes of:</p> <ul style="list-style-type: none"> <li>• Incineration</li> <li>• Pyrolysis</li> <li>• Autoclaving</li> <li>• Microwaving</li> <li>• Chemical disinfections</li> </ul> <p>97. Procedures on Certification and Labelling of MW</p>	<p>Relevance: HS  Efficiency: S  Effectiveness: HS  Sustainability: HS</p> <p>Overall score: HS</p>



Outcome / Output	Results achieved	Relevant indicators	Rating								
<p><i>laboratories</i></p> <p><i>Output 7.4.5 Hold series of workshop targeting separate technologies, implementation of the certification and labelling program and participation of equipment producers and investors in the program</i></p> <p><i>Output 7.4.6 Carry out pilot certification and labelling on qualified products produced by those manufacturing enterprises of better-off conditions</i></p> <p><i>Output 7.4.7 Launch extensive publicity in the MW treatment sector</i></p>	<p>disinfection,</p> <ul style="list-style-type: none"> <li>• Technical requirements for the environmental protection certification of equipment for the processing of medical waste through steam treatment,</li> </ul> <p>The following companies submitted an application and received a certification under the voluntary scheme:</p> <ul style="list-style-type: none"> <li>• Chongqing Gient Thermal Industry</li> <li>• Beijing Fangde Precision Chemical Equipment</li> <li>• ORD Chaoyang Environmental protection equipment</li> <li>• Shenzhen Han solid waste treatment equipment CO, ltd</li> </ul> <p>Certificate is issued by CEPI based on the and analysis data provided by a third party.</p>	<p>Treatment Equipment</p> <p>98. Number of accredited laboratories and testing institutions</p> <p>99. Number of accredited equipment certification institutions</p> <p>100. Number of enterprises and products successfully certified and in certification pipeline</p>									
<p><b>Outcome 7.5 Establish training and accreditation systems for the lifecycle management of MW that support BAT/BEP</b></p> <p><i>Output 7.5.1 Integrate all the experience and results from demonstrations and other external successful experience to compile textbooks for managerial and technical trainings</i></p> <p><i>Output 7.5.2 Develop various curricula to meet different training needs such as entry training, on-the-job training, refresh training, etc.</i></p> <p><i>Output 7.5.3 Train the trainers in environmental and health sectors</i></p> <p><i>Output 7.5.4 Formulate Regulations and Resources Requirements for MW Management Training Institutions</i></p> <p><i>Output 7.5.5 Based on the existing</i></p>	<p>3 training bases for HWM disposal have been established in cooperation among them: Shenyang, Tianjin and Shanghai. Training infrastructures have been established. Training also involved in some cases (Shanghai) the development of a feedback system (questionnaire forms to the student). All the trainings involved admission and final tests, although the documentation of these final tests was not homogeneous among training centers.</p> <p>The task of designing the training for medical waste institution was accomplished by NIHA, who conducted preliminary surveys related to the training needs, issued a number of Guidelines (among which the Guidebook on Medical Institution Medical Waste Supervision and Medical Institution Medical Waste Supervision Process and indicator, and the “Medical Waste Training Manual in Medical Institutions”, coordinated and held the training for the trainers of the 7 training centers established, and coordinated the full scale training in the 7 training bases.</p> <table border="1"> <thead> <tr> <th>S/N</th> <th>Name of training base</th> <th>Number of trainees</th> <th>The proportion of female workers</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Hunan Province Hospital Infection Management Quality Control Center</td> <td>9274</td> <td>80.97%</td> </tr> </tbody> </table>	S/N	Name of training base	Number of trainees	The proportion of female workers	1	Hunan Province Hospital Infection Management Quality Control Center	9274	80.97%	<p>101. Number of trainers receiving training</p> <p>102. Regulations and Resources Requirements for MW Management Training Institutions</p> <p>103. Personnel training systems for lifecycle management of MW</p> <p>104. 7 training bases established for training of high-level managerial and technical staff in health agencies and medical institutions</p> <p>105. 3 training bases established for training of central MW treatment staff</p> <p>106. Number of medical</p>	<p>Relevance: HS</p> <p>Efficiency: S</p> <p>Effectiveness: HS</p> <p>Sustainability: HS</p> <p>Overall score: HS</p>
S/N	Name of training base	Number of trainees	The proportion of female workers								
1	Hunan Province Hospital Infection Management Quality Control Center	9274	80.97%								

Outcome / Output	Results achieved				Relevant indicators	Rating																									
<p><i>administrative structure and training system of the health administration, establish a 4-tier personnel training system covering national, provincial, municipal, and county medical institutions, including establishment of 7 training bases for training of high-level managerial and technical staff in health agencies and medical institutions"</i></p> <p><i>Output 7.5.6 Based on the existing environmental technical training and research system, establish 3 training bases for training of dedicated MW treatment staff</i></p>	<table border="1"> <tr> <td>2</td> <td>Henan Province Hospital Infection Management Quality Control Center</td> <td>16521</td> <td>84.50%</td> </tr> <tr> <td>3</td> <td>Jilin Province Hospital Infection Management Quality Control Center</td> <td>2001</td> <td>88.01%</td> </tr> <tr> <td>4</td> <td>Jiangxi Province Hospital Infection Management Quality Control Center</td> <td>4766</td> <td>84.00%</td> </tr> <tr> <td>5</td> <td>Hubei Province Hospital Infection Management Quality Control Center</td> <td>11050</td> <td>83.33%</td> </tr> <tr> <td>6</td> <td>Gansu Province Hospital Infection Management Quality Control Center</td> <td>3572</td> <td>76.58%</td> </tr> <tr> <td>7</td> <td>First Hospital of Peking University</td> <td>5230</td> <td>70.00%</td> </tr> <tr> <td colspan="2">Total</td> <td>52414</td> <td>81.06%</td> </tr> </table> <p>Starting from May 2012, when the first training for trainers was held in Hunan, overall, nearly 200 trainings were conducted, involving more than 50,000 trainees. Based on NIHA reports (Summary report on training system construction of medical waste management project in medical institutions, NIHA, 2017), the training was established at different levels: training of trainers, staff training for medical institutions, training for medical staff, training for logistic staff. Training materials and training minutes and reports were recorded and are in the hands of NIHA, for future control and verification. In some cases, feedback / questionnaire surveys to understand the effectiveness of training was undertaken. In all the cases training involved pre- and post- training tests. The evaluators had the possibility to check, in the training centers visited, the existence of training certificates, training material (booklet, ppts, training reports and test sheets). Giving the number of trainers and trainees involved, it is recommended for the future to adopt digital system for training tests, verification and statistics, as the management of the amount of hardcopy material produced is not easily manageable.</p>	2	Henan Province Hospital Infection Management Quality Control Center	16521	84.50%	3	Jilin Province Hospital Infection Management Quality Control Center	2001	88.01%	4	Jiangxi Province Hospital Infection Management Quality Control Center	4766	84.00%	5	Hubei Province Hospital Infection Management Quality Control Center	11050	83.33%	6	Gansu Province Hospital Infection Management Quality Control Center	3572	76.58%	7	First Hospital of Peking University	5230	70.00%	Total		52414	81.06%	<p><i>institution staff receiving BEP trainings</i></p> <p><i>107. Number of dedicated MW treatment staff receiving BAT/BEP trainings</i></p> <p><i>108. Number of management systems certified</i></p>	
2	Henan Province Hospital Infection Management Quality Control Center	16521	84.50%																												
3	Jilin Province Hospital Infection Management Quality Control Center	2001	88.01%																												
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7	First Hospital of Peking University	5230	70.00%																												
Total		52414	81.06%																												
<p><i>7.6 Extensive stakeholder awareness raising including a series of national and international workshops</i></p> <p><i>7.6.1 Prepare technical materials for targeted stakeholder awareness for administrators, managers and other influential players in national</i></p>	<p>Booklet (see chapter 4), videos and education campaign launched. Most of the awareness raising work was carried out by NIHA, which developed a summary report. During the meetings in the demonstration provinces, some of the awareness raising videos were projected. These videos were also released to the evaluators. Posters have been developed under the project and based on the PMU final report, there is a plan to prepare a documentary movie summarizing all project results.</p>	<p><i>109. Plan for stakeholder awareness and education on MW management</i></p> <p><i>110. Number or percentage of the stakeholders receiving information</i></p> <p><i>111. Improved stakeholder</i></p>	<p>Relevance: S Efficiency: MS Effectiveness: S Sustainability: s</p> <p>Overall score: S</p>																												

Outcome / Output	Results achieved	Relevant indicators	Rating
<p><i>investment programs where the outputs of the project can potentially be replicated.</i></p> <p><i>7.6.2 Launch awareness raising and education campaign to the identified stakeholders using direct communication including publications and lectures</i></p> <p><i>Mobilize industrial associations to introduce BAT/BEP among medical product manufacturing enterprises - Mobilize NGOs to introduce knowledge about MW treatment in hospitals, communities, and schools</i></p> <p><i>7.6.3 Promote academic and professional articles for environmentally sustainable MW management</i></p> <p><i>7.6.4 Organize a workshop by the end of this project bringing together all stakeholders and consultants/companies involved in this project to evaluate the outcomes of the project</i></p> <p><i>7.6.5 Hold a national workshop with participation from all provinces and stakeholders</i></p> <p><i>7.6.6 Hold an international workshop to share the national experience with representatives from other countries and also learn from their experiences</i></p>	<p>With relevance to output 7.6.4,MEP/FECO informed that a Wrap-up and Dissemination Meeting was planned on 10th October, 2017</p> <p>Under output 7.6.5, In 2015, 3 national training workshops were held in Shanghai, Tianjin and Shenyang respectively.</p> <p>Relevant to output 7.6.3, the project promoted the publication of 34 scientific article, out of which 11 in international journal of as proceedings of international conferences.</p> <p>Relevant to output 7.6.6 are the side events of annual TCG meeting in 2013 and 2015the international workshops in Italy, Austria, Japan, America, UK, India, Sri Lanka and LAO PDR).</p>	<p><i>awareness levels</i></p> <p><i>112.BAT/BEP extended to medical product manufacturing enterprises</i></p> <p><i>113.Reduced use of hazardous and toxic substances in manufacturing medical products</i></p> <p><i>114.Improved medical product design considering easier recycle and reuse</i></p> <p><i>115.Experience, lessons, results and impacts summarized</i></p> <p><i>116.National experience presented, and international experience learned</i></p>	

### **3.4.3. Relevance**

As explained in section 3.1.2, the relevance of the activities and outcomes envisaged at project design were high. There were no significant deviations in the implementation of the project compared to what was established in the project document, and the commitment of the Government of China on the establishment of an environmentally sound management of healthcare waste remained high, therefore it is confirmed that the project relevance remained high.

### **3.4.4. Effectiveness & Efficiency**

As explained the detailed analysis concerning attainment of objectives (see previous chapter 3.4.1 and 3.4.2), there are little doubts that the project was very effective in achieving most of its key target as defined by the key and specific indicators (Table 1 and Table 2). The only target which were not achieved at the project end were the one related to the promulgations of the BAT level of 0.1 ngTeq/m<sup>3</sup> for incinerator and the final approval of the regulation on the HCW catalogue. Currently, however the HCW waste catalogue is in the pipeline for final endorsement.

At the same time, it is evident that the project was not very efficient in the achievement of its objective, as its completion was delayed for almost 5 years. The reasons for the delay were already identified in 2014 - see UNIDO annual Project Implementation Report (PIR) Fiscal Year (FY) 2014 (1 July 2013 – 30 June 2014). In the final report drafted by FECO, a comparison between the planned deadline and the actual completion was undertaken for all project outputs (see Chapter 1 “Efficiency”). Based on a conversation with the PMO staff, it was confirmed that the main reasons for the delay were as following: Procurement issues (Nanchang, Xiaogan); relocation of the contracted facilities (Changchun); complaint of local population not accepting the plant (YiYang, moved to Huaihua); issues on land availability (demonstration of BAT in rural areas); opposition from the industry against the 0.1 ngTeq/m<sup>3</sup> level; complexity of the procedure for the examination revision and approval of the HC waste catalogue.

To solve some of the procurement issues, FECO in few cases adopted a “performance-based contract” which is faster than the international bidding procedure. However, that solved only few of the bottlenecks the project faced. The complexity of the project, the number of decision makers involved at international national and local level, the lengthy and sometime conflictual law-making process, all these reasons lead eventually to the delay of the project. On the other side, the commitment of the government ensured the completion of the project, notwithstanding the amount of additional resources needed to ensure the management of this project for 5 additional years at no additional cost for the GEF.

### **3.5. Country ownership and mainstreaming**

The MW Project was characterized by its strong country ownership and drivenness, as it initiated from the National Plan for the Construction of Medical Waste Disposal Facilities in China after the outbreak of SARS in 2003. Then the project was implemented with the improving medical waste management practices throughout the country, which provides a basis for deepening country ownership of national development strategies on the sustainable MW management in China.

The strong leadership within the executive has been key in enhancing the country ownership. The MW project was under the national execution by a project team constituted by dedicated officers of the Stockholm Convention Implementation (CIO) and the Foreign Economic Cooperation Office of MEP. The project steering group covers the government officers and experts from MEP and National Health and Family Planning Commission, under the support of Convention Implementation Coordination Group that consists of 13 ministries.

The good coordination resulted in an effective communication and cooperation mechanism among environmental protection and health departments, medical institutions and disposal enterprises in the central and local level which – notwithstanding the delay of project completion - guaranteed the achievement of the planned outcomes and enhancement of whole-process medical waste management capabilities.

Policy proposals and experiences synthesized in the MW project also contributes to the further strengthening and mainstreaming of the medical waste management work into the national environmental protection and social development strategy. Two very important regulations – which are still pending – are in the pipeline for endorsement: the Healthcare Waste Classification Catalogue, and the Environmental Control Standard for medical waste incinerators. The promotion of safe disposal of medical waste was listed into the 13th Five-Year Ecological Environment Protection Plan of the State Council, People Republic of China, 2016. The experiences got from the project, such as expanding the scope of medical waste centralized treatment facilities, establishing regional medical waste coordination and emergency response mechanism, and promoting the safe disposal of medical waste in rural areas, towns and remote areas, are just integrated into the work with high priorities in the central and local governments.

### **3.6. Sustainability**

The project should be considered highly sustainable for a number of reasons:

- The massive training, resulting in an increased (although not measured) awareness of the issues of medical waste among the operators of the healthcare system;
- The very high ownership of the government of China, resulting in the tight integration between the project and the National Plan for the Construction of Facilities for the Disposal of Hazardous and Medical waste;
- The establishment of a strategic partnership among key governmental agencies (MEP, MOH, NIHA) for the project implementation, resulting in more coordinated regulatory effort;
- The establishment under the project of initiatives and local regulation for the coordinated management of waste beyond the administrative boundaries, resulting in an increased and widespread availability of disposal capacity.

At the same time, there are a couple of key issues which, if not addressed, will constitute a significant risk for the sustainability of some of project outcomes:

- 1) After 9 years of project implementation, the regulation establishing the BAT emission level of 0.1 ngTeq/m<sup>3</sup> for the incinerators of medical waste has not been approved yet. Due to the additional cost related to the fulfilment of stricter environmental limits, there is the concrete risk that even the demonstration facilities which under the project adopted the stricter limit will go back to the emission level established by the current Chinese legislation.

A similar issue affects the new catalogue for medical waste developed, demonstrated and replicated under the project. For the first time in China, medical waste is classified not only on the basis of their hazardous characteristics but also on the basis of their material composition. As the new catalogue is currently in the pipeline for final approval, the risk that the administration of the hospital will decide or will be even forced to revert to the previous Catalogue which is still in force is low.

## IV. CONCLUSIONS, SUCCES STORIES, RECOMMENDATIONS AND LESSONS LEARNT

### 4.1. Evaluation rating table

The evaluating table below (**Table 12**) summarizes the results of the Terminal Evaluation in term of quantitative score assigned. The detailed description of achievements by project outcomes and outputs is reported in Section 3.4.2

**Table 12: Project overall rating**

Evaluation Ratings:			
1. Monitoring and Evaluation	Rating	2. IA& EA Execution	Rating
M&E design at entry	HS	Quality of UNIDO Implementation	S
M&E Plan Implementation	S	Quality of Execution - Executing Agency	S
Overall quality of M&E	S	Overall quality of Implementation / Execution	S
3. Assessment of Outcomes	Rating	4. Sustainability (Risk)	Rating
Relevance	HS	Financial resources:	L
Effectiveness	S	Socio-political:	L
Efficiency	MS	Institutional framework and governance:	L
Overall Project Outcome Rating	S	Environmental:	L
		Overall risk for sustainability:	L

### 4.2. Best practices in addressing issues relating to relevance, performance and success

**BAT/BEP demonstration.** The project was extremely effective (although sometime not highly efficient) in the demonstration of BAT in incineration facilities and BEP in healthcare facilities. Three demonstration incineration facilities and 15 replication incineration facilities took part in the project. The project supported the incremental cost of the demonstration facilities and provided a small incentive for the replication facilities. All the facilities taking part in the demonstration / replication were selected through a competitive process. Assistance was provided to the demonstration facility to identify the key improvement in the equipment and procedures capable to bring down the emission level to the BAT requirement. The effectiveness of the improvement was measured through sampling and analysis at the stack, carried out by Chinese dioxin laboratories. All the facilities fulfilled the BAT level for PCDD/F at the stack, as from the laboratory certificates. The environmental improvement was supplemented by a financial analysis, to further assess the sustainability of the plant operation after BAT/BEP were implemented (Demonstration report of Nanchang medical waste disposal center, Fang Pingping, Nanchang medical waste disposal center, 2017); (BAT/BEP demonstration project of Pingliang medical waste Center (in Chinese), Pingliang medical waste center, 2017); (Summary Report of the Sustainable Environment Management Project on Medical Wastes, Ren Zhiyuan, FECO, 2017); (Final Report of the 5th Tripartite Meeting and the Relevant Reports for 2014, 2015, 2016 and 2017, MEP/FECO, 2017).

In addition to the above, the BEP for the management of waste in the hospital consisted in a massive training (BEP Management Demonstration and Promotion of Medical Waste in Medical Institution, NIHA, 2017) which involved demonstration and replication hospitals, improved segregation, the adoption of the provisional waste catalogue by the participating facilities, the demonstration of plastic reduction and plastic recycling in some of the demonstration hospitals (Department of Environmental Protection of Henan Province, 2017) (Leadership Group of the Jiangxi Province Medical Waste Management Project, 2017), the above supervised through a hierarchically organized plan of inspection which covered all the demonstration (20) and replication (1500) hospitals. The capacity developed through this effort reached the critical mass necessary for the sustainment of an Environmentally Sound Management of healthcare waste in China and should also be considered a potential resource for the training and assistance to similar initiatives in other developing countries.

**Recommendation 1:** UNIDO in cooperation with the Government of China, should consider to use the capacity and infrastructure developed under this project on Environmentally Sound Management of healthcare waste as a demonstration and resource for the training and assistance to similar initiatives in other developing countries

#### **4.3. Corrective actions for the design, implementation, monitoring and evaluation of future projects**

Baseline measurement. Although the project achievement – in term of PCDD/F emission prevented, increased awareness raising, training – were very good, little care was paid at the beginning of the implementation to the measurement of relevant baseline.

The definition of a baseline for PCDD/F emission indeed was problematic for at least 3 reasons:

1. Lacking of a decision concerning the selection of the proper emission factor to be adopted for the calculation of the pre-BAT release of PCDD/F;
2. Lacking of enough monitoring data to confirm such emission factor at the time of project drafting;
3. Confidentiality and legal issues: even if some unofficial data were provided concerning pre-BAT levels of PCDD/F emission exceeding tenths of ngTEQ/m<sup>3</sup>, these data cannot be confirmed due to their legal implication. Therefore, in the calculation of the PCDD/F baseline, a pre-BAT level of 0.5ngTEQ/m<sup>3</sup> was adopted, which obviously resulted in a lower estimation of PCDD/F release reduction achieved.

It is likely that similar issues could be found in other projects, either at PPG or implementation stage. To solve the issue, suggested options could be to 1) dedicate more funds for the measurement of PCDD/F emissions already at PPG stage, and 2) to issue temporary policies aimed at relieving plants managers from penalties when they report measured emission values higher than the Stockholm Convention BAT or the national limit values, provided that they commit to solve the issue and to participate in demonstration activities under the project implementation.

The definition of a baseline for pre-BEP waste generation by the hospital facilities was problematic for the following reason:

1. Lacking of a decision concerning a standard methodology for the assessment of the management of HCW in hospital facilities;
2. The current policy does not envisage the measurement of waste generated by weight or volume, as waste disposal services is charged on the basis of number of beds.

**Recommendation 2:** For future projects, UNIDO should establish the respective baseline, and allocate the necessary resources for it. A solution for the measurement of such baseline could be through the adoption

of standardized WHO / UN method for the measurement of HCW in hospitals already at PPG stage (for instance the Individualized Rapid Assessment Tool developed and adopted by UNDP for the measurement of HCW management in various stage of project implementation.

There were also issues in the measurement of a baseline for training, although all the training held under the project required an admission and a post-training test to measure the training effectiveness. Therefore, on the side of training the issue is more related to the management of the large amount of data generated by the massive number of people trained (more than 50,000 people were trained). In general, given the very high capacity of the country to rely on mobile data management software and devices, it could be suggested, for future projects, to adopt IT technologies and mobile app software for the delivery, storage and analysis of training tests.

#### **4.4. Actions to follow up or reinforce initial benefits from the project**

As pointed out at the midterm evaluation, the adoption of the 0.1 ngTeq/m<sup>3</sup> value as standard BAT value for the emission of PCDD/F from incinerators and other industrial facilities has been not yet endorsed by the China government, although this was one of the important project goal and a draft BAT was prepared. Considering that in China the technologies capable to fulfil and monitor this limit are largely available, it is recommended to complete the adoption of this standard as soon as possible.

