Final Evaluation and Learning Exercise of the China Integrated Waste Management (IWM) Project

Mitigation Action Project Evaluation and Learning Exercises for the Mitigation Action Facility

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Final Report

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The results and analysis included in the report are based on an external and independent evaluation conducted by the consortium AMBERO-OPM. The conclusions drawn in the report do not necessarily reflect the official views of the Mitigation Action Facility and/or of the project under evaluation.

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Preface

The Mitigation Action Facility is a joint initiative of the German Federal Ministry for Economic Affairs and Climate Action (BMWK), UK's Department for Energy Security and Net Zero, the Danish Ministry of Climate, Energy and Utilities (KEFM), the Danish Ministry of Foreign Affairs (MFA), the European Union and the Children's Investment Fund Foundation (CIFF). The Mitigation Action Facility evolved from the NAMA Facility, which was established in 2012. The Mitigation Action Facility's vision is to accelerate decarbonisation to keep temperature rises to below 1.5 degrees Celsius by financing measures that shift priority sectors in a country towards a sustainable, carbon-neutral pathway. All projects with an overall duration of more than three years are subject to a mid-term and a final evaluation and learning exercise.

The Technical Support Unit (TSU) functions as the secretariat of the Mitigation Action Facility. The TSU commissioned AMBERO and Oxford Policy Management to conduct mid-term and final Evaluation and Learning Exercises (ELEs). Each ELE is conducted using the same Theoretical Framework (FW), which involves the application of a document review, participatory workshops, and stakeholder interviews to collect evidence about projects' results and lessons analysed using a Theory-based approach centred on the use of contribution analysis reinforced by elements of process tracing.

This document presents the findings of the **Final ELE of the China Integrated Waste Management (IWM) Project.** The report has been reviewed by Luca Petrarulo (Technical Lead, project ELE Team). For further information, please contact vera@ambero.de.

Executive summary

This document presents the findings of the **Final Evaluation and Learning Exercise (ELE) of the China Integrated Waste Management (IWM) Project**. The ELE was undertaken during the period March-July 2023. In accordance with the Terms of Reference, this ELE sought to address the following questions:

- Has the project achieved its planned results?
- Has the project started to trigger transformational change?
- What can be learnt from the project?

The main goal of the project is to support transforming the solid waste management sector in Chinese cities into a low-carbon, modern, integrated environmental service sector. The project (budget EUR 8 million) ran from September 2017 to September 2022, with a no-cost extension to October 2023. **The project is designed around five replicable IWM pilot cities (PCs), Suzhou, Xi'an, Tai'an, Lanzhou and Bengbu, covering a combined population of 18 million.**

The **main project components** include the provision of technical assistance and training to pilot cities in areas related to the Best Available Technology (BAT) and Best Environmental Practice (BEP) in IWM, the implementation of replicable and financially sustainable business models, the development of Key Performance Indicators (KPIs) for assessing the integration of municipal waste management systems, and conducting Life Cycle Assessments (LCA) of various waste management solutions to visualise improvements and compare results to baseline. **An important component of the project was the development of a Measuring, Reporting and Verification (MRV) system** to enable an analysis of GHG mitigation effects of different IWM solutions, intending to help to both inform city government decision-making and link solid waste management (SWM) improvements to the Chinese carbon market. **Recommendations were also made at the national policy level** via the Project Partners, the Ministry of Housing, Urban and Rural Development (MoHURD) and the China Association of Urban Environmental Sanitation (CAUES).

The project's Theory of Change (ToC) foresaw five main causal pathways to addressing the problem and barriers identified and achieving the **two planned outcomes** of i) reducing GHG emissions in China's waste sector; and ii) increasing the attractiveness of IWM and Waste to Energy (WTE) systems as financially interesting low-carbon investment fields.

This final ELE highlighted the following key findings[1]:

- **The project is highly relevant** to national and PCs' needs and other relevant stakeholders.
- **The project delivery and quality of outputs were reported as being excellent.** Communication and visibility were implemented efficiently via a comprehensive communications strategy.

[1] Please see the report's Section 3 for the full findings.