An important achievement of the project has been also the development of a Health Care Waste Catalogue. Based on the information provided during meeting and interviews with key NIHA staff, it was reported that the new Health Care Waste Catalogue has been adopted as a standard in all the demonstration HCFs, and piloted in over 1500 replication facilities. Based on the experience gathered during the implementation of the project, and the comments from the National Family Health Committee, the new Health Care Waste Catalogue has been modified for 18 times before the final version was finally developed and is in the pipeline for final approval by the regulatory body. Considering the huge effort already accomplished, and the fact that this catalogue already constitutes the daily practice for the over 1500 replication facilities, there should be no further delay in the approval of such important piece of regulation. Recommendation 3; The government of China should ensure the timely approval by the relevant regulatory body for of the new health care catalogue developed by NIHA and already approved by the National Family Health Committee.

#### **4.5. Proposals for future directions underlining main objectives**

At Mid Term Evaluation, it was proposed to expand the project activities to the remaining Chinese provinces. This is obviously a very good suggestion, although the replication of such project to the remaining part of the Chinese territory should obviously not include the components of national relevance which have been or should have been completed under this project, with specific reference to the development of national regulation, policies and strategies, for the reason that these have been already supported by the GEF.

There are however at least a couple of aspects that the project did not address, because considered only as secondary objectives at the time of project design, and that should be implemented in a more substantial way in future projects. These are:

1. The inventory, management and disposal of mercury devices and waste (addressed only partially under this project in few demonstration facilities). The project was designed before the entering into force of the Minamata Convention of which China is one of the party. UNIDO should include systematic and effective measures to prevent the use of healthcare equipment containing mercury,



in compliance with the Minamata convention, since the design stage of future projects related to healthcare waste management.

2. The implementation of the activity related to the management of waste in remote and rural areas, was a minor project component implemented in the final stage of the project. Some of the provinces which were not touched by the project are among the less populated within the Chinese territory, with a development which is still lagging behind the eastern and central provinces. As the replication of the project activities in the remaining provinces is strategic for the development of the country and the achievement of environmental objectives, MEP / FECO and UNIDO should ensure that in future projects related to POPs practical actions are identified and implemented to assist the least developed province in implementing environmentally sound management of waste since the early stage of project implementation.

## **ANNEXES**

### **Annex I: Terms of Reference**



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

#### **TERMS OF REFERENCE**

**Independent terminal evaluation of the UNIDO project:  
Environmentally Sustainable Management of Medical Waste in China**

UNIDO Project Number GF/CPR/07/008 - 104036

GEF ID: 2927

**JANUARY 2017**

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## I. Project background and overview

### 1. Project factsheet

<b>Project Title</b>	<b>Environmentally Sustainable Management of Medical Waste in China</b>
<b>UNIDO project No. and/or ID</b>	<b>GFCPR07008 / ID: 104036</b>
<b>GEF project ID</b>	<b>2927</b>
<b>Region</b>	<b>Asia and the Pacific</b>
<b>Country(ies)</b>	<b>The People's Republic of China</b>
<b>GEF focal area(s) and operational programme</b>	<b>GEF-4: POPs SP-2; SP-3; OP-14; OP-10</b>
<b>GEF implementing agency(ies)</b>	<b>UNIDO</b>
<b>GEF executing partner(s)</b>	<b>FECO/SEPA</b>
<b>Project size (FSP, MSP, EA)</b>	<b>FSP</b>
<b>Project CEO endorsement / Approval date</b>	<b>31 October 2007</b>
<b>Project implementation start date (First PAD issuance date)</b>	<b>20 November 2007</b>
<b>Original expected implementation end date (indicated in CEO endorsement/Approval document)</b>	<b>30 November 2012</b>
<b>Revised expected implementation end date (if applicable)</b>	<b>30 June 2017</b>
<b>Actual implementation end date</b>	<b>30 June 2017</b>
<b>GEF project grant (excluding PPG, in USD)</b>	<b>11,650,000</b>
<b>GEF PPG (if applicable, in USD)</b>	<b>350,000</b>
<b>UNIDO co-financing (in USD)</b>	<b>100,000 (In-kind)</b>
<b>Total co-financing at CEO endorsement (in USD)</b>	<b>33,157,140 (cash+in-kind)</b>
<b>Materialized co-financing at project completion (in USD)</b>	
<b>Total project cost (excluding PPG and agency support cost, in USD; i.e., GEF project grant + total co-financing at CEO endorsement)</b>	<b>45,157,140</b>
<b>Mid-term review date</b>	<b>January-March 2011</b>
<b>Planned terminal evaluation date</b>	<b>March-May 2017</b>

(Source: Project document)<sup>1</sup>

### 2. Project background and context

<sup>1</sup> Project information data throughout these TOR are to be verified during the inception phase.

China, one of the largest countries in the world, is located in Eastern Asia, between North Korea and Vietnam and shares a border with 14 countries. It has a population of over 1.3 billion, with almost 79% of the population being below the age of 55. Population growth rate is around 0.5%. Literacy rate of population is over 96%. Around 6% of the population lives below the poverty line. Total unemployment is a little over 4.1%;

China has a GDP of USD 10.36 trillion (official exchange rate, 2014 estimate) and a GDP real growth of 7.3% (2014), which has been over 7% since 2012. Services constitute the highest contribution to GDP with over 48%, followed by industry with almost 43% and the smallest contribution by agriculture with a little less than 10%. The same is however not reflected in the distribution of the labour force engaged in these sectors – more or less around one-third of the population is engaged in the 3 sectors respectively.

China is world leader in gross value of agricultural output; agricultural products are rice, wheat, potatoes, corn, peanuts, tea, millet, barley, apples, cotton, oilseed, pork, and fish. Industries are in the following sectors: mining and ore processing, iron, steel, aluminium, and other metals, coal, machine building, armaments, textiles and apparel, petroleum, cement, chemicals, fertilizers, consumer products (including footwear, toys, and electronics), food processing, transportation equipment, including automobiles, rail cars and locomotives, ships, aircraft, telecommunications equipment, commercial space launch vehicles, and satellites. Growth rate of industrial production is estimated to be at 7.3% (2014).

Export commodities are electrical and other machinery, including data processing equipment, apparel, furniture, textiles, and integrated circuits. Main export partners are US (16.9%), Hong Kong (15.5%), Japan (6.4%), South Korea (4.3%) (2014 est.). It imports electrical and other machinery, oil and mineral fuels, nuclear reactor, boiler, and machinery components, optical and medical equipment, metal ores, motor vehicles, and soybeans. Main countries for imports are South Korea, Japan, US, Taiwan, Germany, and Australia.

China is party to various international environmental agreements, such as Antarctic-Environmental Protocol, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling. Current environmental issues in China are air pollution (greenhouse gases, sulphur dioxide particulates) from reliance on coal produces acid rain; China is the world's largest single emitter of carbon dioxide from the burning of fossil fuels; water shortages, particularly in the north; water pollution from untreated wastes; deforestation; estimated loss of one-fifth of agricultural land, desertification; and trade in endangered species.

The People's Republic of China ratified the Stockholm Convention on POPs on 13th August 2004. Article 5 of the SC requires the Parties to take measures to reduce or, where feasible, eliminate releases of PCDD/PCDF and other unintentionally produced POPs (UPOPs) in Part I from sources listed in Parts II and III of Annex C of the Convention. Waste incinerators, including coincinerators of municipal, hazardous or MW or of sewage sludge are on the foremost top of the list. In the National Implementation Plan (NIP) of China for the implementation of the SC on POPs, MW incineration is listed as a key PCDD/PCDF release source and, pursuant to the "Action Plan for Reduction and Elimination of PCDD/PCDF Releases"; priority should be given to the application of best available techniques and best environmental practices (BAT/BEP).

Medical waste (MW) is generated by medical institutions and research facilities in the delivery of healthcare that includes diagnosis, treatment and research. Medical waste is bio-hazardous with a potential to spread infection and has much higher potential than common municipal wastes to cause pollution during disposal because of its characterization. Medical waste therefore requires safe management throughout the complete life cycle in order to safeguard public health and protect the environment.

The overall objective of the project is to reduce and ultimately eliminate the releases of unintentionally produced POPs and other globally harmful pollutants into the environment, and assist China in implementing its relevant obligations under the Stockholm Convention.

The project is funded through a GEF grant, amounting to USD 11,650,000 (and PPG Grant of USD 350,000), a UNIDO contribution of USD 100,000 (In-kind); and the counterparts' co-financing of USD 32,977,000 (cash and in kind), which amount to total project budget of USD 44,727,140.

Project implementation started in November 2007 and the initial project end date was in November 2012. The same was revised to December 2016. Actual implementation end date is 30 June 2017.

The project will be subject to GEF Monitoring and Evaluation rules and practices of the GEF and UNIDO. A mid-term review (MTR), as well as a terminal evaluation (TE), is foreseen in the project document. Within the frame of the project monitoring and evaluation plan, an external MTR was carried out in January 2011 (MTR report, July 2011). The terminal evaluation is scheduled to take place from March-May 2017.

### **3. Project objective and structure**

The overall objective of the project is to reduce and ultimately eliminate the releases of unintentionally produced POPs (UP-POPs) and other globally harmful pollutants into the environment and assist China in implementing its relevant obligations under the Stockholm Convention.

**Seven substantive components** have been developed, in addition to project management and M&E, to achieve the project objectives:

**Component 1:** Regulatory framework for medical waste (MW) management and performance levels for MW disposal facilities in place

**Component 2:** Institutional capacity for integrated MW management

**Component 3:** Systems management and application of BEP

**Component 4:** Demonstration of BAT using thermal combustion

**Component 5:** Demonstration of BAT/BEP for MW thermal non-combustion, chemical treatment or other appropriate non-combustion treatments

**Component 6:** Integrated and coordinated medical waste management and disposal system

**Component 7:** Strategy and action plan for the adoption of BAT/BEP for medical waste management and disposal

### **4. Mid-term review**

The **MTR** was carried out by an independent evaluation consultant and a national consultant in January 2011.

Main findings of the MTR are as follows (see MTR report, July 2011):

Through the development of this project, awareness at central governmental level has been further raised for the need to properly manage MW in order to minimize the formation and release of dioxins and thus

meeting its obligation towards the SC for the management of medical wastes in China. As a result of the project, China has included the BAT/BEP guidelines for the management of medical wastes in its 12th Five Year program. High levels of funding are available for implementation not only for the project activities but also for other POPs related projects.

The effectiveness of the project was considered to be satisfactory. Some of the objectives stated in the project document had not been achieved at the time of the MTR. However, activities to meet those objectives were near completion. The project also suffered some delays due to different reasons. Chances for sustainability and sustained impact were considered to be very high, owing to, inter alia, the high national commitment.

Further details can be obtained from the MTR report (July 2011), which will also provide inputs to the terminal evaluation.

## **5. Project implementation and execution arrangements**

**UNIDO:** is the implementing agency for the project. A project focal point was to be established within UNIDO to assist with project execution

**Convention Implementation Coordination Group (CICG):** China established the NIP development leading group in 2003 and it became the National Leading Group for implementation of POPs

**Convention Implementation Office (CIO):** The CIO is part of SEPA and is responsible for coordinating the day-to-day management of the SC implementation in China

**National, Provincial and Municipal Steering Groups:** The project will establish a national steering group by drawing upon resources from related ministries or commissions in charge of inter alia development and reform and environment, to provide the project team with political guidance and inter-ministerial coordination support

**National Project Management Team (NPMT):** will be composed of staff from SEPA, relevant ministries and other relevant agencies. SEPA will designate a coordinator/team leader. The NPMT will be responsible for the day-to-day management and execution of the project

**Project Expert Team (PET):** The project would recruit a **Chief Technical Advisor (CTA)**, a **National Technical Advisor (NTA)**, and other relevant technical experts

**Local Project Management Offices (LPMOs):** Since the project would involve a large number of medical institutions, and medical waste treatment facilities nationwide, the PMOs would support the NPMT in management and coordination

**Provincial PMOs:** would be established in the 6 provinces with staff from relevant provincial governmental agencies

**Municipal PMOs:** would be established in the 6 municipalities, with staff from relevant municipal governmental agencies

## **6. Budget information**

The project is funded through a GEF grant, amounting to USD 11,650,000 (and PPG Grant of USD 350,000), a UNIDO co-financing of USD 100,000 (in-kind); and the counterparts' total co-financing of USD 32,977,000 (cash and in-kind) which amount to total project budget of USD 44,727,140.

Some financial details are shown below:

**Financing plan summary for the project (USD)**

	<i>Project Preparation</i>	<i>Project</i>	<i>Total</i>
GEF financing	350,000	11,650,000	12,000,000
Co-financing (Cash and In-kind)	313,400	33,077,140	33,390,540
<b>Total</b>	<b>663,400</b>	<b>44,727,140</b>	<b>45,390,540</b>

(Source: CEO endorsement document)

Project budget:

<b>Project outcomes</b>	<b>GEF (USD)</b>	<b>Co-Financing (USD)</b>	<b>Total (USD)</b>
1. Regulatory framework for medical waste (MW) management and performance levels for MW disposal facilities in place	373,785	514,295	<b>888,080</b>
2. Institutional capacity for integrated MW management	1,409,485	3,490,185	<b>4,899,670</b>
3. Systems management and application of BEP	628,125	1,696,375	<b>2,324,500</b>
4. Demonstration of BAT using thermal combustion	2,432,600	10,799,600	<b>13,232,200</b>
5. Demonstration of BAT/BEP for MW thermal non-combustion, chemical treatment or other appropriate non-combustion treatments	1,984,450	7,600,450	<b>9,584,900</b>
6. Integrated and coordinated medical waste management and disposal system	1,137,200	1,287,200	<b>2,424,400</b>
7. Strategy and action plan for the adoption of BAT/BEP for medical waste management and disposal	2,565,085	5,830,755	<b>8,395,840</b>
8. Project Management budget/cost and M&E	1,119,270	1,858,280	<b>2,977,550</b>
<b>Total</b>	<b>11,650,000</b>	<b>33,077,140</b>	<b>44,727,140</b>

(Source: CEO endorsement document)



Expected co-financing source breakdown is as follows:

<b>Name of Co-financier (source)</b>	<b>Classification</b>	<b>Type</b>	<b>Project</b>
<b>UNIDO</b>	IA	In-kind	100,000
<b>US Government</b>	Bilateral Agency	Grant	200,000
<b>Ministry of Finance</b>	National Government	Grant	3,800,000
<b>Ministry of Health</b>	National Government	In-kind	4,500,000
<b>SEPA/Nationwide Investment Plan</b>	National Government	Grant	15,000,000
<b>Private Enterprises</b>	Private Sector	Grant	9,557,140
<b>Total Co-Financing</b>			<b>33,157,140</b>

(Source: CEO endorsement document)

**UNIDO GEF-grant disbursement breakdown:**

<b>Item</b>	<b>Disbursement (expenditure, incl. commitment) up to 2012</b>	<b>Disbursement in 2013</b>	<b>Disbursement in 2014</b>	<b>Disbursement in 2015</b>	<b>Disbursements in 2016</b>	<b>Total disbursement (in USD) (2007-06 May 2016)</b>
Contractual Services	6,861,030.00		13,755.16	410,001.00		<b>7,284,786.16</b>
Equipment	3,229,569.54			-0.01		<b>3,229,569.53</b>
Internat. Cons/Staff	324,014.62	74,800.81	31,449.64	88,955.66	122,284.21	<b>641,504.94</b>
Local Travel	97,964.06	83,433.84	20,064.13	12,110.35	10,412.28	<b>223,984.66</b>
Nat. Consult./Staff	19,314.72	16,806.28	1,563.93	15,404.17	38,232.20	<b>91,321.30</b>
Other Direct Costs		37.84	551.74	-82.44		<b>507.14</b>
Staff Travel						<b>0.00</b>
Train/Fellowsh/Study	28,279.53	563.93				<b>28,843.46</b>
<b>Total (in USD)</b>	<b>10,560,172.47</b>	<b>175,642.70</b>	<b>67,384.60</b>	<b>526,388.73</b>	<b>170,928.69</b>	<b>11,500,517.19</b>

Source: Project database, 06 May 2016 ( to be updated during the evaluation inception phase)

## **II. Scope and purpose of the evaluation**

The terminal evaluation (TE) will cover the whole duration of the project from its starting date in November 2007 to the estimated completion date in June 2017. It will assess project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the GEF that may help improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion. The terminal evaluation report should include examples of good practices for other projects in the focal area, country, or region.

The terminal evaluation should provide an analysis of the attainment of the project objective(s) and the corresponding technical components or outputs. Through its assessments, the terminal evaluation should enable the Government, the national GEF Operational Focal Point (OFP), counterparts, the GEF, UNIDO and other stakeholders and donors to verify prospects for development impact and promoting sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators, and management of risks. The assessment includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.

The key question of the terminal evaluation is whether the project has achieved or is likely to achieve its main objective of reducing and ultimately eliminating the releases of UP-POPs and other globally harmful pollutants into the environment, and assist China in implementing its relevant obligations under the Stockholm Convention; further whether the project interacted with the Nationwide Investment Plan and promoted the widespread adoption of BAT/BEP in the evolving medical waste management infrastructure and industry in a manner that reduces adverse environmental impacts and protects human health.

## **III. Evaluation approach and methodology**

The terminal evaluation will be conducted in accordance with the UNIDO Evaluation Policy<sup>2</sup>, the UNIDO Guidelines for the Technical Cooperation Programme and Project Cycle<sup>3</sup>, the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations<sup>4</sup>, the GEF Monitoring and Evaluation Policy<sup>5</sup> and the GEF Minimum Fiduciary Standards for GEF Implementing and Executing Agencies<sup>6</sup>.

It will be carried out by an independent evaluation team, as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project are kept informed and regularly consulted throughout the evaluation. The evaluation team will liaise with

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<sup>2</sup> UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1)

<sup>3</sup> UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

<sup>4</sup> GEF. (2008). Guidelines for GEF Agencies in Conducting Terminal Evaluations (Evaluation Office, Evaluation Document No. 3, 2008)

<sup>5</sup> GEF. (2010) The GEF Monitoring and Evaluation Policy (Evaluation Office, November 2010)

<sup>6</sup> GEF. (2011). GEF Minimum Fiduciary Standards: Separation of Implementation and Execution Functions in GEF Partner Agencies (GEF/C.41/06/Rev.01, 3 November 2011, prepared by the Trustee)

the UNIDO Independent Evaluation Division (ODG/EVQ/IEV) on the conduct of the evaluation and methodological issues.

The evaluation team will be required to use different methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources, as necessary: desk studies and literature review, statistical analysis, individual interviews, focus group meetings, surveys and direct observation. This approach will not only enable the evaluation to assess causality through quantitative means but also to provide reasons for why certain results were achieved or not and to triangulate information for higher reliability of findings. The specific mixed methodological approach will be described in the inception report.

The evaluation team will develop interview guidelines. Field interviews can take place either in the form of focus-group discussions or one-to-one consultations.

The methodology will be based on the following:

1. A desk review of project documents, including, but not limited to:
  - (a) The original project document, monitoring reports (such as progress and financial reports to UNIDO and UNIDO-GEF annual Project Implementation Reports (PIRs)), mid-term review (MTR) report, output reports (case studies, action plans, sub-regional strategies, etc.), back-to-office mission report(s), end-of-contract report(s) and relevant correspondence.
  - (b) If applicable, notes from the meetings of committees involved in the project (e.g. approval and steering committees).
  - (c) Other project-related material produced by the project.
2. The evaluation team will use available models of (or reconstruct if necessary) theory of change for the different types of intervention (enabling, capacity, investment, demonstration). The validity of the theory of change will be examined through specific questions in interviews and possibly through a survey of stakeholders.
3. Counterfactual information: In those cases where baseline information for relevant indicators is not available, the evaluation team will aim at establishing a proxy-baseline through recall and secondary information.
4. Interviews with project management and technical support including staff and management at UNIDO HQ and in the field and – if necessary - staff associated with the project’s financial administration and procurement.
5. Interviews with project partners and stakeholders, including, among others, government counterparts, GEF OFP, project stakeholders, and co-financing partners as shown in the corresponding sections of the project documents.
6. On-site observation of results achieved by demonstration projects, including interviews of actual and potential beneficiaries of improved technologies.
7. Interviews and telephone interviews with intended users for the project outputs and other stakeholders involved in the project. The evaluation team shall determine whether to seek additional information and opinions from representatives of any donor agency(ies) or other organizations.
8. Interviews with the relevant UNIDO Regional Office in China, to the extent that it was involved in the project, and members of the project management team and the various national and sub-regional authorities dealing with project activities as necessary. If deemed necessary, the evaluation team shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.

9. Other interviews, surveys or document reviews as deemed necessary by the evaluation team and/or UNIDO, ODG/EVQ/IEV for triangulation purposes.
10. The inception report will provide details on the methodology used by the evaluation team and include an evaluation matrix.

#### **IV. Evaluation team composition**

The evaluation team will be composed of one international evaluation consultant acting as the team leader and one national consultant(s). The consultants will be contracted by UNIDO. The tasks of each team member are specified in the job descriptions annexed to these terms of reference.

The evaluation team might be required to provide information relevant for follow-up studies, including terminal evaluation verification on request to the GEF partnership up to three years after completion of the terminal evaluation.

Members of the evaluation team must not have been directly involved in the design and/or implementation of the projects/programme under evaluation.

The UNIDO project manager and the project teams in the participating countries will support the evaluation team. The UNIDO GEF Coordinator and the GEF OFP will be briefed on the evaluation and provide support to its conduct. GEF OFP will, where applicable and feasible, also be briefed and debriefed at the start and end of the evaluation mission.

#### **V. Time schedule and deliverables**

The evaluation is scheduled to take place from 15 March 2017 to 14 June 2017. The evaluation mission is planned for 15 to 23 March 2017. At the end of the field mission, there will be a presentation of the preliminary findings for all stakeholders involved in this project/programme in the participating country.

At the end of the evaluation field mission, a debriefing should also be conducted inviting local stakeholders (incl. government and parties involved in the evaluation). After the evaluation mission, the international evaluation consultant will come to UNIDO HQ for debriefing and presentation of the preliminary findings of the terminal evaluation.

The draft TE report will be submitted 4 to 6 weeks after the end of the mission. The draft TE report is to be shared with the UNIDO PM, ODG/EVQ/IEV, the UNIDO GEF Coordinator and the GEF OFP and other relevant stakeholders for receipt of comments. The ET is expected to revise the draft TE report based on the comments received, edit the language and form and submit the final version of the TE report in accordance with UNIDO ODG/EVQ/IEV standards.

#### **VI. Project evaluation parameters**

The evaluation team will assess the project performance guided by the parameters and evaluations questions provided in this section. In addition to the qualitative assessment based on the evidence gathered in the evaluation, the evaluation team will rate the project on the basis of the **rating criteria for the parameters described in the following sub-chapters, A to I.**

**Ratings will be presented in the form of tables** with each of the criteria / aspects rated separately and with **brief justifications for the rating** based on the findings and the main analyses (see Table 1 to Table 3 in Annex 2. Table 4 in Annex 2 presents the template for summarizing the overall ratings.

For GEF projects: As per the GEF's requirements, the evaluation report should also provide information on project identification, time frame, actual expenditures, and co-financing in the format in Annex 6, which is modelled after the GEF's project identification form (PIF).

## **A. Project identification and design**

Project identification assessment criteria derived from the logical framework approach (LFA) methodology, establishing the process and set up of steps and analyses required to design a project in a systematic and structured way, e.g. situation, stakeholder, problem and objective analyses.

The aspects to be addressed by the evaluation include inter alia the extent to which:

- a) The situation, problem, need / gap was clearly identified, analysed and documented (evidence, references). The project design was based on a needs assessment
- b) Stakeholder analysis was adequate (e.g. clear identification of end-users, beneficiaries, sponsors, partners, and clearly defined roles and responsibilities in the project(s)).
- c) The project took into account and reflects national and local priorities and strategies
- d) ISID-related issues and priorities were considered when designing the project
- e) Relevant country representatives (from government, industries, gender groups, custom officers and civil society - including the GEF OFP for GEF projects), were appropriately involved and participated in the identification of critical problem areas and the development of technical cooperation strategies.

Project design quality assessment criteria derive from the logical framework approach (LFA) methodology, leading to the establishment of LogFrame Matrix (LFM) and the main elements of the project, i.e. overall objective, outcomes, outputs, to defining their causal relationship, as well as indicators, their means of verification and the assumptions. The evaluation will examine the extent to which:

- f) The project's design were adequate to address the problems at hand;
- g) The project had a clear thematically focused development objective;
- h) The project outcome was clear, realistic, relevant, addressed the problem identified and provided a clear description of the benefit or improvement that will be achieved after project completion;
- i) Outputs were clear, realistic, adequately leading to the achievement of the outcome;
- j) The attainment of overall development objective, outcome and outputs can be determined by a set of SMART verifiable indicators;
- k) The results hierarchy in the LFM, from activities to outputs, outcome and overall objective, is logical and consistent.
- l) Verification and Assumptions were adequate, identifying important external factors and risks;
- m) All GEF-4 and GEF-5 projects have incorporated relevant environmental and social considerations into the project design / GEF-6 projects have followed the provisions specified in UNIDO/DGAI.23: UNIDO Environmental and Social Safeguards Policies and Procedures (ESSPP).

## **B. Implementation Performance**

Implementation assessment criteria to be applied are shown below and correspond to DAC criteria, as well as to good programme/project management practices.

### **a) Relevance and ownership**

The evaluation will examine the extent to which the project is relevant to the:

- i. National development and environmental priorities and strategies of the Government and the population, and regional and international agreements. See possible evaluation questions under “Country ownership/drivenness” below.
- ii. Target groups: relevance of the project’s objectives, outcomes and outputs to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.).
- iii. GEF’s focal areas/operational programme strategies: In retrospect, were the project’s outcomes consistent with the GEF focal area(s)/operational program strategies? Ascertain the likely nature and significance of the contribution of the project outcomes to the wider portfolio of POPs.
- iv. Does the project remain relevant taking into account the changing environment?

### **b) Effectiveness**

- i. Achievement of expected outcomes:
  - What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)?
  - To what extent have the expected outcomes, outputs and long-term objectives been achieved or are likely to be achieved?
  - Has the project generated any results that could lead to changes of the assisted institutions?
  - Have there been any unplanned effects?
  - Are the project outcomes commensurate with the original or modified project objectives?
  - If the original or modified expected results were described as merely outputs/inputs, were there any real outcomes of the project and, if so, were these commensurate with realistic expectations from the project?
  - If there was a need to reformulate the project design and the project results framework given changes in the country and operational context, were such modifications properly documented?
- ii. How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?
- iii. Longer-term impact: Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these (see also below “monitoring of long term changes”). Wherever possible, evaluators should indicate how findings on impacts will be reported in future.
- iv. Catalytic or replication effects: Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the project’s catalytic role.

### **c) Efficiency**

The extent to which:

- i. The project cost was effective? Was the project using the most cost-efficient options?

- ii. Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project's activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?
- iii. Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet the requirements? Was the quality of UNIDO inputs and services as planned and timely?
- iv. Was there coordination with other UNIDO and other donors' projects, and did possible synergy effects happen?
- v. Were there delays in project implementation and if so, what were their causes?

#### **d) Assessment of risks to sustainability of project outcomes**

Sustainability is understood as the likelihood of continued benefits after the GEF project ends. Assessment of sustainability of outcomes will be given special attention but also technical, financial and organization sustainability will be reviewed. This assessment should explain how the risks to project outcomes will affect continuation of benefits after the GEF project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

- i. **Financial risks.** Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once GEF assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.) Was the project successful in identifying and leveraging co-financing?
- ii. **Sociopolitical risks.** Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?
- iii. **Institutional framework and governance risks.** Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency and required technical know-how in place?
- iv. **Environmental risks.** Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to have adverse environmental impacts, which, in turn, might affect sustainability of project benefits? The evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

#### **e) Assessment of monitoring and evaluation (M&E) systems**



- i. **M&E design.** Did the project have an M&E plan to monitor results and track progress towards achieving project objectives? The evaluation will assess whether the project met the minimum requirements for the application of the Project M&E plan (see annex 3).
- ii. **M&E plan implementation.** The evaluation should verify that an M&E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings; the information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure that data will continue to be collected and used after project closure. Was monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts? Are there any annual work plans? Was any steering or advisory mechanism put in place? Did reporting and performance reviews take place regularly?
- iii. **Budgeting and Funding for M&E activities.** In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for at the project planning stage and whether M&E was adequately funded and in a timely manner during implementation.

#### **f) Monitoring of long-term changes**

The M&E of long-term changes is often incorporated in GEF-supported projects as a separate component and may include determination of environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use. This section of the evaluation report will describe project actions and accomplishments towards establishing a long-term monitoring system. The evaluation will address the following questions:

- i. Did the project contribute to the establishment of a long-term monitoring system? If it did not, should the project have included such a component?
- ii. What were the accomplishments and shortcomings in establishment of this system?
- iii. Is the system sustainable — that is, is it embedded in a proper institutional structure and does it have financing? How likely is it that this system continues operating upon project completion?
- iv. Is the information generated by this system being used as originally intended?

#### **g) Assessment of processes affecting achievement of project results**

Among other factors, when relevant, the evaluation will consider a number of issues affecting project implementation and attainment of project results. The assessment of these issues can be integrated into the analyses of project design, relevance, effectiveness, efficiency, sustainability and management as the evaluators deem them appropriate (it is not necessary, however it is possible to have a separate chapter on these aspects in the evaluation report). The evaluation will consider, but need not be limited to, the following issues that may have affected project implementation and achievement of project results:

- i. **Preparation and readiness / Quality at entry.** Were the project's objectives and components clear, practicable, and feasible within its time frame? Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements

- in place at project entry? Were the capacities of executing institution and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?
- ii. **Country ownership/drivenness.** Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects? Are project outcomes contributing to national development priorities and plans? Were relevant country representatives from government and civil society involved in the project? Was the GEF OFP involved in the project design and implementation? Did the recipient government maintain its financial commitment to the project? Has the government—or governments in the case of multi-country projects—approved policies or regulatory frameworks in line with the project’s objectives?
  - iii. **Stakeholder involvement and consultation.** Did the project involve the relevant stakeholders through continuous information sharing and consultation? Did the project implement appropriate outreach and public awareness campaigns? Were the relevant vulnerable groups and powerful supporters and opponents of the processes involved in a participatory and consultative manner? Which stakeholders were involved in the project (e.g., NGOs, private sector, other UN Agencies) and what were their immediate tasks? Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, nongovernmental organizations, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions?
  - iv. **Financial planning.** Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize? Specifically, the evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing.
  - v. **UNIDO’s supervision and backstopping.** Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed? Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?
  - vi. **Co-financing and project outcomes and sustainability.** Did the project manage to mobilize the co-financing amount expected at the time of CEO Endorsement? If there was a difference in the level of expected co-financing and the co-financing actually mobilized, what were the reasons for the variance? Did the extent of materialization of co-financing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
  - vii. **Delays and project outcomes and sustainability.** If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
  - viii. **Implementation and execution approach.** Is the implementation and execution approach chosen different from other implementation approaches applied by UNIDO and other

agencies? Does the approach comply with the principles of the Paris Declaration? Is the implementation and execution approach in line with the GEF Minimum Fiduciary Standards: Separation of Implementation and Execution Functions in GEF Partner Agencies (GEF/C.41/06/Rev.01) and the relevant UNIDO regulations (DGAI.20 and Procurement Manual)? Does the approach promote local ownership and capacity building? Does the approach involve significant risks? In cases where Execution was done by third parties, i.e. Executing Partners, based on a contractual arrangement with UNIDO was this done in accordance with the contractual arrangement concluded with UNIDO in an effective and efficient manner?

- ix. **Environmental and Social Safeguards.** If a GEF-5 project, has the project incorporated relevant environmental and social risk considerations into the project design? What impact did these risks have on the achievement of project results?

#### **h) Project coordination and management**

The extent to which:

- i. The national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up agreed/corrective actions)?
- ii. The UNIDO HQ-based management, coordination, monitoring, quality control and technical inputs have been efficient, timely and effective (e.g. problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?

#### **i) Assessment of gender mainstreaming**

Gender mainstreaming assessment criteria are provided in the table below. Guidance on integrating gender is included in Annex 4.

The evaluation will consider, but need not be limited to, the following issues that may have affected gender mainstreaming in the project:

• Did the project/programme design adequately consider the gender dimensions in its interventions? If so, how (at the level of project outcome, output or activity)?
• Was a gender analysis included in a baseline study or needs assessment (if any)?
• How gender-balanced was the composition of the project management team, the Steering Committee, experts and consultants and the beneficiaries?
• Have women and men benefited equally from the project's interventions? Do the results affect women and men differently? If so, why and how? How are the results likely to affect gender relations (e.g., division of labour, decision-making authority)?
• Are women/gender-focused groups, associations or gender units in partner organizations consulted/included in the project?
• To what extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?

## **VII. Deliverables and reporting**

### **Inception report**

These terms of reference (TOR) provide some information on the evaluation methodology, but this should not be regarded as exhaustive. After reviewing the project documentation and initial interviews with the project manager, the evaluation team will prepare a short inception report that will operationalize the TOR relating to the evaluation questions and provide information on what type of and how the evidence will be collected (methodology). It will be discussed with and approved by the responsible in the UNIDO Independent Evaluation Division.

The inception report will focus on the following elements: preliminary project theory model(s); elaboration of evaluation methodology including quantitative and qualitative approaches through an evaluation framework (“evaluation matrix”); division of work between the international evaluation consultants; mission plan, including places to be visited, people to be interviewed and possible surveys to be conducted and a debriefing and reporting timetable<sup>7</sup>.

### **Evaluation report format and review procedures**

The draft report will be delivered to UNIDO Independent Evaluation Division (the suggested report outline is in annex 1) and circulated to UNIDO staff, the GEF OFP, and national stakeholders associated with the project for factual validation and comments. Any comments or responses, or feedback on any errors of fact to the draft report provided by the stakeholders will be sent to UNIDO ODG/EVQ/IEV for collation and onward transmission to the project evaluation team who will be advised of any necessary revisions. On the basis of this feedback, and taking into consideration the comments received, the evaluation team will prepare the final version of the terminal evaluation report.

The evaluation team will present its preliminary findings to the national stakeholders at the end of the field visit and take into account their feed-back in preparing the evaluation report. A presentation of preliminary findings will take place at UNIDO HQ after the field mission.

The terminal evaluation report should be brief, to the point and easy to understand. It must explain the purpose of the evaluation, exactly what was evaluated, and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

Findings, conclusions and recommendations should be presented in a complete, logical and balanced manner. The evaluation report shall be written in English and follow the outline given in annex 1.

### **Evaluation work plan and deliverables**

The “Evaluation Work Plan” includes the following main products/deliverables:

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<sup>7</sup> The evaluator will be provided with a Guide on how to prepare an evaluation inception report prepared by the UNIDO Independent Evaluation Division.

#### **INCEPTION PHASE:**

1. Desk review, briefing by project manager and development of methodology: Following the receipt of all relevant documents, and consultation with the Project Manager about the documentation, including reaching an agreement on the methodology, the desk review could be completed.
2. Inception report: At the time of departure to the field mission, all the received material has been reviewed and consolidated into the Inception report.

#### **FIELD MISSION:**

3. Field mission: The principal responsibility for managing this evaluation lies with UNIDO. It will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field missions, coordinate with the Government. At the end of the field mission, there will be a presentation of preliminary findings to the key stakeholders in the country where the project was implemented.
4. Preliminary findings from the field mission: Following the field mission, the main findings, conclusions and recommendations would be prepared and presented in the field and at UNIDO Headquarters.

#### **REPORTING:**

5. Data analysis/collation of the data/information collected
6. A draft terminal evaluation report will be forwarded electronically to the UNIDO Independent Evaluation Division and circulated to main stakeholders.
7. Final terminal evaluation report will incorporate comments received.

#### **VIII. Quality assurance**

All UNIDO terminal evaluations are subject to quality assessments by the UNIDO Independent Evaluation Division. Quality assurance and control is exercised in different ways throughout the evaluation process (briefing of consultants on methodology and process by the UNIDO, ODG/EVQ/IEV, providing inputs regarding findings, lessons learned and recommendations from other UNIDO evaluations, review of inception report and evaluation report by UNIDO, ODG/EVQ/IEV). The quality of the evaluation report will be assessed and rated against the criteria set forth in the Checklist on evaluation report quality, attached as Annex 4. The applied evaluation quality assessment criteria are used as a tool to provide structured feedback. UNIDO, ODG/EVQ/IEV should ensure that the evaluation report is useful for UNIDO in terms of organizational learning (recommendations and lessons learned) and is compliant with UNIDO's evaluation policy and these terms of reference. The draft and final terminal evaluation report are reviewed by the UNIDO Independent Evaluation Division, which will submit the final report to the GEF Evaluation Office and circulate it within UNIDO together with a management response sheet.

## **Annex 1 - Outline of an in-depth project evaluation report**

### **Executive summary**

- Must provide a synopsis of the storyline which includes the main evaluation findings and recommendations
- Must present strengths and weaknesses of the project
- Must be self-explanatory and should be maximum 3-4 pages in length

### **I. Evaluation objectives, methodology and process**

- Information on the evaluation: why, when, by whom, etc.
- Scope and objectives of the evaluation, main questions to be addressed
- Information sources and availability of information
- Methodological remarks, limitations encountered and validity of the findings

### **II. Country and project background**

- Brief country context: an overview of the economy, the environment, institutional development, demographic and other data of relevance to the project
- Sector-specific issues of concern to the project<sup>8</sup> and important developments during the project implementation period
- Project summary:
  - Fact sheet of the project: including project objectives and structure, donors and counterparts, project timing and duration, project costs and co-financing
  - Brief description including history and previous cooperation
  - Project implementation arrangements and implementation modalities, institutions involved, major changes to project implementation
  - Positioning of the UNIDO project (other initiatives of Government, other donors, private sector, etc.)
  - Counterpart organization(s)

### **III. Project assessment**

This is the key chapter of the report and should address all evaluation criteria and questions outlined in the TOR (see section VI - Project evaluation parameters). Assessment must be based on factual evidence collected and analyzed from different sources. The evaluators' assessment can be broken into the following sections:

- A. Project identification and formulation
- B. Project design
- C. Implementation performance
  - a) Relevance and ownership (report on the relevance of project towards countries and beneficiaries, country ownership, stakeholder involvement)
  - b) Effectiveness (the extent to which the development intervention's objectives and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)
  - c) Efficiency (report on the overall cost-benefit of the project and partner countries' contribution to the achievement of project objectives)

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<sup>8</sup> Explicit and implicit assumptions in the logical framework of the project can provide insights into key-issues of concern (e.g., relevant legislation, enforcement capacities, government initiatives)

- d) Likelihood of sustainability of project outcomes (report on the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in partner countries, and its impact on continuation of benefits after the GEF project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks)
- e) Project coordination and management (Report on the project management conditions and achievements, and partner countries' commitment)
- f) Assessment of monitoring and evaluation systems (report on M&E design, M&E plan implementation, and budgeting and funding for M&E activities)
- g) Monitoring of long-term changes
- h) Assessment of processes affecting achievement of project results (report on preparation and readiness / quality at entry, country ownership, stakeholder involvement, financial planning, UNIDO support, co-financing and project outcomes and sustainability, delays of project outcomes and sustainability, and implementation approach)

#### D. Gender mainstreaming

At the end of this chapter, an overall project achievement rating should be developed as required in annex 2. The overall rating table required by the GEF should be presented here.

### IV. Conclusions, recommendations and lessons learned

This chapter can be divided into three sections:

#### A. Conclusions

This section should include a storyline of the main evaluation conclusions related to the project's achievements and shortfalls. It is important to avoid providing a summary based on each and every evaluation criterion. The main conclusions should be cross-referenced to relevant sections of the evaluation report.

#### B. Recommendations

This section should be succinct and contain few key recommendations. They should be:

- Based on evaluation findings
- Realistic and feasible within a project context
- Indicating institution(s) responsible for implementation (addressed to a specific officer, group or entity who can act on it) and have a proposed timeline for implementation if possible
- Commensurate with the available capacities of project team and partners
- Taking resource requirements into account.

Recommendations should be structured by addressees:

- UNIDO
- Government and/or counterpart organizations
- Donor

#### C. Lessons learned

- Lessons learned must be of wider applicability beyond the evaluated project but must be based on findings and conclusions of the evaluation
- For each lesson, the context from which they are derived should be briefly stated

**Annexes** should include the evaluation TOR, list of interviewees, documents reviewed, a summary of project identification and financial data, including an updated table of expenditures to date, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an annex.



## Annex 2 - Rating tables

Ratings will be presented in the form of tables with each of the criteria / aspects rated separately and with brief justifications for the rating based on the findings and the main analyses (see Table 1 to Table 3 below. Table 4 presents the template for summarizing the overall ratings.

Table 1. Rating criteria for Quality of project identification and formulation process (LFA Process)

Evaluation issue	Evaluator's comments	Ratings
1. Extent to which the situation, problem, need / gap is clearly identified, analysed and documented (evidence, references).		
2. Adequacy and clarity of the stakeholder analysis (clear identification of end-users, beneficiaries, sponsors, partners, and clearly defined roles and responsibilities in the project(s)).		
3. Adequacy of project monitoring and evaluation (M&E) design.		
4. Overall LFA design process.		

Table 2. Quality of project design (LFM)

Evaluation issue	Evaluator's comments	Rating
1. Clarity and adequacy of <b>outcome</b> (clear, realistic, relevant, addressing the problem identified). Does it provide a clear description of the benefit or improvement that will be achieved after project completion?		
2. Clarity and adequacy of <b>outputs</b> (realistic, measurable, adequate for leading to the achievement of the <b>outcome</b> ).		
3. Clarity, consistency and logic of the <b>objective tree</b> , and its reflexion in the LFM results hierarchy from <b>activities</b> to <b>outputs</b> , to <b>outcome</b> and to <b>overall objective</b> .		
4. Indicators are SMART for Outcome and Output levels.		
5. Adequacy of <b>Means of Verification and Assumptions</b> (including important external factors and risks).		
6. Overall LFM design quality.		

Table 3. Quality of project implementation performance

Evaluation criteria	Rating	
7. <b>Ownership and relevance</b>		
8. <b>Effectiveness</b>		
9. <b>Efficiency</b>		
10. <b>Impact</b>		
11. <b>Likelihood of/ risks to sustainability</b>		
12. <b>Project management</b>		
13. <b>M&amp;E</b>		

Table 4. Template for summarizing the overall ratings

Criterion	Evaluator's summary comments	Evaluator's rating
<b>Attainment of project objectives and results (overall rating),</b> sub criteria (below)		
Project implementation		
Effectiveness		
Relevance		
Efficiency		
<b>Sustainability of project outcomes (overall rating),</b> sub criteria (below)		
Financial risks		
Sociopolitical risks		
Institutional framework and governance risks		
Environmental risks		
<b>Monitoring and evaluation (overall rating),</b> sub criteria (below)		
M&E Design		
M&E Plan implementation (use for adaptive management)		
Budgeting and Funding for M&E activities		
<b>Project management - UNIDO specific ratings</b>		
Quality at entry / Preparation and readiness		
Implementation approach		
UNIDO Supervision and backstopping		
<b>Gender Mainstreaming</b>		
<b>Overall rating</b>		

#### RATING OF PROJECT OBJECTIVES AND RESULTS

- Highly satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Highly unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

**Please note:** Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results **may not be higher** than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

## RATINGS ON SUSTAINABILITY

Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits beyond project completion. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes.

### Rating system for sustainability sub-criteria

On each of the dimensions of sustainability of the project outcomes will be rated as follows.

- Likely (L): There are no risks affecting this dimension of sustainability.
- Moderately likely (ML). There are moderate risks that affect this dimension of sustainability.
- Moderately unlikely (MU): There are significant risks that affect this dimension of sustainability.
- Unlikely (U): There are severe risks that affect this dimension of sustainability.

All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

## RATINGS OF PROJECT M&E

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project M&E system will be rated on M&E design, M&E plan implementation and budgeting and funding for M&E activities as follows:

- Highly satisfactory (HS): There were no shortcomings in the project M&E system.
- Satisfactory(S): There were minor shortcomings in the project M&E system.
- Moderately satisfactory (MS): There were moderate shortcomings in the project M&E system.
- Moderately unsatisfactory (MU): There were significant shortcomings in the project M&E system.
- Unsatisfactory (U): There were major shortcomings in the project M&E system.
- Highly unsatisfactory (HU): The Project had no M&E system.

M&E plan implementation will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on M&E plan implementation.

All other ratings will be on the GEF six-point scale:

HS	= Highly satisfactory	Excellent
S	= Satisfactory	Well above average
MS	= Moderately satisfactory	Average
MU	= Moderately unsatisfactory	Below average
U	= Unsatisfactory	Poor
HU	= Highly unsatisfactory	Very poor (appalling)

## **Annex 3 - GEF Minimum requirements for M&E<sup>9</sup>**

### **Minimum requirement 1: Project design of M&E**

All projects will include a concrete and fully budgeted M&E plan by the time of work program entry for full-sized projects (FSP) and CEO approval for medium-sized projects (MSP). This M&E plan will contain as a minimum:

- SMART indicators for project implementation, or, if no indicators are identified, an alternative plan for monitoring that will deliver reliable and valid information to management;
- SMART indicators for results (outcomes and, if applicable, impacts), and, where appropriate, indicators identified at the corporate level;
- Baseline for the project, with a description of the problem to be addressed, with indicator data, or, if major baseline indicators are not identified, an alternative plan for addressing this within one year of implementation;
- Identification of reviews and evaluations that will be undertaken, such as mid-term reviews or evaluations of activities; and
- Organizational set-up and budgets for monitoring and evaluation.

### **Minimum requirement 2: Application of project M&E**

Project monitoring and supervision will include implementation of the M&E plan, comprising:

- SMART indicators for implementation are actively used, or if not, a reasonable explanation is provided;
- SMART indicators for results are actively used, or if not, a reasonable explanation is provided;
- The baseline for the project is fully established and data compiled to review progress reviews, and evaluations are undertaken as planned; and
- The organizational set-up for M&E is operational and budgets are spent as planned.

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<sup>9</sup> [http://www.thegef.org/gef/sites/thegef.org/files/documents/ME\\_Policy\\_2010.pdf](http://www.thegef.org/gef/sites/thegef.org/files/documents/ME_Policy_2010.pdf)

## **Annex 4 - Guidance on integrating gender in evaluations of UNIDO projects and programmes**

### **A. Introduction**

Gender equality is internationally recognized as a goal of development and is fundamental to sustainable growth and poverty reduction. The UNIDO Policy on gender equality and the empowerment of women and its addendum, issued respectively in April 2009 and May 2010 (UNIDO/DGB(M).110 and UNIDO/DGB(M).110/Add.1), provides the overall guidelines for establishing a gender mainstreaming strategy and action plans to guide the process of addressing gender issues in the Organization's industrial development interventions.

According to the UNIDO Policy on gender equality and the empowerment of women:

Gender equality refers to the equal rights, responsibilities and opportunities of women and men and girls and boys. Equality does not suggest that women and men become 'the same' but that women's and men's rights, responsibilities and opportunities do not depend on whether they are born male or female. Gender equality implies that the interests, needs and priorities of both women and men are taken into consideration, recognizing the diversity of different groups of women and men. It is therefore not a 'women's issues'. On the contrary, it concerns and should fully engage both men and women and is a precondition for, and an indicator of sustainable people-centered development.

Empowerment of women signifies women gaining power and control over their own lives. It involves awareness-raising, building of self-confidence, expansion of choices, increased access to and control over resources and actions to transform the structures and institutions which reinforce and perpetuate gender discriminations and inequality. Gender parity signifies equal numbers of men and women at all levels of an institution or organization, particularly at senior and decision-making levels.

UNIDO projects/programmes can be divided into two categories: 1) those where promotion of gender equality is one of the key aspects of the project/programme; and 2) those where there is limited or no attempted integration of gender. Evaluation managers/evaluators should select relevant questions depending on the type of interventions.

### **B. Gender responsive evaluation questions**

The questions below will help evaluation managers/evaluators to mainstream gender issues in their evaluations.

#### **B.1 Design**

- Is the project/programme in line with the UNIDO and national policies on gender equality and the empowerment of women?
- Were gender issues identified at the design stage?
- Did the project/programme design adequately consider the gender dimensions in its interventions? If so, how?
- Were adequate resources (e.g., funds, staff time, methodology, experts) allocated to address gender concerns?
- To what extent were the needs and priorities of women, girls, boys and men reflected in the design?
- Was a gender analysis included in a baseline study or needs assessment (if any)?

- If the project/programme is people-centered, were target beneficiaries clearly identified and disaggregated by sex, age, race, ethnicity and socio-economic group?
- If the project/programme promotes gender equality and/or women's empowerment, was gender equality reflected in its objective/s? To what extent are output/outcome indicators gender disaggregated?

## **B.2 Implementation management**

- Did project monitoring and self-evaluation collect and analyze gender disaggregated data?
- Were decisions and recommendations based on the analyses? If so, how?
- Were gender concerns reflected in the criteria to select beneficiaries? If so, how?
- How gender-balanced was the composition of the project management team, the Steering Committee, experts and consultants and the beneficiaries?
- If the project/programme promotes gender equality and/or women's empowerment, did the project/programme monitor, assess and report on its gender related objective/s?

## **B.3 Results**

- Have women and men benefited equally from the project's interventions? Do the results affect women and men differently? If so, why and how? How are the results likely to affect gender relations (e.g., division of labour, decision making authority)?
- In the case of a project/programme with gender related objective/s, to what extent has the project/programme achieved the objective/s? To what extent has the project/programme reduced gender disparities and enhanced women's empowerment?

## Annex 5. Checklist on terminal evaluation report quality

Independent terminal evaluation of UNIDO-GEF project:

Project Title:

UNIDO Project NO:

GEF ID:

Evaluation team leader:

Quality review done by:

Date:

### CHECKLIST ON EVALUATION REPORT QUALITY

Report quality criteria	UNIDO ODG/EVQ/IEV assessment notes	Rating
A. Was the report well-structured and properly written? (Clear language, correct grammar, clear and logical structure)		
B. Was the evaluation objective clearly stated and the methodology appropriately defined?		
C. Did the report present an assessment of relevant outcomes and achievement of project objectives?		
D. Was the report consistent with the ToR and was the evidence complete and convincing?		
E. Did the report present a sound assessment of sustainability of outcomes or did it explain why this is not (yet) possible? (Including assessment of assumptions, risks and impact drivers)		
F. Did the evidence presented support the lessons and recommendations? Are these directly based on findings?		
G. Did the report include the actual project costs (total, per activity, per source)?		
H. Did the report include an assessment of the quality of both the M&E plan at entry and the system used during the implementation? Was the M&E sufficiently budgeted for during preparation and properly funded during implementation?		
I. Quality of the lessons: were lessons readily applicable in other contexts? Did they suggest prescriptive action?		
J. Quality of the recommendations: did recommendations specify the actions necessary to correct existing conditions or improve operations ('who?' 'what?' 'where?' 'when?'). Can these be immediately implemented with current resources?		
K. Are the main cross-cutting issues, such as gender, human rights and environment, appropriately covered?		
L. Was the report delivered in a timely manner? (Observance of deadlines)		

### Rating system for quality of evaluation reports

A number rating 1-6 is used for each criterion: Highly satisfactory = 6, Satisfactory = 5, Moderately satisfactory = 4, Moderately unsatisfactory = 3, Unsatisfactory = 2, Highly unsatisfactory = 1, and unable to assess = 0.

## Annex 6 – Required project identification and financial data

The evaluation report should provide information on project identification, time frame, actual expenditures, and co-financing in the following format, which is modelled after the project identification form (PIF).

### I. Dates

Milestone	Expected date	Actual date
Project CEO endorsement/approval date		
Project implementation start date (PAD issuance date)		
Original expected implementation end date (indicated in CEO endorsement/approval document)		
Revised expected implementation end date (if any)		
Terminal evaluation completion		
Planned tracking tool date		

### II. Project framework

Project component	Activity type	GEF financing (in USD)		Co-financing (in USD)	
		Approved	Actual	Promised	Actual
1.					
2.					
3.					
4.					
5.					
6. Project management					
<b>Total (in USD)</b>					

Activity types are:

- i) Experts, researches hired
- j) technical assistance, Workshop, Meetings or experts consultation scientific and technical analysis, experts researches hired
- k) Promised co-financing refers to the amount indicated on endorsement/approval.



### III. Co-financing

Source of co-financing (name of specific co-financiers)	Type of co-financier (e.g. government, GEF agency(ies), Bilateral and aid agency (ies), multilateral agency(ies), private sector, NGO/CSOs, other)	Type of co-financing	Project preparation – CEO endorsement/ approval stage (in USD)		Project implementation stage (in USD)		Total (in USD)	
			Expected	Actual	Expected	Actual	Expected	Actual
	...							
<b>Total co-financing</b> (in USD)								

Expected amounts are those submitted by the GEF agencies in the original project appraisal document. Co-financing types are grant, soft loan, hard loan, guarantee, in kind, or cash.

## Annex 7 – Job descriptions



### UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

#### TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)

Title:	International evaluation consultant, team leader
Main Duty Station and Location:	Home-based
Missions:	Missions to Vienna, Austria and China
Start of Contract (EOD):	March, 2017
End of Contract (COB):	May, 2017
Number of Working Days:	40 working days spread over 2 months

#### 1. ORGANIZATIONAL CONTEXT

The UNIDO Independent Evaluation Division (ODG/EVQ/IEV) is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. ODG/EVQ/IEV is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

#### 2. PROJECT CONTEXT

The People's Republic of China ratified the Stockholm Convention on POPs on 13th August 2004. Article 5 of the SC requires the Parties to take measures to reduce or, where feasible, eliminate releases of PCDD/PCDF and other unintentionally produced POPs (UPOPs) in Part I from sources listed in Parts II and III of Annex C of the Convention. In the National Implementation Plan (NIP) of China for the implementation of the SC on POPs, MW incineration is listed as a key PCDD/PCDF release source and, pursuant to the "Action Plan for Reduction and Elimination of PCDD/PCDF Releases"; priority should be given to the application of best available techniques and best environmental practices (BAT/BEP).

Medical waste (MW) is generated by medical institutions and research facilities in the delivery of healthcare that includes diagnosis, treatment and research. Medical waste is bio-hazardous with a potential to spread infection and has much higher potential than common municipal wastes to cause pollution during disposal because of its characterization. Medical waste therefore requires safe management throughout the complete life cycle in order to safeguard public health and protect the environment. The overall objective of the project is to reduce and ultimately eliminate the releases of unintentionally produced POPs and other globally harmful pollutants into the environment and assist China in implementing its relevant obligations under the Stockholm Convention.

Detailed background information of the project can be found the Terms of Reference (TORs) for the terminal evaluation.

### 3. DUTIES AND RESPONSIBILITIES

MAIN DUTIES	Concrete/ Measurable Outputs to be achieved	Working Days	Location
<p>1. Review project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data); determine key data to collect in the field and adjust the key data collection instrument of 3A accordingly (if needed);</p> <p>Assess the adequacy of legislative and regulatory framework relevant to the project's activities and analyze other background info.</p>	<ul style="list-style-type: none"> <li>• Adjust table of evaluation questions, depending on country specific context;</li> <li>• Draft list of stakeholders to interview during the field missions;</li> <li>• Brief assessment of the adequacy of the country's legislative and regulatory framework.</li> </ul>	8 days	Home-based
<p>2. Briefing with the UNIDO Independent Evaluation Division, project managers and other key stakeholders at UNIDO HQ.</p> <p>Preparation of the Inception Report</p>	<ul style="list-style-type: none"> <li>• Detailed evaluation schedule with tentative mission agenda (incl. list of stakeholders to interview and site visits); mission planning;</li> <li>• Division of evaluation tasks with the National Consultant.</li> <li>• Inception Report</li> </ul>	2 days	Vienna, Austria
<p>3. Conduct field mission to China in <b>March-April 2017</b><sup>10</sup>.</p>	<ul style="list-style-type: none"> <li>• Conduct meetings with relevant project stakeholders, beneficiaries, the GEF Operational Focal Point (OFP), etc. for the collection of data and clarifications;</li> <li>• Agreement with the National Consultant on the structure and content of the evaluation report and the distribution of writing tasks;</li> <li>• Evaluation presentation of the evaluation's initial findings prepared, draft conclusions and recommendations to stakeholders in the country, including the GEF OFP, at the end of the mission.</li> </ul>	16 days	China
<p>4. Present overall findings and recommendations to the stakeholders at UNIDO HQ</p>	<ul style="list-style-type: none"> <li>• After field mission(s): Presentation slides, feedback from stakeholders obtained and discussed</li> </ul>	2 days	Vienna, Austria
<p>5. Prepare the evaluation report, with inputs from the National Consultant, according to the TOR;</p> <p>Coordinate the inputs from the National Consultant and combine with her/his own inputs</p>	<ul style="list-style-type: none"> <li>• Draft evaluation report.</li> </ul>	8 days	Home-based

<sup>10</sup> The exact mission dates will be decided in agreement with the Consultant, UNIDO HQ, and the country counterparts.

MAIN DUTIES	Concrete/ Measurable Outputs to be achieved	Working Days	Location
into the draft evaluation report. Share the evaluation report with UNIDO HQ and national stakeholders for feedback and comments.			
6. Revise the draft project evaluation report based on comments from UNIDO Independent Evaluation Division and stakeholders and edit the language and form of the final version according to UNIDO standards.	<ul style="list-style-type: none"> <li>Final evaluation report.</li> </ul>	4 days	Home-based
	<b>TOTAL</b>	<b>40 days</b>	

#### MINIMUM ORGANIZATIONAL REQUIREMENTS

##### Education:

Advanced degree in environment, energy, engineering, development studies or related areas

##### Technical and functional experience:

- Minimum of 10 years' experience in environmental/energy project management and/or evaluation (of development projects)
- Strong experience on environmental/energy and knowledge about GEF operational programs and strategies and about relevant GEF policies such as those on project life cycle, M&E, incremental costs, and fiduciary standards
- Experience in the evaluation of GEF projects and knowledge of UNIDO activities an asset
- Knowledge about multilateral technical cooperation and the UN, international development priorities and frameworks
- Working experience in developing countries

##### Languages:

Fluency in written and spoken English is required.

##### Reporting and deliverables

- 1) At the beginning of the assignment the Consultant will submit a concise Inception Report that will outline the general methodology and presents a concept Table of Contents;
- 2) The country assignment will have the following deliverables:
  - Presentation of initial findings of the mission to key national stakeholders;
  - Draft report;
  - Final report, comprising of executive summary, findings regarding design, implementation and results, conclusions and recommendations.
- 3) Debriefing at UNIDO HQ:
  - Presentation and discussion of findings;
  - Concise summary and comparative analysis of the main results of the evaluation report.

All reports and related documents must be in English and presented in electronic format.

##### Absence of conflict of interest:

According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the programme/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before the completion of her/his contract with the UNIDO Independent Evaluation Division.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

**TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)**

Title:	National evaluation consultant
Main Duty Station and Location:	Home-based
Mission/s to:	Travel to potential sites within China
Start of Contract:	March 2016
End of Contract:	May 2016
Number of Working Days:	35 days over 2 months

**ORGANIZATIONAL CONTEXT**

The UNIDO Independent Evaluation Division is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. The UNIDO Independent Evaluation Division is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

**PROJECT CONTEXT**

The national evaluation consultant will evaluate the projects according to the terms of reference (TOR) under the leadership of the team leader (international evaluation consultant). S/he will perform the following tasks:

<b>MAIN DUTIES</b>	<b>Concrete/measurable outputs to be achieved</b>	<b>Expected duration</b>	<b>Location</b>
Review and analyze project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data); in cooperation with the Team Leader: determine key data to collect in the field and prepare key instruments in both English and local language (questionnaires, logic models) to collect these data through interviews and/or surveys during and prior to the field missions; Coordinate and lead interviews/ surveys in local language and assist the team leader with translation where necessary; Analyze and assess the adequacy of legislative and regulatory framework, specifically in the context of the project's objectives and targets; provide analysis and advice to the team leader on existing and appropriate policies for input to the team leader.	<ul style="list-style-type: none"> <li>List of detailed evaluation questions to be clarified; questionnaires/interview guide; logic models; list of key data to collect, draft list of stakeholders to interview during the field missions</li> <li>Drafting and presentation of brief assessment of the adequacy of the country's legislative and regulatory framework in the context of the project.</li> </ul>	7 days	Home-based

<b>MAIN DUTIES</b>	<b>Concrete/measurable outputs to be achieved</b>	<b>Expected duration</b>	<b>Location</b>
<p>Review all project outputs/publications/feedback; Briefing with the evaluation team leader, UNIDO project managers and other key stakeholders. Coordinate the evaluation mission agenda, ensuring and setting up the required meetings with project partners and government counterparts, and organize and lead site visits, in close cooperation with the Project Management Unit. Assist and provide detailed analysis and inputs to the team leader in the preparation of the inception report.</p>	<ul style="list-style-type: none"> <li>• Interview notes, detailed evaluation schedule and list of stakeholders to interview during the field missions.</li> <li>• Division of evaluation tasks with the Team Leader.</li> <li>• Inception Report.</li> </ul>	6 days	Home-based (telephone interviews)
<p>Coordinate and conduct the field mission with the team leader in cooperation with the Project Management Unit, where required;  Consult with the team leader on the structure and content of the evaluation report and the distribution of writing tasks.</p>	<ul style="list-style-type: none"> <li>• Presentations of the evaluation's initial findings, draft conclusions and recommendations to stakeholders in the country at the end of the mission.</li> <li>• Agreement with the Team Leader on the structure and content of the evaluation report and the distribution of writing tasks.</li> </ul>	16 days (including travel days)	China
<p>Prepare inputs and analysis to the evaluation report according to TOR and as agreed with the Team Leader.</p>	Draft evaluation report prepared.	4 days	Home-based
<p>Revise the draft project evaluation report based on comments from UNIDO Independent Evaluation Division and stakeholders and edit the language and form of the final version according to UNIDO standards.</p>	Final evaluation report prepared.	2 days	Home-based
<b>TOTAL</b>		<b>35 days</b>	

## REQUIRED COMPETENCIES

### **Core values:**

1. Integrity
2. Professionalism
3. Respect for diversity

### **Core competencies:**

1. Results orientation and accountability
2. Planning and organizing
3. Communication and trust
4. Team orientation
5. Client orientation
6. Organizational development and innovation

***Managerial competencies (as applicable):***

1. Strategy and direction
2. Managing people and performance
3. Judgement and decision making
4. Conflict resolution

**MINIMUM ORGANIZATIONAL REQUIREMENTS**

**Education:**

Advanced university degree in environmental science, engineering or other relevant discipline like developmental studies with a specialization in industrial energy efficiency and/or climate change.

**Technical and functional experience:**

- Exposure to the needs, conditions and problems in developing countries.
- Familiarity with the institutional context of the project is desirable.
- Experience in the field of environment and energy, including evaluation of development cooperation in developing countries is an asset

**Languages:** Fluency in written and spoken English and Chinese is required.

**Absence of conflict of interest:**

According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the programme/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before the completion of her/his contract with the UNIDO Independent Evaluation Division.

## Annex 8 – Project results framework

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p><b>Objectives</b></p> <p>The project aims to reduce and ultimately eliminate the releases of unintentionally produced POPs and other globally harmful pollutants into the environment and assist China in implementing its relevant obligations under the Stockholm Convention.</p>	<ul style="list-style-type: none"> <li>➤ Number of medical institutions adopting BEP (baseline: 0; target: 20 for demonstration and 1500 for replication)</li> <li>➤ Number of dedicated MW disposal facilities adopting BAT (baseline: 0; target: 3 for demonstration and 15 for replication)</li> <li>➤ Number of dedicated MW treatment facilities adopting non-incineration as BAT/BEP (baseline: 0; target: 3 for demonstration and 120 for replication)</li> <li>➤ Quantitative reduction of MW produced by medical institutions through BEP application</li> <li>➤ Reduction in the manufacture and use of medical care products containing hazardous substances such as Hg and PVC containing phtalates</li> <li>➤ Reduction of PCDD/PCDF releases from MW incineration disposal (baseline: 0; target: 9.7g)</li> <li>➤ Avoided releases of PCDD/PCDF releases from MW treatment (baseline: 0; target: 12.95g)</li> <li>➤ Level of the stakeholder awareness of and participation in environmentally sound MW management in high-risk exposure areas (baseline: very low; target: 60%)</li> <li>➤ Levels of PCDD/PCDF in biological organisms in the vicinity of dedicated MW treatment and disposal facilities (baseline</li> </ul>	<ul style="list-style-type: none"> <li>➤ Texts of revised or established regulations, standards, and policies and their specifications</li> <li>➤ Bidding documents calling for proposals for the purchase of technical services and equipment</li> <li>➤ TORs of consulting services</li> <li>➤ Service contracts</li> <li>➤ Work plans</li> <li>➤ Thematic study reports</li> <li>➤ M &amp; E reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ The country, society and sector support actions to reduce PCDD/PCDF releases</li> <li>➤ Various barriers can be successfully removed with effective interventions from this project</li> <li>➤ MW treatment will be an economically viable option</li> <li>➤ The regulatory and policy framework established by this project can continue to work effectively after the completion of the project</li> </ul>



Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
	and target to be determined in the first year of project implementation) ➤ Social and economic benefits from the adoption of BAT/BEP (baseline: 0; target to be determined in the middle and terminal stages of project implementation)		
<b>Outcome 1: Strengthened regulatory framework in place and pollution performance levels upgraded or established</b>			
<b>Output 1.1 Strengthen the regulatory framework for MW management</b>			
1.1.1 Investigate, analyze and evaluate the laws and regulations on MW s and their implementation  1.1.2 Adapt the related regulations to the BAT/BEP requirements  1.1.3 Hold workshop to discuss the revised drafts  1.1.4 Circulate the drafts among governmental agencies, enterprises, academia, international community, and the public for comments  1.1.5 Promulgate the adapted regulations, and introduce and implement enforcement mechanisms	➤ Adapted Detailed Rules to Implement Measures on MW Operating License Management  ➤ Adapted Measures on MW (as Hazardous Waste) Consignment Management  ➤ Adapted Classification System of MW	➤ Explanations of Detailed Rules to Implement Measures on M W Operating License Management  ➤ Explanations of Adapted Measures on Hazardous Waste Consignment Management  ➤ Explanations of Adapted Classification System of MWs  ➤ Meeting minutes  ➤ Collection of suggestions	➤ Government will endorse and adopt the adapted regulations and measures  ➤ The adapted regulations meet the international requirements and respect the actual situation of China  ➤ The adapted regulations are practicable for implementation  ➤ The adapted regulations are not enforced
<b>Output 1.2 Upgrade or establish pollution performance levels for dedicated MW disposal facilities</b>			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>1.2.1 Investigate and analyze feasibility to upgrade or establish new pollution performance levels</p> <p>1.2.2 Draft the upgraded pollution control levels for the incineration of MW to the BAT achievable performance level</p> <p>1.2.3 Draft the pollution performance levels for non-incineration treatment of MW</p> <p>1.2.4 Hold a workshop with representatives from international organizations, governments, academia, enterprises, and the public to review the proposed performance levels</p> <p>1.2.5 Select 3 provinces for first pilot implementation of the upgraded performance levels</p>	<ul style="list-style-type: none"> <li>➤ Technical standards upgraded or established regarding: <ul style="list-style-type: none"> <li>- Pollution control for incineration of MW</li> <li>- Pollution control for non-incineration treatment of MW</li> </ul> </li> <li>➤ PCDD/PCDF release in pilot provinces meeting upgraded performance levels</li> <li>➤ Other pollutants release in pilot provinces meeting established performance levels</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on standards upgraded or established regarding: <ul style="list-style-type: none"> <li>- Pollution control for incineration processes</li> <li>- Pollution control for non-incineration treatment of MW</li> </ul> </li> <li>➤ Investigation and feasibility study reports</li> <li>➤ Meeting minutes</li> <li>➤ Collection of suggestions</li> </ul>	<ul style="list-style-type: none"> <li>➤ The upgraded performance levels can meet the requirements of BAT/BEP and also respect the actual technical and economic situation</li> <li>➤ Various stakeholders can be effectively involved throughout the whole process</li> <li>➤ Selected pilot provinces are willing to implement the upgraded performance levels first</li> <li>➤ The Government will accept and promulgate the established or revised performance levels nationwide</li> </ul>
<p>1.2.6 Select 3 provinces for first pilot implementation of the upgraded performance levels</p> <p>1.2.7 Revise the performance levels by incorporating the experience from the pilot implementation</p> <p>1.2.7 Circulate the revised performance levels for comments and forward to SEPA for review</p> <p>1.2.8 Promulgate nationwide the revised performance levels as technical standard</p>	<ul style="list-style-type: none"> <li>➤</li> </ul>	<ul style="list-style-type: none"> <li>➤</li> </ul>	<ul style="list-style-type: none"> <li>➤</li> </ul>
<b>Outcome 2: Strengthened institutional capacity for integrated MW management at national and local levels in support of the Nationwide Investment Plan</b>			
<b>Output 2.1 Establish a long-term national coordination mechanism for integrated MWs management</b>			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>2.1.1 Establish a national MW management steering group led by SEPA and MOH and composed of other relevant ministries for coordination of integrated MW management</p> <p>2.1.2 Regularly hold coordination meetings to provide guidance and coordination on issuance of laws, regulations, standards and policies and other important issues</p> <p>2.1.3 Provide guidance to the establishment and operation of local steering groups on MW management</p>	<ul style="list-style-type: none"> <li>➤ A national inter-ministerial coordination mechanism for integrated MW management</li> <li>➤ Local inter-departmental coordination mechanism for integrated MW management</li> <li>➤ Improved coordination of MWs management at national and local levels</li> </ul>	<ul style="list-style-type: none"> <li>➤ Working rules of the national steering group and the local steering groups</li> <li>➤ Work plans and annual reports of the national and local steering groups</li> <li>➤ Minutes of review, coordination and guidance meetings</li> <li>➤ Resolutions agreed by the steering groups</li> </ul>	<ul style="list-style-type: none"> <li>➤ Relevant ministries agree on and support the concept of integrated MW management</li> <li>➤ Coordination and cooperation can be achieved among various ministries</li> </ul>
<p><b>Output 2.2      <i>Strengthen supervision and inspection on medical institutions in MW management</i></b></p>			
<p>2.2.1 Based on Output 3.1, develop specifications for Health Agencies to supervise Medical Institutions in the adoption of BEP on MW Management</p> <p>2.2.2 Organize health departments to have trainings on the specifications based on the staff training system established by Output 7.4</p>	<ul style="list-style-type: none"> <li>➤ Specifications for Health Departments to supervise Medical Institutions in adoption of BEP on MW Management</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on specifications for Health Departments to supervise Medical Institutions in adoption of BEP on MW Management</li> </ul>	<ul style="list-style-type: none"> <li>➤ Health agencies attach sufficient importance to MW management supervision</li> </ul>
<p>2.2.3 Establish and implement a MW data reporting system between medical institutions and authorities</p> <p>2.2.4 Establish a mechanism for the local environment and health departments to regularly inspect the implementation of BEP for MW management</p>	<ul style="list-style-type: none"> <li>➤ Number of trainees</li> <li>➤ Capacity for supervision and inspection improved</li> <li>➤ MW amount reporting system</li> <li>➤ MW traceability system</li> <li>➤ A dedicated management system for integrated MW management</li> </ul>	<ul style="list-style-type: none"> <li>➤ Training materials</li> <li>➤ Inventory of MW</li> <li>➤ Monitoring report</li> <li>➤ Consignments saved and archived for tracing</li> <li>➤ Intensive inspection reports</li> <li>➤ Management system records</li> </ul>	<ul style="list-style-type: none"> <li>➤ Personnel training system established by Output 7.4 is effective in practice</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<b>Output 2.3 Strengthen the monitoring and supervision capacity on MW treatment and disposal</b>			
2.3.1 Develop monitoring and supervision standard norms 2.3.2 Train the municipal monitoring and supervision staff on the application of the methods 2.3.3 Develop and implement monitoring data publishing and reporting system 2.3.4 Undertake formal quarterly inspections in pilot MW disposal facilities during the project implementation period	<ul style="list-style-type: none"> <li>➤ Methods on monitoring and supervision of pollutants release from MW facilities</li> <li>➤ Municipal monitoring and inspection capacity improved</li> <li>➤ On-line monitoring network connected with the environmental authorities established</li> <li>➤ Monitoring data publishing and reporting systems established</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on methods on monitoring and supervision of pollutants release from MW</li> <li>➤ Monitoring data</li> <li>➤ Training materials</li> <li>➤ Regularly published monitoring and statistical data</li> <li>➤ Regularly reported monitoring and statistical data</li> </ul>	<ul style="list-style-type: none"> <li>➤ The dedicated treatment facilities install on-line monitoring system in compliance with related regulations and standards</li> <li>➤ The local EPBs have the access to the on-line monitoring data of the dedicated treatment facilities</li> </ul>
<b>Output 2.4 Strengthen the environmental impact assessment on disposal facilities</b>			
2.4.1 Develop Guideline for Environmental Impact Assessment on MW Disposal Facilities to include related existing or new engineering design standards and other related standards 2.4.2 Hold a training workshop on the implementation of the guideline to a qualified number of certified environmental impact assessors 2.4.3 Issue and implement the guideline nationwide on disposal facilities	<ul style="list-style-type: none"> <li>➤ Guideline for Environmental Impact Assessment on MW Disposal Facilities</li> <li>➤ Number of environmental impact assessors having received the training</li> <li>➤ Number of disposal facilities assessed with the guideline, including number of accepted or rejected proposals</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on Guideline for Environmental Impact Assessment on MW Disposal Facilities</li> <li>➤ Training materials and list of trainees</li> <li>➤ EIA reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ The EIA reports prepared in accordance with the Guideline will be used by the environmental authorities in approving or not approving the proposals for the construction of dedicated MW disposal facilities</li> </ul>
<b>Output 2.5 Strengthen the capacity to audit the operation of disposal facilities</b>			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>2.5.1 Design and disseminate a methodology to audit disposal facilities</p> <p>2.5.2 Develop accreditation and management measures for the establishment of national audit services</p> <p>2.5.3 Support and encourage the existing institutions for the audit of the operation of disposal facilities</p>	<ul style="list-style-type: none"> <li>➤ Methodology to audit disposal facilities</li> <li>➤ Measures on Accreditation and Management of Auditing Institutions for MW Facilities</li> <li>➤ New facilities checked and accepted</li> <li>➤ Existing facilities operation risk evaluated</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on methodology to audit disposal facilities</li> <li>➤ Explanations on Accreditation and Measures on Management of Auditing Institutions for MW Facilities</li> <li>➤ Evaluation reports</li> <li>➤ Correction reports</li> </ul>	<p>Evaluation and correction reports can be used as a strong reference by the environmental authorities in approving or suspending MW management license</p>
<p><b>Outcome 3: System management demonstrated and BEP based management of MW including measurement and monitoring applied</b></p>			
<p><b>Output 3.1 Demonstrate BEP in medical institutions for the management of MW</b></p>			
<p>3.1.1 Develop Specifications on MW Management in Medical Institutions</p> <p>3.1.2 Develop booklet for BEP Application in Medical Institutions for pilot application based on the previously achieved experience</p> <p>3.1.3 Select 20 representative medical institutions for the demonstration program</p> <p>3.1.4 Develop the demonstration program, covering purchasing practices, reduction, reuse, waste segregation, intermediate storage, transportation and traceability</p> <p>3.1.5 Establish MW management systems and carry out staff trainings on BEP application at the demonstration institutions</p> <p>3.1.6 Monitor, record and evaluate the implementation process and results</p>	<ul style="list-style-type: none"> <li>➤ Booklet of BEP Application in Medical Institutions</li> <li>➤ Reduced MW amount</li> <li>➤ Reduced use of disposable medical products</li> <li>➤ Reduced use of Hg contained products</li> <li>➤ Reduced use of PVC products</li> <li>➤ Reduced injuries to MW working staff</li> <li>➤ Improved personnel capacity for MW management and improved awareness</li> <li>➤ Established MW management system</li> <li>➤ Specifications on MW Management in Medical Institutions</li> <li>➤ Number of occupational injuries and accidents in healthcare facilities caused by handling and treatment of medical care</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tender document calling for technical services needed in demonstration of BEP in Medical Institutions</li> <li>➤ MoUs signed with the selected medical institutions for demonstration</li> <li>➤ Monthly progress reports</li> <li>➤ Inventory of MWs</li> <li>➤ Evaluation reports</li> <li>➤ Technical training materials</li> <li>➤ Recorded texts, photos and videos</li> <li>➤ Accident Report Form (incl. spillage response)</li> </ul>	<ul style="list-style-type: none"> <li>➤ The selected demonstration institutions are active and cooperative</li> <li>➤ The demonstration plan is feasible</li> <li>➤ The trainers can help the trainees understand the BEP</li> <li>➤ Increase hospital staff awareness when accidents are reported and statistics are presented / published. Get the information about occupational safety to implement specific measures in healthcare facilities</li> </ul>
<p>3.1.7 Validate the draft booklet by incorporating lessons and experience from the evaluations, issue and disseminate the validated booklet</p>			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<b>Outcome 4: BAT demonstrated for MW disposal using thermal combustion including air pollution monitoring</b>			
<b>Output 4.1 Demonstrate the application of BAT for incineration process of MW</b>			
<p>4.1.1 Develop a draft Booklet of BAT Application for Incineration Process of MW</p> <p>4.1.2 Develop a draft Specification for Construction and Operation of MW Disposal Facility Using Incineration Process</p> <p>4.1.3 Select one representative existing facility for demonstration</p> <p>4.1.4 Carry out the feasibility study and EIA of the demonstrative facility and develop the demonstration implementation plan</p> <p>4.1.5 Retrofit and optimize the operation of the modified facility, including on-line PCDD/PCDF sampling system, and train the relevant managerial and operation staff</p> <p>4.1.6 Validate the modified facility, monitor, record and evaluate the implementation process and results</p> <p>4.1.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</p>	<ul style="list-style-type: none"> <li>➤ Booklet of BAT Application for Incineration Process of MW</li> <li>➤ Specification for Construction and Operation of MW Disposal Facility Using Incineration Process</li> <li>➤ Demonstration implementation plan</li> <li>➤ Skills of operators improved</li> <li>➤ Overall management level improved</li> <li>➤ PCDD/PCDF releases consistent with performance level associated with BAT</li> <li>➤ Releases of other pollutants meeting the limits</li> <li>➤ Solid residues to landfill meeting the limits for safe disposal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tender document calling for technical services needed in demonstration of BAT in selected incineration facilities</li> <li>➤ MOUs signed with selected facilities</li> <li>➤ Monthly progress reports</li> <li>➤ Evaluation reports</li> <li>➤ Report of engineering validation</li> <li>➤ Technical training materials</li> <li>➤ Recorded texts, photos and videos</li> </ul>	<ul style="list-style-type: none"> <li>➤ The selected demonstration facilities are willing to cooperate</li> <li>➤ The demonstration implementation is feasible</li> <li>➤ The purchased equipment is reliable</li> <li>➤ Modified facilities can meet the release standards</li> <li>➤ The trainers can help the trainees master the operating skills</li> </ul>
<b>Output 4.2 Demonstrate the application of BAT in pyrolysis process of MWs</b>			
<p>4.2.1 Develop a Booklet of BAT application in pyrolysis process of MW</p> <p>4.2.2 Develop a draft Specification for Construction and Operation of MW Disposal Facility Using Pyrolysis Process</p> <p>4.2.3 Select 2 representative existing facilities for</p>	<ul style="list-style-type: none"> <li>➤ Booklet of BAT Application in Pyrolysis Process for MWs Disposal</li> <li>➤ Specification for Construction and Operation of MW Disposal Facility Using Pyrolysis Process</li> <li>➤ Demonstration implementation plan</li> <li>➤ Skills of operators improved</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tender document calling for technical services needed in demonstration of BAT in selected pyrolysis incinerator facilities</li> <li>➤ MOUs signed with selected facilities</li> </ul>	<ul style="list-style-type: none"> <li>➤ The selected demonstration facilities are active and cooperative</li> <li>➤ The demonstration implementation is feasible</li> <li>➤ The purchased equipment is</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>demonstration</p> <p>4.2.4 Carry out the feasibility study and EIA of the demonstrative facility and develop the demonstration implementation plan</p> <p>4.2.5 Retrofit and optimize the operation of the modified facility, including on-line PCDD/PCDF sampling system, and train the relevant managerial and operation staff</p> <p>4.2.6 Validate the modified facility, and monitor, record and evaluate the implementation process and results</p> <p>4.2.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</p>	<ul style="list-style-type: none"> <li>➤ Overall management level improved</li> <li>➤ PCDD/PCDF releases consistent with performance level associated with BAT</li> <li>➤ Release of other pollutants within permitted limits</li> <li>➤ Solid residues to landfill meeting the standards of safe disposal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Monthly progress reports</li> <li>➤ Evaluation reports</li> <li>➤ Report of engineering validation</li> <li>➤ Technical training materials</li> <li>➤ Recorded texts, photos and videos</li> </ul>	<p>reliable</p> <ul style="list-style-type: none"> <li>➤ Modified facilities can meet the performance levels</li> <li>➤ The trainers can help the trainees master the operating skills</li> </ul>
<b>Outcome 5: BAT/BEP demonstrated for MW thermal non-combustion, chemical treatment or other appropriate non-combustion treatment</b>			
<b>Output 5.1 Demonstrate the application of BAT in autoclaving process of MW</b>			
<p>5.1.1 Develop Booklet of BAT Application in Autoclaving Process of MW</p> <p>5.1.2 Develop a draft Specification for Construction and Operation of MW Disposal Facility Using Autoclaving Process</p> <p>5.1.3 Select one representative existing facility for demonstration</p>	<ul style="list-style-type: none"> <li>➤ Booklet of BAT Application in Autoclaving Process for MW Treatment</li> <li>➤ Specification for Construction and Operation of MW Disposal Facility Using Autoclaving Process</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tender document calling for technical services needed in demonstration of BAT in selected autoclave facilities</li> <li>➤ MoUs signed with selected facilities</li> </ul>	<ul style="list-style-type: none"> <li>➤ The selected demonstration facilities are active and cooperative</li> </ul>
<p>5.1.4 Carry out the feasibility study and EIA of the demonstration facility and develop the demonstration implementation plan</p> <p>5.1.5 Procure, retrofit, and operate the modified facility and train the relevant managerial and operation staff</p> <p>5.1.6 Validate the modified facility, and monitor,</p>	<ul style="list-style-type: none"> <li>➤ Testing methods for emissions and discharges</li> <li>➤ Demonstration implementation plan</li> <li>➤ Skills of operators improved</li> <li>➤ Overall management level improved</li> <li>➤ Emission of VOCs and other pollutants meeting the performance levels</li> <li>➤ Validation of sterilization process</li> </ul>	<ul style="list-style-type: none"> <li>➤ Monthly progress reports</li> <li>➤ Evaluation reports</li> <li>➤ Report of engineering validation</li> <li>➤ Technical training materials</li> <li>➤ Recorded texts, photos and videos</li> </ul>	<ul style="list-style-type: none"> <li>➤ The demonstration implementation is feasible</li> <li>➤ The purchased equipment is reliable</li> <li>➤ Modified facilities can meet the performance levels</li> <li>➤ The trainers can held the</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>record and evaluate the implementation process and results</p> <p>5.1.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</p>	<ul style="list-style-type: none"> <li>➤ Treated waste meeting standards for safe disposal to landfill</li> </ul>		<p>trainees master the operating skills</p>
<p><b>Output 5.2 Demonstrate the application of BAT in other non-incineration processes of MW</b></p>			
<p>5.2.1 Develop Booklet of BAT Application in Other Non-incineration Processes of MWs</p> <p>5.2.2 Develop a draft Specification for Operation of MW Disposal Facility Using Other Non-incineration Process</p> <p>5.2.3 Select 2 representative existing facilities for demonstration of microwave irradiation, chemical disinfection or combination</p> <p>5.2.4 Carry out the feasibility study and EIA of the demonstrative facilities and develop the demonstration implementation plan</p> <p>5.2.5 Procure, retrofit and operate the modified facility and train the relevant managerial and operation staff</p> <p>5.2.6 Validate the modified facility and monitor, record and evaluate the implementation process and results</p> <p>5.2.7 Validate the Booklet and the Specification by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet and Specification</p>	<ul style="list-style-type: none"> <li>➤ Booklet of BAT Application in Non-incineration Processes for MW Treatment</li> <li>➤ Specification for Construction and Operation of MW Disposal Facility Using Other Non-incineration Process</li> <li>➤ Demonstration implementation plan</li> <li>➤ Skills of operators improved</li> <li>➤ Overall management level improved</li> <li>➤ Emission of VOCs and other pollutants meeting the limits</li> <li>➤ Validation of sterilization process</li> <li>➤ Treated waste meeting standards for safe disposal to landfill</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tender document calling for technical services needed in demonstration of BAT in selected facilities</li> <li>➤ MoUs signed with selected facilities</li> <li>➤ Monthly progress reports</li> <li>➤ Evaluation reports</li> <li>➤ Report of engineering validation</li> <li>➤ Technical training materials</li> <li>➤ Recorded texts, photos and videos</li> </ul>	<ul style="list-style-type: none"> <li>➤ The selected demonstration facilities are active and cooperative</li> <li>➤ The demonstration implementation is feasible</li> <li>➤ The purchased equipment is reliable</li> <li>➤ Modified facilities can meet the standards</li> <li>➤ The trainers can help the trainees master the operating skills</li> </ul>
<p><b>Output 5.3 Demonstrate the application of BAT/BEP for treatment and disposal of MWs in remote rural areas</b></p>			
<p>5.3.1 Develop Booklet of BAT/BEP Application for Treatment and Disposal of MW in remote rural areas</p> <p>5.3.2 Select representative remote rural areas for</p>	<ul style="list-style-type: none"> <li>➤ Booklet of BAT/BEP Application for Treatment and Disposal of MW in remote rural areas</li> <li>➤ Operation and pollutant release indicators of the demonstrated facilities meeting BAT achievable</li> </ul>	<ul style="list-style-type: none"> <li>➤ Investigation reports on MW management status in proposed demonstration areas</li> <li>➤ Demonstration implementation</li> </ul>	<ul style="list-style-type: none"> <li>➤ The municipal authorities are stably staffed</li> <li>➤ The managerial and operating staff in</li> </ul>



Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>demonstration of the recommended BAT/BEP of the Booklet</p> <p>5.3.3 Develop the demonstration implementation plan</p> <p>5.3.4 Procure, install and operate the facilities and train the relevant managerial and operation staff</p> <p>5.3.5 Monitor, record and evaluate the implementation process and results</p> <p>5.3.6 Validate the Booklet by incorporating lessons and experience from the evaluation, issue and disseminate the validated Booklet</p>	<p>limits</p> <ul style="list-style-type: none"> <li>➤ Skills of the facility operators improved</li> <li>➤ Overall MW management capacity improved</li> <li>➤ Established policies and management systems</li> <li>➤ Treated waste meeting standards for safe disposal to landfill</li> </ul>	<p>plan</p> <ul style="list-style-type: none"> <li>➤ Report on the economic, technical, policy and management studies of the demonstration projects</li> <li>➤ Training materials</li> <li>➤ Evaluation reports</li> </ul>	<p>demonstration areas can properly treat MW through training</p> <ul style="list-style-type: none"> <li>➤ Reliable and affordable equipment can be locally provided or introduced from abroad</li> <li>➤ Proper fee-based system can be implemented</li> </ul>
<p><b>Outcome 6: Spatially integrated and coordinated MW management and disposal systems demonstrated in geographically defined clusters that include medical institutions and dedicated treatment and disposal facilities</b></p>			
<p><b>Output 6.1 Demonstrate the application of integrated MW management among institutions at the municipal level</b></p>			
<p>6.1.1 Select 3 demonstrations municipalities</p> <p>6.1.2 Participation of project stakeholders to international symposia and undertake field visits to learn international experience in integrated MW management among institutions</p> <p>6.1.3 Establish inter-departmental mechanism for policy consultation and coordination for integrated MW management among institutions at municipal level</p> <p>6.1.4 Develop municipal-level integrated MW management information system</p> <p>6.1.5 Monitor, record and evaluate the implementation process and results</p>	<ul style="list-style-type: none"> <li>➤ Municipal-level Integrated MW Management Plan</li> <li>➤ Municipal Integrated MW Management Coordination Mechanism</li> <li>➤ Municipal integrated MW management information system</li> <li>➤ Established municipal policies, regarding MW treatment charge, taxation, financial support, market orientation and other incentives</li> </ul>	<ul style="list-style-type: none"> <li>➤ Workshop notes and proceedings</li> <li>➤ Overseas study tour report</li> <li>➤ Report on the development of Municipal Integrated MW Management Plan</li> <li>➤ Report on municipal MW treatment policies</li> <li>➤ Report on the development of municipal integrated MW management information system</li> <li>➤ Training materials</li> <li>➤ Evaluation reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ The municipal authorities are stably staffed</li> <li>➤ Good cooperation among the municipal authorities, medical institutions, and dedicated treatment and disposal facilities can be achieved</li> <li>➤ MW fee-based system can be implemented</li> </ul>
<p><b>Output 6.2 Demonstrate coordinated MW treatment among the dedicated MW facilities at the provincial level</b></p>			
<p>6.2.1 Select 3 demonstration provinces for coordinated MW management and treatment</p> <p>6.2.2 Assist the selected provinces establish provincial MW management steering groups</p> <p>6.2.3 Hold a coordinating workshop among the provincial and municipal departments and the</p>	<ul style="list-style-type: none"> <li>➤ Better social, economic and environmental benefits achieved by disposal technologies: <ul style="list-style-type: none"> <li>- Different MW streams treated by different way</li> <li>- Effective response to emergencies</li> <li>- Co-building between neighbouring</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on Specifications of BAT/BEP Application in Coordinated MW Treatment Planning and Implementation</li> <li>➤ Bidding document calling for technical services for coordinated MW treatment planning and</li> </ul>	<ul style="list-style-type: none"> <li>➤ The provincial authorities are stably staffed</li> <li>➤ Good coordination and cooperation can be achieved by the following actions: <ul style="list-style-type: none"> <li>- Strengthen supervision</li> </ul> </li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>dedicated MW treatment facilities</p> <p>6.2.4 Develop and carry out a logistics plan for the coordinated activities</p> <p>6.2.5 Promulgate and implement supporting policies by the local government</p> <p>6.2.6 Monitor, record and evaluate the implementation process and results</p>	<p>municipalities</p> <ul style="list-style-type: none"> <li>- Co-building MW treatment facility with hazardous waste treatment facility</li> </ul>	<p>implementation</p> <ul style="list-style-type: none"> <li>➤ Investigation and feasibility study reports</li> <li>➤ Implementation plan</li> <li>➤ Meeting minutes</li> <li>➤ Texts of promulgated policies</li> <li>➤ Evaluation reports</li> </ul>	<p>and inspection to ensure safe treatment of all types of MW</p> <ul style="list-style-type: none"> <li>- Raise the awareness of the local governments about the importance of safe MW treatment</li> <li>- Develop reasonable benefit sharing mechanism among dedicated facilities</li> </ul> <ul style="list-style-type: none"> <li>➤ Accidental risks from transportation can be managed</li> <li>➤ Consignment system is effectively implemented</li> </ul>
<p><b>Outcome 7. A national strategy and action plan of BAT/BEP for MW management and disposal developed and formulated based on the experience gained through the demonstration activities of the project</b></p>			
<p><b>Output 7.1 Formulate techno-economic policies that promote the adoption of BAT/BEP</b></p>			
<p>7.1.1 Investigate and analyze the needs of techno-economic policies according to the requirements of BAT/BEP and the Convention</p> <p>7.1.2 Draft the needed techno-economic policies</p> <p>7.1.3 Hold a policy dialogue workshop attended by representatives from governments, international and domestic experts, enterprises, and the public</p> <p>7.1.4 Circulate the policy texts for comments</p> <p>7.1.5 Incorporate the comments into the final policy texts</p>	<ul style="list-style-type: none"> <li>➤ Techno-economic policies promoting adoption of BAT/BEP in MW management</li> <li>➤ MW treatment fee-based system</li> <li>➤ Policies encouraging investment in MW treatment from the private sector</li> <li>➤ Policies encouraging commercialization of MW treatment</li> <li>➤ Measures of Franchised Operation of MW Treatment</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on techno-economic policies promoting adoption of BAT/BEP in MW management</li> <li>➤ Explanations on MW treatment fee-based system</li> <li>➤ Explanations on policies encouraging investment in MW treatment from the private sector</li> <li>➤ Explanations on policies encouraging commercialization of MW treatment</li> <li>➤ Explanations on Measures of Franchised Operation of MW Treatment</li> <li>➤ Meeting minutes</li> </ul>	<ul style="list-style-type: none"> <li>➤ The existing legal framework provides clear status to commercialization in waste management sector</li> <li>➤ The established techno-economic policies can meet the BAT/BEP requirements and also respect the actual situation of China</li> <li>➤ Policies implementation is pushed by proper incentives</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
7.1.6 Submit the policies to SEPA and other related ministries for promulgation			
<b>Output 7.2 Demonstrate and promote different commercial models for the construction and operation of MW treatment and disposal facilities</b>			
7.2.1 Develop investment models to facilitate MW treatment and disposal 7.2.2 Conduct trainings for government officials and enterprises managers from at least 60 municipalities in the realization and management of MW management projects 7.2.3 Assist at least 20 municipalities in establishing MW management steering groups 7.2.4 Provide technical assistance to the municipalities with MW management steering group in adopting BOT, BOO, TOT models, etc. 7.2.5 Provide incentives to facility owners to purchase certified equipment 7.2.6 Establish technical consulting institutions to provide technical services in options for private investment	<ul style="list-style-type: none"> <li>➤ Specifications on investment models to facilitate MW treatment and disposal</li> <li>➤ List of trained municipal staff</li> <li>➤ Investment amount from non-governmental sources</li> <li>➤ More than 20 municipal MW management steering groups established</li> <li>➤ Dedicated MW treatment facilities operation meeting pollutant release levels</li> <li>➤ Dedicated MW treatment facilities operating on a financially sustainable basis</li> <li>➤ Established technical consulting institutions providing technical services in options for private investment</li> </ul>	<ul style="list-style-type: none"> <li>➤ Training materials</li> <li>➤ Contracts signed between the municipal environmental authority and the dedicated MW treatment facilities</li> <li>➤ Working rules of the municipal MW management steering groups</li> <li>➤ Monitoring data and reports</li> <li>➤ Financial statement of the facility owners</li> <li>➤ Monitoring data and reports</li> <li>➤ Financial statement of the facility owners</li> <li>➤ Consulting contracts and reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ The municipal governments take in great consideration the safe MW treatment</li> <li>➤ The municipal governments alone cannot afford the financial and human resources needed to realize safe MW treatment</li> <li>➤ The municipal government can promote favourable conditions to attract external investment</li> </ul>
<b>Output 7.3 Strengthen national capacity to develop new MWs treatment technologies appropriate to China's socio-economic context</b>			
7.3.1 Identify, evaluate and establish the catalogue of processes, techniques and equipment in great demand while not yet made locally available and affordable in China	<ul style="list-style-type: none"> <li>➤ Program of research, development and application of key technical processes, techniques, and equipment</li> <li>➤ National investment on R&amp;D of the needed technical processes, techniques and equipment</li> </ul>	<ul style="list-style-type: none"> <li>➤ Report on program of research, development and application of key technical processes, techniques and equipment</li> <li>➤ Meeting minutes</li> <li>➤ Funding program developed and implemented by national R&amp;D funding authorities</li> </ul>	<ul style="list-style-type: none"> <li>➤ The national government continues to push the implementation of Construction Plan of Dedicated Hazardous and MW Treatment Facilities</li> <li>➤ The national R&amp;D funding program can be adjusted to emerging needs</li> </ul>
7.3.2 Hold 3 workshops attended by representatives from national and local governments,	<ul style="list-style-type: none"> <li>➤ Key equipment locally available and affordable</li> <li>➤ Joint ventures established and operated</li> </ul>	<ul style="list-style-type: none"> <li>➤ R&amp;D result appraisal report</li> <li>➤ Statutes of joint ventures</li> </ul>	<ul style="list-style-type: none"> <li>➤ The domestic R&amp;D community has a basis for further R&amp;D</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p>international technology vendors, domestic research institutes, equipment manufacturers, and treatment operators to discuss technology supplies and demands for incineration, autoclave and other non-incineration technologies</p> <p>7.3.3 Establish incentives to encourage joint development of market needed technologies and equipment by international vendors and domestic research entities</p> <p>7.3.4 Establish incentives for successful application of advanced feasible technologies and equipment</p>	<p>profitable</p>	<ul style="list-style-type: none"> <li>➤ Financial statement of manufacturing enterprises</li> </ul>	<ul style="list-style-type: none"> <li>➤ There are effective regulations protecting intellectual property rights and patents</li> </ul>
<p><b>Output 7.4      <i>Develop and implement a MW treatment equipment certification and labelling program</i></b></p>			
<p>7.4.1 Develop technical requirements for Certification and Labelling of MW Treatment Equipment</p> <p>7.4.2 Develop procedures on Certification and Labelling of MW Treatment Equipment</p> <p>7.4.3 Strengthen the capacity of certification institutions</p> <p>7.4.4 Strengthen the capacity of the testing institutions and laboratories</p> <p>7.4.5 Hold series of workshop targeting separate technologies, implementation of the certification and labelling program and participation of equipment producers and investors in the program</p> <p>7.4.6 Carry out pilot certification and labelling on qualified products produced by those manufacturing enterprises of better-off conditions</p> <p>7.4.7 Launch extensive publicity in the MW treatment sector</p>	<ul style="list-style-type: none"> <li>➤ Technical requirements for Certification and Labelling of MW Treatment and Disposal Equipment for processes of: <ul style="list-style-type: none"> <li>- Incineration</li> <li>- Pyrolysis</li> <li>- Autoclaving</li> <li>- Microwaving</li> <li>- Chemical disinfections</li> </ul> </li> <li>➤ Procedures on Certification and Labelling of MW Treatment Equipment</li> <li>➤ Number of accredited laboratories and testing institutions</li> <li>➤ Number of accredited equipment certification institutions</li> <li>➤ Number of enterprises and products successfully certified and in certification pipeline</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explanations on technical requirements for Certification and Labelling of MW Treatment Equipment</li> <li>➤ Explanations on Detailed Measures on Certification and Labelling of MW Treatment Equipment</li> <li>➤ Bidding document recruiting technical services in developing and implementing the certification and labelling program</li> <li>➤ Capacity requirements on certification and testing institutions</li> <li>➤ Designs of labels</li> </ul>	<ul style="list-style-type: none"> <li>➤ There are existing laboratories capable of PCDD/PCDF analysis</li> <li>➤ Equipment produced by top manufacturing enterprises can meet the certification requirements</li> <li>➤ The authorities can strictly enforce the related technical requirements and standards with necessary trainings delivered and awareness raised</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<b>Output 7.5 Establish training and accreditation systems for lifecycle management of MW that support BAT/BEP</b>			
<p>7.5.1 Integrate all the experience and results from demonstrations and other external successful experience to compile textbooks for managerial and technical trainings</p> <p>7.5.2 Develop various curricula to meet different training needs such as entry training, on-the-job training, refresh training, etc.</p> <p>7.5.3 Train the trainers in environmental and health sectors</p> <p>7.5.4 Formulate Regulations and Resources Requirements for MW Management Training Institutions</p> <p>7,5,5 Based on the existing administrative structure and training system of the health administration, establish a 4-tier personnel training system covering national, provincial, municipal, and county medical institutions, including establishment of 7 training bases for training of high-level managerial and technical staff in health agencies and medical institutions</p> <p>7.5.6 Based on the existing environmental technical training and research system, establish 3 training bases for training of dedicated MW treatment staff</p>	<ul style="list-style-type: none"> <li>➤ Number of trainers receiving training</li> <li>➤ Regulations and Resources Requirements for MW Management Training Institutions</li> <li>➤ Personnel training systems for lifecycle management of MW</li> <li>➤ 7 training bases established for training of high-level managerial and technical staff in health agencies and medical institutions</li> <li>➤ 3 training bases established for training of central MW treatment staff</li> <li>➤ Number of medical institution staff receiving BEP trainings</li> <li>➤ Number of dedicated MW treatment staff receiving BAT/BEP trainings</li> <li>➤ Number of management systems certified</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tender document recruiting technical services in training the trainers</li> <li>➤ Training materials, textbooks, and other courseware</li> <li>➤ Text of Regulations and Resources Requirements for MW Management Training Institutions</li> <li>➤ Licenses issued by the authorities to the established training bases</li> <li>➤ Certificates granted to the trainees</li> <li>➤ Reports on establishment of personnel training systems for lifecycle management of MW</li> <li>➤ Evaluation reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ Medical institutions and dedicated MW treatment facilities take in great consideration the personnel training</li> <li>➤ Compulsory training and authorized certificates are required on some key working posts by law</li> <li>➤ Training is subject to governance of health and safety</li> <li>➤ Existing administrative management and training system of the health sector is appropriate for MW management training</li> <li>➤ Existing environmental technical training and research system is appropriate for MW disposal training</li> </ul>
<b>Output 7.6 Extensive stakeholder awareness raising, including a series of national and international workshops</b>			
<p>7.6.1 Prepare technical materials for targeted stakeholder awareness for administrators, managers and other influential players in national investment programs where the outputs of the project can potentially be replicated.</p> <p>7.6.2 Launch awareness raising and education</p>	<ul style="list-style-type: none"> <li>➤ Plan for stakeholder awareness and education on MW management</li> <li>➤ Number or percentage of the stakeholders receiving information</li> <li>➤ Improved stakeholder awareness levels</li> <li>➤ BAT/BEP extended to medical product manufacturing enterprises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Stakeholder awareness investigation questionnaires</li> <li>➤ Materials for stakeholder awareness raising and education</li> <li>➤ Reports by industrial associations</li> <li>➤ Academic articles</li> <li>➤ Evaluation reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ Materials are made easy to understand, impressive, and acceptable to the stakeholders</li> <li>➤ Industrial associations have strong influences on enterprises in improving awareness and changing</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
campaign to the identified stakeholders using direct communication including publications and lectures	➤ Reduced use of hazardous and toxic substances in manufacturing medical products	➤ Meeting notices and list of participants	behaviours
<ul style="list-style-type: none"> <li>- Mobilize industrial associations to introduce BAT/BEP among medical product manufacturing enterprises</li> <li>-Mobilize NGOs to introduce knowledge about MW treatment in hospitals, communities, and schools</li> <li>7.6.3 Promote academic and professional articles for environmentally sustainable MW management</li> <li>7.6.4 Organize a workshop by the end of this project bringing together all stakeholders and consultants/companies involved in this project to evaluate the outcomes of the project</li> <li>7.6.5 Hold a national workshop with participation from all provinces and stakeholders</li> <li>7.6.6 Hold an international workshop to share the national experience with representatives from other countries and also learn from their experiences</li> </ul>	<ul style="list-style-type: none"> <li>➤ Improved medical product design considering easier recycle and reuse</li> <li>➤ Experience, lessons, results and impacts summarized</li> <li>➤ National experience presented, and international experience learned</li> </ul>	<ul style="list-style-type: none"> <li>➤ Meeting minutes</li> <li>➤ Workshop/seminar proceedings</li> </ul>	<ul style="list-style-type: none"> <li>➤ Project results including raw data can be disseminated effectively to the scientific research community</li> <li>➤ National and international stakeholders can be widely mobilized</li> <li>➤ Provinces will have the willingness to implement BAT/BEP in the sector of MW management</li> </ul>
<b>Outcome 8: Project management and monitoring and evaluation</b>			
<b>Output 8.1 Establish the project management structure</b>			
<ul style="list-style-type: none"> <li>8.1.1 Establish the Steering group by relying on resources from related ministries or commissions at the national level and from local governmental agencies</li> <li>8.1.2 Establish the National Project management Team under CIO</li> <li>8.1.3 Recruit a CTA, a NTA, policy experts, technical experts in MW management, and evaluation and programming experts to form a PET</li> </ul>	<ul style="list-style-type: none"> <li>➤ Steering group established</li> <li>➤ National Project Management Team established with necessary office equipment procured</li> <li>➤ National project expert team established</li> <li>➤ 3 local PMOs established</li> <li>➤ Project management capabilities improved at national and local levels</li> </ul>	<ul style="list-style-type: none"> <li>➤ Working rules of the Steering group</li> <li>➤ TORs of the project management staff, including the project managers, coordinator, and technical support staff</li> <li>➤ Expert recruitment notices and TORs for the CTA, NTA, policy experts, technical experts in MW management, and evaluation and programming experts</li> </ul>	<ul style="list-style-type: none"> <li>➤ Various ministries agree on and support the project</li> <li>➤ Coordination and cooperation can be achieved among various ministries</li> <li>➤ Qualified project management staff can be recruited</li> <li>➤ Qualified experts can be recruited</li> </ul>

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
8.1.4 Establish 3 local PMOs in selected provinces for intensive demonstrations 8.1.5 Carry out series of management training classes to the national/local project management staff		<ul style="list-style-type: none"> <li>➤ TORs of the local PMOs</li> <li>➤ Training materials on contractual management, project management tools, and basics of MW management and disposal</li> </ul>	<ul style="list-style-type: none"> <li>➤ The selected demonstration provinces have strong willingness for participation and cooperation</li> </ul>
<b>Output 8.2 Design and implement an M&amp;E mechanism according to GEF M&amp;E procedures</b>			
8.2.1 Hold the Inception Workshop 8.2.2 Prepare the Inception Report 8.2.3 Measure impact indicators on an annual basis 8.2.4 Prepare Annual Project Reports and Project Implementation Reviews 8.2.5 Hold annual tripartite review meetings 8.2.6 Hold biannual Steering group meetings 8.2.7 Carry out mid-term external evaluation 8.2.8 Carry out final external evaluation 8.2.9 Complete the Terminal Report 8.2.10 Carry out annual project financial audits 8.2.11 Carry out biannual visits to selected filed sites 8.2.12 Establish a project management information system (MIS), including a project website to disseminate information to various stakeholders	<ul style="list-style-type: none"> <li>➤ Inception Workshop held</li> <li>➤ Detailed work plans prepared</li> <li>➤ Data and information against indicators input into the MIS</li> <li>➤ Non-compliances identified and corrected</li> <li>➤ Technical and political guidance from the Steering group</li> <li>➤ Experience summarized and recommendations raised</li> <li>➤ Problems identified and recommendations provided by field visits</li> <li>➤ MIS established and made functional</li> <li>➤ Project information, experience and lessons disseminated through website</li> </ul>	<ul style="list-style-type: none"> <li>➤ Inception workshop meeting minutes</li> <li>➤ Inception Report</li> <li>➤ Annual Project Reports and Project Implementation Reviews</li> <li>➤ Biannual Steering group meeting minutes</li> <li>➤ Mid-term and terminal external evaluation reports</li> <li>➤ Terminal Report</li> <li>➤ Annual project financial audit reports</li> <li>➤ Field inspection reports</li> <li>➤ MIS development documentations and reports generated by properly retrieving data and information from the MIS</li> <li>➤ Project website development and maintenance documentations</li> </ul>	<ul style="list-style-type: none"> <li>➤ The trained project management staff can well perform their jobs required in TORs</li> <li>➤ Qualified external evaluation experts can be recruited</li> <li>➤ No extreme weather conditions or other extreme events upon field visits</li> <li>➤ Qualified IT service providers can be recruited to develop the MIS, including the project website</li> <li>➤ A data and information collection mechanism among various stakeholders at different levels can be established to activate the MIS</li> </ul>

**ANNEX II. Terminal evaluation agenda**

Date		Activity			Participants	location	Transport	Scheduled Time	Accommodation
		Subjects	Main Contents	Responsible Person					
Day 1 Starting Date Jul.18	Morning	Reception for terminal evaluation of the medical waste project and workshop on the final achievements	Welcome address	MEP	Independent assessment expert panel (IAEP), representatives from UNIDO Beijing Office, FECO (Division V, Division of contract division of finance), National Institute of Hospital Administration (NIHA), project experts, Interpreter (All journey)	Beijing	Car Rental	9:00-12:00	Beijing
			Opening remarks of the evaluation team	IAEP					
			Summary report of the medical waste ProJet	FECO					
			Summary report on sub-project "Medical Waste Best Management Practices Demonstration and Promotion in Medical Institutes"	National Institute of Hospital Administration SHAN Shujuan					
			Summary Report on overall status of the revision of policies, regulations and standards	Chinese Academic of Sciences CHEN Yang					
			Report on overall status of the construction of demonstration provinces and cities	Chinese Academy for Environmental Planning SUN Ning					
			Report on the overall status of the demonstration and promotion of disposal techniques	Project core expert JIANG Feng					
			Q&A, discussion, summary	UNIDO					
	Afternoon	Visit Chinese Academy for Environmental Planning	Introduction on overall status on national medical waste planning and implementation Achievements introduction on sub-	Chinese Academy for Environmental Planning SUN Ning					



Date		Activity			Participants	location	Transport	Scheduled Time	Accommodation
		Subjects	Main Contents	Responsible Person					
			projects such as economic policies, commercial mode, technical specification of high temperature steam sterilization, etc.						
Day 2	Morning	Visit National Institute of Hospital Administration	Workshop on "Medical Waste Best Management Practices Demonstration and Promotion in Medical Institutes" sub-project	National Institute of Hospital Administration SHAN Shujuan	IAEP, FECO, JIANG Feng	Beijing	Car Rental	9:30-11:30	Beijing
	Afternoon	Workshop with Chinese Academy of Sciences and Environmental Science Academy of Sheng Yang	Introduction of sub-project achievements (BAT Guideline, emission standards, performance test, equipment certification, technical specification revision, remote areas research, training base, etc.)	Chinese Academy of Sciences CHEN Yang Environmental Science Academy of Sheng Yang CHEN Gang				14:00-17:30	
Day 3	Morning	Leave for Shanghai Visit Shanghai Solid Waste Disposal Center	Beijing – Shanghai Report by Shanghai Solid Waste Environmental Protection Training Base	Shanghai Solid Waste Management ZHA Ping	IAEP, FECO, Shanghai Solid Waste Disposal Center, JIANG Feng	Shanghai	Plane CA1831 0730-0940	8:30-12:00	Shanghai /Beijing
	Afternoon	Workshop	Report on completion status of incentive plan enterprises and site visiting Introduction of training conditions in Shanghai	Shanghai Solid Waste Disposal Center WANG Dehao				IAEP, FECO, Shanghai Solid Waste Disposal Center, JIANG Feng	
Day 4	Morning	Leave for Tianjin Visit Tianjin University	Achievement Report on VOCs control technology researches and developments	Tianjin University WANG Fumin	IAEP, FECO, Tianjin University, JIANG Feng, JIN Dengchao	Tianjin	High-speed Train	8:30-12:00	Tianjin /Beijing
	Afternoon	Visit State	Report on emergency	Hejiaveolia				IAEP, FECO, Environmental	

Date		Activity			Participants	location	Transport	Scheduled Time	Accommodation
		Subjects	Main Contents	Responsible Person					
		Environmental Protection Engineering Center (Tianjin) for Hazardous Waste Disposal	guidelines and textbooks composition Report on Tianjin Medical Waste Environmental Protection Training Base	CAI Ling	Protection Department of Tianjin, Hejiaveolia, JIANG Feng		speed Train	17:00	
Day 5	Morning	Prepare assessment report				Changchun		8:30-12:00	Jilin
	Afternoon	Leave for Changchun			IAEP, FECO, NIHA, JIANG Feng		Plane CA1649 1240-1450	14:00-17:30	
Day 6 23 July	Morning	Visit Changchun Medical Waste Disposal Center	Introduction of Rotary Kiln BAT/BEP technology demonstration	Changchun Medical Waste Disposal Center GUO Chengyin	IAEP, FECO, NIHA, EPB, JIANG Feng	Changchun	Car Rental	8:30-12:00	Jilin
	Afternoon	Visit demonstration medical institute of Jilin Province	Introduction of medical waste BEP and promotions of health department	National Institute of Hospital Administration SHAN Shujuan	IAEP, FECO, NIHA, Public Health Authority, Hospitals, JIANG Feng		Car Rental	14:00-17:30	
Day 7	Morning	Workshop on local medical waste management	Introduction of demonstration province and city	Jilin EPB WANG Xiaoheng	IAEP, FECO, NIHA, EPB, Public Health Authority, JIANG Feng	Changchun	Car Rental	8:30-12:00	Nanchang
	Afternoon	Leave					Plane CA1650 1545-1745 CA1537 2000-2230	14:00-22:30	
Day 8 25, Tuesday	Morning	Visit Nanchang Medical Waste Disposal Center	Introduction of continuous pyrolysis BAT/BEP technology demonstration	Nanchang Medical Waste Disposal Center FANG Pingping	IAEP, FECO, NIHA, EPB, JIANG Feng	Nanchang	Car Rental	8:30-12:00	Nanchang
	Afternoon	Visit Jiangxi Solid Waste Management Center	Introduction of the construction status of Jiangxi demonstration province	Jiangxi Solid Waste Management Center XIAHOU Juan	IAEP, FECO, NIHA, EPB, Public Health Authority, JIANG Feng		Car Rental	14:00-17:30	
Day 9 26,	Morning	Visit demonstration	Introduction of medical	National Institute of	IAEP, FECO, NIHA, local EPB	Nanchang	Car Rental	9:00-13:00	

Date		Activity			Participants	location	Transport	Scheduled Time	Accommodation
		Subjects	Main Contents	Responsible Person					
Wednesday		medical institute of Jiangxi Province	waste BEP and promotions of Jiangxi health department	Hospital Administration SHAN Shujuan	and health departments, JIANG Feng				Beijing
	Afternoon	Leave for Beijing					Plane CA1512 1520-1745	15:00-18:00	
Day 10 27, Thursday	Morning	Head for Xinxiang				Xinxiang	High-speed Train	9:00-12:00	Henan
	Afternoon	Visit Xinxiang Medical Waste Disposal Center Visit People's Government of Xinxiang City	Introduction of chemistry disinfection BAT/BEP technology demonstration Introduction of the construction status of Xinxiang demonstration City	Xinxiang Medical Waste Disposal Center YANG Jun Xinxiang EPB	IAEP, FECO, NIHA, local EPB and health departments, JIANG Feng	Xinxiang	Car Rental	14:00-18:00	
Day 11 28, Friday	Morning	Leave for Zhengzhou Visit Henan EPB	Xinxiang - Zhengzhou Introduction of the construction status of Henan demonstration province	Henan Solid Waste Management Center GUO Chunxia	IAEP, FECO, NIHA, local EPB and health departments, JIANG Feng	Zhengzhou	High-speed Train	9:00-12:00	Beijing
	Afternoon	Visit demonstration medical institute of Henan Province Leave for Beijing	Introduction of medical waste BEP and promotions of Henan health department	National Institute of Hospital Administration SHAN Shujuan	IAEP, FECO, NIHA, local EPB and health departments, JIANG Feng	Zhengzhou	Car Rental High-speed Train	14:00-20:00	
Day 12 29, Saturday	All day	Workshop	Interview stakeholders		IAEP, FECO, project experts	Beijing		9:00-17:00	Beijing
Day 13 30, Sunday	Morning	Visit CSD Emerging Environmental Technology Center (CETC)	The Evaluation Report of Performance Testing and Evaluation for BAT/BEP Technical Demonstrations	CETC WU Changmin	IAEP, FECO, project experts	Beijing		9:00-12:00	Beijing
	Afternoon	Prepare assessment report	Prepare assessment report, communications			Beijing		14:00-18:00	
Day 14 31, Monday	All day	Discussion on assessment report	Discussion on assessment report, conclusion	UNIDO	IAEP, Seroprotect experts	Beijing		9:00-17:00	Beijing

## ANNEX III: List of replication facilities

### 3.1. Incineration facilities

No.	Name of the disposal facility	Tech. Type	Capacity (t/d)	Reduction Factor (g Teq/t)	Emission Reduction (g TEQ)
1	Production Line of Medical Waste Incineration of Taizhou Xiangjin Medical Waste Disposal Co., Ltd.	B	10	0.046	0.46
2	No. I Incineration Production Line of Nanjing Huihe Environmental Engineering Technology Co., Ltd.	C	30	0.036	1.09
3	No. II Incineration Production Line of Nanjing Huihe Environmental Engineering Technology Co., Ltd.	C	30	0.036	1.09
4	Disposal Facilities for Medical Waste Incineration of Guangxi Shenzhou Lifang Environmental Resources Co., Ltd.	R	30	0.028	0.83
5	Measures for Medical Waste Disposal of Qingdao Xintiandi Solid Waste Comprehensive Disposal Co., Ltd.	R	30	0.028	0.83
6	No. 1 Rotary Kiln Incineration System of Shanghai Solid Waste Disposal Center	R	25	0.028	0.70
7	No. 2 Rotary Kiln Incineration System of Shanghai Solid Waste Disposal Center	R	25	0.028	0.70
8	No. 3 Rotary Kiln Incineration System of Shanghai Solid Waste Disposal Center	R	72	0.028	2.00
9	Production Line of Medical Waste Incineration of Yanji Solid Waste Disposal Co., Ltd.	B	8	0.046	0.37
10	Zhengzhou Hanyang Tianchen Hazardous Waste Disposal Co., Ltd.	C	30	0.036	1.09
11	Beihai Longzhong Environmental Protection Co., Ltd.	B	5	0.046	0.23
12	No. 1 Production Line of Tianjin Hanyang Huihe Environmental Protection Technology Co., Ltd.	C	30	0.036	1.09
13	No. 2 Production Line of Tianjin Hanyang Huihe Environmental Protection Technology Co., Ltd.	C	30	0.036	1.09
14	No. II Production Line of Beijing Runtai Environmental Protection Technology Co., Ltd.	R	22.5	0.028	0.63
15	No. I Production Line of Beijing Runtai Environmental Protection Technology Co., Ltd.	R	22.5	0.028	0.63
17	Qinzhou Shidai Environmental Protection Technology Co., Ltd.	B	5	0.046	0.23
18	Hunan Hanyang Environmental Protection Technology Co., Ltd.	R	5	0.028	0.14
Total					13.19

By-batch feeding Pyrolysis (B); Continuous feeding Pyrolysis (C); Rotary Kiln (R)

### 3.2. Non-incineration disposal facilities

Item	Facility Location	Tech. Type	Capacity (t/d)
1	Beijing	Autoclave	10
2	Xuancheng City	Autoclave	3
3	Lu'an City	Autoclave	5
4	Wuzhou City	Autoclave	3
5	Fangchenggang City	Autoclave	3
6	Guigang City	Autoclave	5
7	Baise City	Autoclave	5
8	Hezhou City	Autoclave	3
9	Laibin City	Autoclave	3
10	Chongzuo City	Autoclave	3
11	Pingliang City	Microwave	3
12	Tianshui City	Autoclave	5
13	Qingyang City	Autoclave	3
14	Longnan City	Autoclave	3
15	Baiyin City	Autoclave	3
16	Jiuquan City	Autoclave	3
17	Jiayuguan City	Autoclave	3
18	Zhangye City	Autoclave	3
19	Jinchang City	Autoclave	3
20	Wuwei City	Autoclave	3
21	Dingxi City	Autoclave	3
22	Linxia Autonomous Prefecture	Autoclave	3
23	Gannan Autonomous Prefecture	Autoclave	3
24	Southwest Guizhou Autonomous Prefecture	Autoclave	3
25	Southeast Guizhou Autonomous Prefecture	Autoclave	3
26	South Guizhou Autonomous Prefecture	Autoclave	3
27	Anshun City	Autoclave	3
28	Tongren City	Autoclave	3
29	Bijie City	Autoclave	3
30	Zunyi City	Autoclave	5
31	Zhangjiakou City	Chemical	8
32	Yichun City	Autoclave	3
33	Qitaihe City	Autoclave	3
34	Heihe City	Autoclave	5
35	Shuangyashan City	Microwave	3
36	Mudanjiang City	Microwave	5
37	Jixi City	Autoclave	5
38	Suihua City	Autoclave	5
39	Da Hinggan Ling Area	Autoclave	3
40	Heilongjiang Province	Autoclave	5
41	Heilongjiang Province	Autoclave	10
42	Shaoyang City	Chemical	8
43	Chenzhou City	Chemical	5
44	West Hunan Autonomous Prefecture	Autoclave	5
45	Siping City	Autoclave	6
46	Tonghua City	Autoclave	5
47	Jingdezhen City	Autoclave	3

Item	Facility Location	Tech. Type	Capacity (t/d)
48	Pingxiang City	Autoclave	3
49	Xinyu City	Autoclave	3
50	Yichun City	Autoclave	5
51	Hulun Buir City	Autoclave	3
52	Xilin Gol League	Autoclave	3
53	Ulanqab City	Autoclave	3
54	Ordos City	Autoclave	4
55	Bayan Nur City	Autoclave	3
56	Alashan Autonomous Prefecture	Autoclave	3
57	Wuzhong City	Autoclave	3
58	Guyuan City	Autoclave	3
59	Shizuishan City	Autoclave	3
60	Zhongwei City	Autoclave	3
61	Weifang City	Chemical	16
62	Tai'an City	Autoclave	8
63	Linyi City	Autoclave	10
64	Lvliang City	Autoclave	3
65	Changzhi City	Autoclave	5
66	Baoji City	Autoclave	5
67	Ankang City	Autoclave	3
68	Yan'an City	Autoclave	3
69	Meishan City	Autoclave	3
70	Liangshan Prefecture	Autoclave	3
71	Guangyuan City	Autoclave	5
72	Ziyang City	Autoclave	5
73	Bazhong City	Autoclave	3
74	Nanchong City	Autoclave	5
75	Zigong City	Autoclave	3
76	Deyang City	Autoclave	5
77	Ya'an City	Autoclave	3
78	Suining City	Autoclave	3
79	Leshan City	Autoclave	5
80	Dazhou City	Autoclave	5
81	Yibin City	Autoclave	5
82	Luzhou City	Autoclave	5
83	Guang'an City	Autoclave	3
84	Neijiang City	Autoclave	3
85	Ngawa Prefecture	Autoclave	3
86	Ganzi Prefecture	Autoclave	3
87	Nyingchi Area	Autoclave	3
88	Qamdo City	Autoclave	3
89	Shigatse Area	Autoclave	3
90	Shannan Prefecture	Autoclave	3
91	Hami City	Autoclave	3
92	Changji City	Autoclave	3
93	Bayingol Prefecture	Autoclave	3
94	Tarbagatay Prefecture	Autoclave	3
95	Kashi City	Autoclave	3
96	Hotan Prefecture	Autoclave	3

Item	Facility Location	Tech. Type	Capacity (t/d)
97	Turpan Prefecture	Autoclave	3
98	Altay Prefecture	Autoclave	3
99	Yuxi City	Autoclave	3
100	Chuxiong City	Autoclave	5
101	Nujiang Prefecture	Autoclave	3
102	Xishuangbanna City	Autoclave	3
103	Lijiang City	Autoclave	3
104	Diqing Prefecture	Autoclave	1
105	Hangzhou City	Chemical	30
106	Fuling District, Chongqing City	Autoclave	5
107	Wanzhou District, Chongqing City	Autoclave	8
108	Qianjiang District, Chongqing City	Autoclave	3
109	Pingdingshan City	Autoclave	5
110	Hebi City	Autoclave	3
111	Xinxiang City	Chemical	8
112	Jiaozuo City	Chemical	5
113	Xuchang City	Autoclave	5
114	Luohe City	Autoclave	3
115	Sanmenxia City	Autoclave	5
116	Shangqiu City	Autoclave	8
117	Xinyang City	Autoclave	5
118	Zhumadian City	Autoclave	5
119	Jiyuan City	Chemical	5
120	Haidong City	Autoclave	3
121	Golmud City	Autoclave	3
122	Haixi Prefecture	Autoclave	3
123	Huangnan Prefecture	Autoclave	3
124	Hainan Prefecture	Autoclave	5
125	Haibei Prefecture	Autoclave	3
126	Guoluo Prefecture	Autoclave	3
127	Yushu Autonomous Prefecture	Autoclave	5
128	Anshan City	Chemical	8
129	Fuxin City	Chemical	5
130	Dandong City	Chemical	8
131	Chaoyang	Dry Heat	6
132	Panjin City	Autoclave	3
133	Changzhou City	Autoclave	5
134	Yangzhou City	Autoclave	15
135	Xiangyang City	Autoclave	8
136	Jingzhou City	Autoclave	8
137	Jingmen City	Autoclave	3
138	Ezhou City	Autoclave	3
139	Xiaogan City	Autoclave	5
140	Suizhou City	Autoclave	3
141	Enshi Autonomous Prefecture	Autoclave	3

#### **ANNEX IV: List of regulations/guidance issued by the central government**

1. Incineration of medical waste disposal. Specification for the facility performance test. HJ561-2010
2. BAT/BEP guidelines for medical waste, HJ-BAT-8, 2012
3. Centralized incineration of medical waste disposal. Technical specification for facility operation supervision and management. HJ516-2009
4. Technical Guideline of Monitoring on Dioxins Emission from Hazardous Waste (including Medical Waste) Incinerators, MEP, HJ/T 365-2007
5. Circular of the Promotion of Medical Institutions for Classified Management of Domestic Garbage G. W. B. Y. F. [2017] No. 30
6. Circular on further strengthening of medical waste management, NHFPC and MEP, 2013
7. Environmental Pollution Prevention and Control Law of Solid Wastes (Amendment), MEP, 2016
8. National Hazardous Wastes Catalogue, MEP, 2016
9. The 13th five-year plan for ecological and environmental protection, State Council, 2016
10. Technical Guidelines for Environmental Protection in Medical Organization for Check and Accept of Completed Project, MEP, 2016
11. Guide for the assessment of environmental impact of hazardous waste in construction projects, MEP, 2017
12. The 13th five-year plan for state environmental protection standards, MEP, 2017
13. Annual report on the prevention and control of environmental pollution by solid waste in the scaled municipalities in China (2014 and 2016), MEP, 2015 and 2017
14. The 12th five-year plan for the prevention and control of hazardous waste pollution, MEP, 2012
15. Guiding Opinions on Strengthening Dioxins Pollution Prevention and Control, MEP, 2011
16. Technical policy on prevention and control of dioxin pollution in key industries, MEP, 2015
17. China's 12th five-year plan for the prevention and control of persistent organic pollutants in major industries, MEP, 2012  
The state encouraging development catalogue of environmental protection technologies, MEP, 2013

#### **In the pipe for policy making and issuing**

1. Non - incineration disposal of medical wastes in a centralized facility. Performance test specification, MEP
2. Incineration of hazardous waste pollution control standards, prepared by MEP (Circular for public comments in 2014)
3. Non - incineration disposal of medical wastes pollution control standards, prepared by MEP
4. Non - incineration medical waste centralized treatment facility. Technical specification for operation supervision and management. Prepared by MEP
5. Technical specification for the construction of centralized disposal of medical waste incinerator facility construction technical specifications, prepared by MEP
6. Chemical disinfection of medical waste centralized treatment engineering technical specification, prepared by MEP
7. Microwave disinfection of medical waste centralized treatment engineering technical specification, prepared by MEP
8. Centralized disposal engineering technical specification of medical waste steam sterilization, prepared by MEP
9. Medical waste disposal technology of pollution control policies, prepared by MEP

#### **Guidelines and manuals developed and internally used in the project**

1. Technical guideline for the environmental impact assessment of medical waste disposal, Considered in EIA guidelines for solid waste.
2. Economic Policy Research for Medical waste treatment and disposal-
3. Technical requirements for the environmental protection certification of medical waste incineration equipment, adopted by EPIA (Beijing) Certification Center



4. Technical requirements for the environmental protection certification of equipment for the processing of medical waste through chemical disinfection, adopted by EPIA (Beijing) Certification Center (Beijing) Certification Center
5. Technical requirements for the environmental protection certification of equipment for the processing of medical waste through microwave disinfection, adopted by EPIA (Beijing) Certification Center
6. Technical requirements for the environmental protection certification of equipment for the processing of medical waste through steam treatment, adopted by EPIA (Beijing) Certification Center
7. Medical waste categories, prepared by National Health and Family Planning Commission
8. Internal guidelines for Medical Waste management by medical institutions, prepared by National Health and Family Planning Commission
9. Emergency guidelines for the operation of medical waste disposal facilities
10. Performance Evaluation Guidelines for medical waste treatment facilities
11. Guidelines for medical waste treatment and disposal facilities engineering construction cost
12. BAT/BEP Operation and management manual for rotary kiln incinerators for the disposal of medical waste.
13. BAT/BEP Operation and management manual for pyrolysis facilities for the disposal of medical waste.
14. BAT/BEP Operation and management manual for non-incineration medical waste facilities
15. BAT/BEP manual for medical waste management and disposal in remote areas
16. Supervision and management methods for medical waste management in medical and health institution
17. Health Care Training Series textbooks on medical waste management
18. Medical treatment facility operation and management training series textbooks
19. Technical Training Tutorial of Environmentally Sustainable Supervision and Management of Medical Waste
20. Technical Training Tutorial of Operation Management of Medical Waste Incineration Facilities
21. Technical Training Tutorial of Operation Management of Medical Waste Non-incineration Facilities
22. Training measures for the administration of medical waste management – Health
23. Training measures for the administration of Medical Waste Management - Environmental Protection
24. Training materials for the medical waste disposal business model
25. Guidance of Application for Demonstration, Promotion and Incentive Plan
26. Action Program of Demonstration, Promotion and Incentive Plan
27. Acceptance Check Plan of demonstrations

**Local regulations and policies:**

**Demonstration Provinces:**

1. Comments of the People's Government of Gansu Province on Further Strengthening of the Supervision and Management of Hazardous Wastes (G. Z. F. [2014] No. 102)
2. Comments of Gansu Province Health and Family Planning Commission and Department of Environmental Protection of Gansu Province on Further Strengthening of the Management of Medical Waste (G. W. Y. Z. F. [2014] No. 534)
3. Notice of Department of Environmental Protection of Gansu Province and Gansu Province Health and Family Planning Commission on Practically Strengthening of the Safety Disposal of Medical Waste (G. H. F. [2015] No. 113)
4. Notice of Establishment of Leading Group of Medical Waste Comprehensive Management and Co-processing Subproject in Henan Province (Y. H. W. [2014] No. 15)
5. Implementation Plan for Medical Waste Comprehensive Management and Co-processing Demonstration Project in Henan Province jointly printed and issued by Department of Environmental Protection and Henan Province and Henan Province Health and Family Planning Commission
6. Notice on Strengthening the Implementation Plan for Medical Waste Supervision and Management in the Whole Province (Henan)

7. Notice of Department of Environmental Protection of Henan Province on Printing and Issuing Working Points of Solid Waste Environment Supervision and Management in Henan Province in 2015 (Y. H. B. [2015] No. 21)
8. Notice of Department of Environmental Protection of Henan Province on Development of Supervision and Other Special Supervisions after Hazardous Waste Standardized Management in Henan Province (Y. H. M. D. [2013] No. 48)
9. Notification on Assessment of Hazardous Waste Standardized Management Supervision in Henan Province in 2014 (Y. H. B. [2015] No. 38)
10. Notice of Department of Environmental Protection of Henan Province on Development of Supervision after Hazardous Waste Standardized Management in Henan Province (Y. H. M. D. [2015] No. 90)
11. Trial Measures for Performance Assessment of Primary-level Medical and Health Care Institutions in Jilin Province
12. Standards for Performance Assessment of Community Health Services Center in Jilin Province
13. Implementation Plan of Hazardous Waste Supervision and Management Internet of Things System Construction Project (Phase I) in Hubei Province (E. H. B. [2014] No. 63)
14. Emergency Notice on Professional Skill Training of Medical Waste Environment Sustainable Management, Medical Waste Comprehensive Management and Co-processing Project in Hubei Province (E. H. G. W. [2014] No. 8)
15. Notice of Development of Special Inspection for Medical Waste in the Whole Province E. W. S. J. S. T. [2014] No. 173
16. Notification on Joint Inspection for Medical Waste in the Whole Province E. W. S. J. S. T. B. [2014] No. 84
17. Medical Waste Emergency Disposal in Wuhan City of Department of Environmental Protection of Hubei Province E. H. B. W. [2014] No. 15
18. Letter for Coordination of Medical Waste Disposal Problems of Hubei Province Health and Family Planning Commission
19. Reply for Coordination of Medical Waste of Department of Environmental Protection E. H. H. [2014] No. 148
20. Letter for Coordination of Medical Waste Disposal Problems of Department of Environmental Protection of Hubei Province
21. Notification on Assessment of Hazardous Waste Declaration Registration and Hazardous Waste Standardized Management Supervision in the Whole Province in 2013 E. H. B. [2014] No. 302 Document

**Demonstration Cities: Changchun**

1. Implementation Scheme for Establishment of Demonstration City of Comprehensive Management of Medical Waste in Changchun City
2. *Scheme for Comprehensive Management of Medical Waste in Changchun*
3. Methods on Centralized Management of Medical Waste for Small Medical Institution in Kuancheng District
4. Emergency Plan for Medical Waste Management in Changchun City
5. Scheme for Medical Waste Treatment in Small Clinic and Class I Medical Institution of Towns
6. Scheme for Training Work of Medical Waste
7. Regulations on Safety Management and Disposal for Waste out of Disposal Range of Facilities in Changchun City
8. Plans of Public Participation
9. *Notice on the Further Improvement for Management Work of Medical Waste and Others* issued by Health Bureau of Changchun
10. Notice on *Suggestions for Further Strengthening of Supervision Work of Hazardous Waste and Medical Waste for Ministry of Environmental Protection and Ministry of Health* forwarded by Medical Administration Division of Health Bureau of Changchun

11. Notice on Special Examination of Fiberning Medical Waste in Medical and Health Institutions issued by Health Bureau of Changchun
12. Notice on Issuing of *Survey Form for Management Item Promotion to Medical Institutions* by Health Bureau of Changchun
13. Notice on Convening of Meeting for Management Item Promotion of Medical Waste of Medical Institutions by Health Bureau of Changchun
14. Research Scheme for Promotion of Management Item of Medical Waste by Health Bureau of Changchun
15. Notice on Promotion of Medical Waste Management of Medical Institutions forwarded by Health Department of Health Bureau of Changchun
16. Notice on Special Examination for Management of Medical Waste of Medical Institutions in Changchun City by Health Supervision Institute of Health Bureau of Changchun
17. *Notice on Relevant Problems of Standard Management Strengthening of Medical Waste* issued by Changchun Environmental Protection Bureau
18. *Notice on Special Checking for Specification Disposal of Medical Waste* issued by Changchun Environmental Protection Bureau
19. Notice on the *Notice of Transmitting of the Further Strengthening of Management for Medical Waste for National Health and Family Planning Commission of the People's Republic of China and General Office of the Ministry of Environmental Protection of the People's Republic of China* issued by Health Bureau of Changchun and Changchun Environmental Protection Bureau
20. Notice on Issuing of Scheme for *2014 Spring Actions Plan for Thorough Inspection and Rectification of Environmental Safety Hazard of Changchun* issued by Changchun Environmental Protection Bureau
21. List on *Sorted Collection of Medical Waste in Changchun City of Jilin Province* (a Trial Draft of Pilot Unit) issued by Infection Management Quality Control Center of Hospitals in Jilin Province
22. Notice on Development of "Green Hospital" Joint Construction Activity jointly issued by Changchun Environmental Protection Bureau and Changchun Health Bureau
23. Notice on Standardization of the Placenta Disposal of Maternal Mortality after Delivery in Changchun City of Changchun Health Bureau

**Demonstration cities: Xiaogan**

1. Letter about work of medical waste comprehensive management demonstration city
2. Notice on establishing the leading group of Xiaogan medical waste comprehensive management demonstration city
3. Notice on implementation scheme for Xiaogan medical waste comprehensive management demonstration city
4. Assignment agreement of Xiaogan medical waste comprehensive management demonstration city
5. Outline for work of medical waste comprehensive management demonstration city
6. Management methods for medical wastes in Xiaogan City
7. Implementations rules of management methods for medical wastes in Xiaogan City
8. Notice on list for classified collection of medical wastes in Xiaogan City
9. Notice of Xiaogan on centralized storage and disposal of medical wastes
10. Report on the implementation of *Management Methods for Medical Wastes in Xiaogan*
11. Notice on carrying out pollution prevention supervision of medical wastes
12. Scheme for centralized storage activity of medical wastes in Xiaogan City
13. Report on special inspection of medical waste management in Xiaogan City
14. Xiaogan Environmental Protection Bureau issued X. H. [2013] No. 4 Document
15. Xiaogan Environmental Protection Bureau issued the Management Methods for Medical Wastes in Township Hospitals, Village Clinics and Individual Clinics in Xiaogan.
16. E. W. S. J. S. T. [2014] No. 173 Document - Notice on carrying out the special inspection of medical wastes in the whole province
17. E. H. B. [2014] No. 63 Document - Notice on printing and issuing the Implementation Scheme for Hazardous Waste Supervision IOT System Construction Project.

18. X. H. B. [2015] No. 1 Document, issued by Xiaogan Environmental Protection Bureau
19. Emergency plan for medical waste disposal in Xiaogan City
20. Emergency plan for unexpected environmental events in Xiaogan City
21. Work and action plan for sustainable management project on medical wastes in Xiaogan City
22. Announcement on Public Soliciting for Proposed Standard Suggestions on Charges of Centralized Disposal of Medical Waste of Xiaogan City issued by Xiaogan Price Bureau

**Demonstration cities: Pingliang**

1. Methods on Temporary Management for Centralized Disposal of Medical Waste in Pingliang City
2. Notice on Preparing of Charge Standard for Centralized Disposal (Trial) of Medical Waste in Pingliang City
3. Implementation Scheme for Comprehensive Management of Medical Waste in Pingliang City
4. Implementation Scheme for Works of Demonstration City of Comprehensive Management of Medical Waste in Pingliang City
5. Methods on Sorted Collection of Medical Waste in Pingliang City (Temporary)
6. Standards for Quantitative Assessment of Medical Waste Management in Medical Institutions in Pingliang City
7. Temporary Methods on Medical Waste Disposal of Medical Institutions in Remote Rural Areas in Pingliang City
8. Methods on Joint Management of Medical Waste in Pingliang City
9. Plans for Public Participation in Comprehensive Management of Medical Waste in Pingliang City
10. Management Methods on Medical Waste in Pingliang City
11. System of Declaration and Registration of Medical Waste in Pingliang City
12. Training Schemes for Comprehensive Management of Medical Waste in Pingliang City
13. Technical Regulations on Disposal of Medical Waste in Pingliang City (Trial)
14. Schemes for Safety Management and Disposal for Waste out of Disposal Range of Facilities in Pingliang City
15. Emergency Plans for Environment Emergency Accidents of Centralized Disposal Center of Medical Waste in Pingliang City
16. Approval on Adjusting for Treatment Charges of Domestic Waste and Charge Standard of Centralized Treatment for Medical Waste of Urban Area in Pingliang City

**Demonstration cities: Nanchang**

1. Implementation Scheme for Works of Demonstration City of Comprehensive Management of Medical Waste in Nanchang City
2. Implementation Scheme on Further Strengthening of Hazardous Waste and Supervision of Medical Waste in Nanchang City
3. Notice on Special Examination of Law Enforcement of Medicine Waste Disposal in Medical Institutions in Nanchang City
4. Notice on the Forwarding of Working Scheme for Centralized Disposal of Medicine Waste of Town level Medical Institutions issued by City Environmental Protection Bureau of Nanchang
5. Notice on Strengthening of Centralized Disposal of Medical Waste in Nanchang City
6. Notice on Preparing of Charge Standard for Centralized Disposal of Medical Waste for Town Center Hospital and Town Hospital in Nanchang City

**Demonstration cities: Xinxiang**

1. Regulations on Medical Waste Management in Xinxiang City
2. Notice on Further Definition of Supervision Duty and Strengthening of Management of Medical Waste Disposal
3. Management Scheme of Comprehensive Management of Medical Waste in Xinxiang City
4. Notice on Charge Standard for Centralized Disposal of Medical Waste in Xinxiang City
5. Notice on Joint Conference System for Demonstration City of Comprehensive Management of Medical Waste in Xinxiang City

6. Schemes for Joint Law Enforcement Supervision for Comprehensive Management of Medical Waste in Xinxiang City
7. Emergency Plans for Emergencies of Medical Waste Disposal of Xinxiang City
8. Notice on Strengthening Supervision and Management for Flowing of Medical Waste issued by Office of People's Government in Xinxiang City
9. Plans for Public Participation in Demonstration City Projects for Comprehensive Management of Medical Waste in Xinxiang City
10. Safety Management and Disposal Scheme for Waste out of Disposal Range of Facilities of City Medical Waste Disposal Center in Xinxiang City
11. Management Scheme for Collection of Medical Waste in Small Clinic and Class I Hospitals in Xinxiang City
12. Scheme on the Further Strengthening of Sort Management and Reduction of Medical Waste Source in Medical and Health Institutions in Xinxiang City
13. Notice on Adjusting the Disposal Fees of Medical Waste in Xinxiang City

**Demonstration cities: Huaihua**

1. Scheme for Establishment of National Demonstration City of Comprehensive Management of Medical Waste in Huaihua City
2. Joint Management System of Medical Waste in Huaihua City
3. Account System of Medical Waste Management
4. System on Sort Collection and Management of Medical Waste in Huaihua City (temporary)
5. System on Medical Waste Disposal Management of Medical Institutions in Remote Rural Areas in Huaihua City (temporary)
6. Emergency Plan for Medical Waste Management in Huaihua City
7. Emergency Disposal Scheme for Medical Waste Disposal in Huaihua City
8. Approval on the Verification of Charge Standard of Medical Waste Disposal of Tianyuan Environmental Protection Technology Co., Ltd. in Huaihua City

**Demonstration cities: Shennongjia (Rural area)**

1. Methods on Medical Waste Management in Shennongjia Forestry District (S. Z. F. [2017] No. 13)
2. <http://www.snj.gov.cn/gov/info/egovinfo/1029/xxgknry/snjzf-16c/2017-0613001.htm>
3. Operation and Management System of Centralized Disposal Facilities of Medical Waste in Shennongjia Forestry District
4. Temporary Provisions on Collection, Transfer, Temporary Storage of Medical Waste in Shennongjia Forestry District
5. Supplementary Provisions on Centralized Collection, Transfer and other Management of Medical Waste in Shennongjia Forestry District
6. Provisions on Internal Medical Waste Management of Medical Institutions in Shennongjia Forestry District
7. Emergency Plan on Management and Disposal of Medical Waste in Shennongjia Forestry District

**ANNEX V: List of people met**

<b>List of people met</b>
Cai Lin, General Manager, VEOLIA SW Disposal Center
Cao Xianwei, Director, First Hospital of Nanchang University
Chang Zheng, Director, Environmental Hyge Management Division, Gansu
Chen Xiuwen, Director, Jiangxi Children's Hospital
Chen Yang, Professor, IHEP
Chen Yu, Jiangxi Provincial Health and Family Planning Commission
Chen Yukun, Director, First Hospital of Jilin University
Dai Fengwei, Provincial SW Management Center
Fan Qiuping, Director, First hospital of Zhenzhou University
Fang Pingping, General Manager, Nanchang MW Disposal Center
Fu Qiang, Deputy Director General, NIHA, NHFPC
Gang Chen (Shenyang Academy of Environmental Science),
Ge Weinian, Division director, Jinlin Solid Waste Managment Center
Ge Yuri, Manager of CETC
Gou Jinqu, Director, Jinlin Solid Waste Managment Center
Guan Yuying, Director, Changchun Central Hospital
Guo Chengyin, General manager, Changchun MW Disposal Center,
Guo Jingqu, Director, Jilin Provincial Solidwaste Management Center
Hu Guoliang, Vice-director, Shanghai SW Management Center
Hu Mei, Director, Ninth Hospital of Nanchang Municipality
Huang Jing, Director, Beijing You'an Hospital of Capital Medical University
Jiang Feng, Consultant, President of Beijing Envisolve Company Co. Ltd.
Jiang Wenbo, Enviornmental management division, Changchun MW Disposal Center
Kang Peisong, General Engineering, VEOLIA SW Disposal Center
Li Chunlan, Deputy Division-Director, Jilin Provincial Medical Administration
Li Han, First Hospital of Jilin University
Li Liuyi, Division Director, First hospital of Peking University
Li Suying, Senior Doctor, Beijing You'an Hospital of Capital Medical University

<b>List of people met</b>
Li Tuo, General Engineer,
Liang Weiwei, Changchun Central Hospital
Liang, VEOLIA SW Disposal Center
Liao Liang (Deputy District District, Kongtong District, Pingliang, Gansu)
Liu Hongqiang(Huaihua Environmental Protection Bureau)
Liu Jianqing, Director, SW managerment center, Jiangxi EPB
Liu Jinhong( Deputy director, MW Disposal Center (microwave), Pingliang, Gansu)
Liu Yongxuan, SW managerment center, Jiangxi EPB
Luo Jiaosheng, General Engineer, Provincial SW Management Center of Jianxi EPB
Luo Lisheng, Division Director, Jiangxi Provincial Health and Family Planning Commission
Luo Xiaoli, Director, Quality control Center on Healthcare-associated Infection Control of Jiangxi Provincial
Pan Wenjing, Changchun Municipal Solidwaste Management Center
Ren Yong (FECO)
Ren Zhiyuan, Project Officer, FECO
Shan Shujuan, Deputy Director, National Institute of Hospital Administration
Shi Xinlong, Deputy-CEO, Shanghai HW disposal Center
Sun Liping, Director, Second Hospital of Jilin University
Sun Ning, Chinese Academy of Environmental Planning
Sun Ning, Professor, Chinese Academy of Environmental Planning,
Tang Jie, Deputy-CTO, Shanghai HW disposal Center
Wang Dayong, Deputy Genral manager, Changchun MW Disposal Center
Wang Fuming, Tianjin University
Wang Haifeng, Vice President, First Hospital of Jilin University
Wang Mengyun, Project Assistant, CIO, FECO
Wang Xiaohe, Deputy-Director, Jilin Provincial Solidwaste Management Center
Wang Xiaowei, Chief Technical Officer, Changchun MW Disposal Center
Wang Yaobin, Changchun Municipal Solid Waste Managment Center
Wen Hua, Jiangxi Provincial Health and Family Planning Commission

<b>List of people met</b>
Wu Anhua, Director, Xiangya Hospital of Zhongnan University
Wu Yingbin, Director, People's Hospital of Peking University
Xiahou Juan, Deputy-Director, SW management center, Jiangxi EPB
Xiong Wei, Director, Tongji Hospital of Huazhong University of Science and Technology
Xu Jie, Changchun Municipal Solidwaste Management Center
Xu Shujian, Jiangxi Children's Hospital
Xu Shujuan, Senior Doctor, Jiangxi Children's Hospital
Xu Yucheng, Changchun Municipal Solidwaste Management Center
Xu Zheng, First Hospital of Nanchang University
Yan Zhenhui, CTO, Shanghai HW disposal Center
Yang Chuqing(Deputy Secretary General of Huaihua Municipal Government)
Yang Hangsheng (Zhejiang University)
Yang Jiangmiao, Director, Jilin Cancer Hospital
Yang Shaojun, Division Director of Soil Environmental Division, Jiangxi EPB
Yang Yunhai, Director, Second Hospital of Jilin University
Yin Yanling, Second hospital of Jilin University, Nightingale Prize Awarded
Yu Lina, Chief Nurse, Changchun Central Hospital
Zha Ping, Director, Shanghai SW Management Center
Zhang Jian, Director, People's Hospital of Gansu Province
Zhang Wei, Vice-President, First Hospital of Nanchang University
Zhang Xiaokang, President of Jiangxi Children's Hospital
Zhang Yiquan, Director, Jilin Provincial Medical Administration
Zhang Zheng, CAEP
Zhang Zhicheng, Vice-President of Ninth Hospital of Nanchang Municipality
Zhao Xiaoqi, Changchun Municipal Solidwaste Management Center
Zhou Bin, Director, First Hospital of Nanchang University
Zhu Bo, First Hospital of Jilin University
Zhu Guigang, Manager, Changchun MW Disposal Center



## ANNEX VI: List of documents reviewed

[1]	People Republic of China, "National Plan for the Construction of Hazardous and Medical Waste Disposal Facilities," 2004.
[2]	People Republic of China, "National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutant," 2007.
[3]	UNIDO, "UNIDO ANNUAL PROJECT IMPLEMENTATION REPORT (PIR) Fiscal Year (FY) 2016 (1 July 2015 – 30 June 2016)," 2016.
[4]	MEP/FECO, "Inception Workshop of Environmentally Sustainable Management of Medical Wastes in China," 2008.
[5]	B. H. Y. S. Q. L. B. C. T. H. J. Q. W. H. Z. Z. Xiaodong Gao <sup>1</sup> , "A large-scale survey on sharp injuries among hospital-based healthcare workers in China," 2016.
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[8]	Chen Yang, IHEP, <i>Medical waste disposal pollution control BAT / BEP guidelines Subproject--work report</i> , 2017.
[9]	Chinese Academy For Environmental Planning, MEP, <i>Economic Policies for Centralized Medical Waste Disposal In China</i> , 2017.
[10]	Chinese Academy for Environmental Planning, <i>Commercial mode of centralized medical waste disposal</i> , 2017.
[11]	Chinese Academy for Environmental Planning, MEP, <i>Business Mode for Centralized Medical Waste Disposal in China</i> , 2017.
[12]	Chen Yang, IHEP, <i>Medical waste disposal environmental protection product certification and disposal technology assessment system</i> , 2017.
[13]	People Republic of China, <i>Technical Specifications for Operation Supervision and Management of Centralized Incineration Disposal Facilities of Medical Wastes (HJ519-2009)</i> ., 2009.
[14]	Tianjin Hejiaveolia environmental services Co.,Ltd, <i>Technical guidelines for emergency management of medical waste management and disposal, (in Chinese)</i> , 2017.
[15]	Yang Hangsheng, Zhejiang University, <i>R&amp;D of SCR Technology for the abatement of Dioxins/NOX Emitted from Flue gases</i> , 2017.
[16]	Wang Fumin, Tianjin University , <i>R&amp;D and demonstration of medical waste non incineration treatment facilities VOCs and odor pollution control technology (in Chinese)</i> , 2017.
[17]	MEP/FECO and UNIDO, "Project document "Environmentally Sustainable Manageent of Medical Waste in China", " 2007.

[18]	O'Laoir Russel Associates - Environmental Consulting, "SPECIAL SERVICE AGREEMENT – E-697608 / 07-279/CC/BLB ISSION REPORT Environmentally Sustainable Management of Medical Wastes in China," 2007.
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[20]	D. O'Laoire, <i>Workshop on Feasibility Assessment for the Recovery and Reuse of Medical Waste Residues</i> , Forlì, October 2013, 2013.
[21]	Y. Zhou, <i>Personal communication through email</i> , 2017.
[22]	FECO, <i>List of MW disposal facilities</i> , 2017.
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[24]	UNIDO, "UNIDO ANNUAL PROJECT IMPLEMENTATION REPORT (PIR) Fiscal Year (FY) 2015 (1 July 2014 – 30 June 2015)," 2015.
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[26]	MEP/FECO, "Final Report of the 5th Tripartite Meeting and the Relevant Reports for 2014, 2015, 2016 and 2017," 2017.
[27]	<i>GEF Project - Environmentally Sustainable Management of Medical Waste in China</i> . [Film]. FECO, 2017.
[28]	Shanghai Solid Waste Disposal Center, "Project Report. The Incentive Plan for Demonstration and Popularization of the Best Available Technology for Medical Waste Incineration Facilities," Shanghai, 2017.
[29]	NIHA, <i>Report on the Reduction of Medical Waste in Pilot Medical Institutions</i> , 2017.
[30]	Department of Environmental Protection of Henan Province, <i>Work Report on Henan Province's Integrated Medical Waste Management and Co-disposal Demonstration Province Project</i> , 2017.
[31]	Xinxiang municipal government, <i>Report on the establishment of Xinxiang medical waste comprehensive management demonstration city</i> , 2017.
[32]	Jilin University First Hospital, "The Checking and Acceptance Report on Sustainable Management of Medical Waste in China," Jiling, 2017.
[33]	M. Y. e. a. Xiao-dong Li, "Levels of PCDD/Fs in soil in the vicinity of a medical waste incinerator in China: The temporal variation during 2007–2009," <i>Journal of Hazardous Materials</i> , 2010, vol. 179, p. 783–789, 2010.
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[36]	NIHA, <i>BEP Management Demonstration and Promotion of Medical Waste in Medical Institution</i> , 2017.
[37]	MEP/FECO, "Application of Best Available Techniques for Medical Waste Incinerators Action Program of Demonstration, Promotion and Incentive Plan," April 2014.
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[40]	Fang Pingping, Nanchang medical waste disposal center, <i>Demonstration report of Nanchang medical waste disposal center</i> , 2017.
[41]	Huaihua Tianyuan Environmental Science and Technology Co.,Ltd and Huaihua Medical Waste Disposal Center, "The Introduction of BAT/BEP Demonstration Project for Centralized Medical Waste Pyrolytic Incineration Facility in Huaihua City," July 2017.
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[43]	People Republic of China, "13th Five-Year Plan for Eco-Environmental Protection," 2016.
[44]	NIHA, <i>Summary report on training system construction of medical waste management project in medical institutions</i> , 2017.
[45]	<i>4 years practice in integrated management and co-disposal of medical waste in Henan Province</i> . [Film]. Henan Province, 2016.
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