- **The project has led to a cumulative direct reduction of 5,921,720 tCO2e since 2019** which greatly exceeded the original target of 433,100 - 736,270 CO2e by the end of the project.
- The project has made an **important contribution to the awareness of private sector entities in commercial opportunities, and subsequent investment, related to IWM and WTE systems**.
- **The project has played an important catalysing role** in the shift of the PCs towards IWM practice and investments**. It is challenging to directly attribute the large GHG emission reductions and investments in IWM infrastructure directly to the project.**
- **The project has made excellent progress in developing the MRV** and implementing this at the city level, but **has not been able to fully exploit the role of carbon trading to incentivise private sector investment in IWM activities**.
- **The project is on track to achieving transformational change:** it clearly demonstrated the effectiveness of IWM as a mitigation solution with strong buy-in from the Project Partners and the PC governments; it started causing a catalytic effect in terms of raising the awareness of citizens and the interest of the private sector in IWM, supporting the change of crucial enabling regulations and policies, and obtaining written commitment from an additional group of 11 cities to use the project-backed MRV system and IWM best practices; and, because of this enabling environment, the project is likely to contribute to additional, long-term and sustained GHG savings in the medium/long-term.

Key learnings points for the sustained impact of the project arising from this ELE include:

- Partnership with both national and city-level political decision-making bodies, enabling engagement and communication, can facilitate further improvements to national policy.
- The MRV is complex for cities to implement, and significant capacity development and handholding are required for sustained impact.
- Carbon trading is challenging due to external factors and is not a significant revenue generator in the SWM sector.
- Cities seeking to replicate the experiences of the five PCs must create the necessary enabling environment conditions, such as staff capacity building, MRV implementation and training to ensure implementation, and so on.
- There are significant opportunities to continue replicating the project approach in other industries to measure and manage GHG emissions.

Recommendations for the sustained legacy of the project include the points below:

- GIZ should ensure that CAUES can maintain the availability of a platform to disseminate the best practices and knowledge developed by the project in the medium term.
- CAUES should continue to deliver knowledge management and capacity-building activities for city staff and other relevant stakeholders, based on the project approach. They should also maintain the comprehensive technical network in China that the project has developed.
- CAUES should maintain the policy-making participation channels within and between the national and local government levels and continue to support and facilitate private sector finance in IWM infrastructure and services.

- GIZ should liaise with TSU and international organisations and platforms to share the project knowledge and findings.
- GIZ should discuss with the Mitigation Action Facility the possibility of receiving a costed extension of the project to focus on supporting the uptake of the demonstrated IWM solutions by the most promising group of the 11 cities and, to a minor extent, potential replication in other sectors.
- GIZ could review the GHG mitigation opportunities in waste management-related sectors, such as textiles waste and plastics, and potentially apply for a new Mitigation Action Facility-funded project to build on the success of this project.

Learning and recommendations for the Mitigation Action Facility portfolio, more broadly, have also been provided in Section 5 of the report.

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List of abbreviations

AD	Anaerobic Digestion
BAT	Best Available Technology
BAU	Business as Usual
BEP	Best Environmental Practice
BMWK	German Federal Ministry for Economic Affairs and Climate Action
BOT	Build-Operate-Transfer
CAAS	Chinese Academy of Agricultural Sciences
CAUES	China Association of Urban Environmental Sanitation
CCER	China Certified Emission Reduction
CDM	Clean Development Mechanism, a previous climate finance facility
CIFF	Children's Investment Fund Foundation
CNY	Chinese Yuan Renminbi = about 13 Eurocents at time of AR2022 writing
COVID-19	Corona Virus Disease 2019
CO_2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
CPC	Communist Party of China
CUCD	China Urban Construction Design and Research Institute
C&D	Construction and Demolition
DAC	The Development Assistance Committee of the Organisation for Economic Co-operation and Development (also referred to as OECD DAC)
NDC	Nationally Determined Contribution
DTU	Technical University of Denmark
ELE	Evaluation and Learning Exercise
ELEQ	Evaluation and Learning Exercise Question
EQ	Evaluation Question
ETS	Emissions Trading System
EU	European Union
EUR	Euros
FC	Financia Cooperation
FW	Theoretical Framework (the ELE standard methodology)
FYP	Five-year plan
GHG	Greenhouse Gases
GIZ	Gesellschaft für Internationale Zusammenarbeit
IOs	Intermediate Outcomes
IWM	Integrated Waste Management
KEFM	Danish Ministry of Climate, Energy and Utilities
KfW	KfW Development Bank (KfW – Kreditanstalt für Wiederaufbau)
KII	Key Informant Interview
KPI	Key Performance Indicator
Logframe	Logical Framework
MEE	Ministry of Ecology and Environment of the People's Republic of China
M&E	Monitoring and Evaluation
MFA	Danish Ministry of Foreign Affairs
MoHURD	Ministry of Housing and Urban Development

MOU	Memorandum of Understanding
MRV	Measuring, Reporting, and Verification
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
N2O	Nitrous oxide
NAMA	Nationally Appropriate Mitigation Actions
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organisation
OECD DAC	Organisation for Economic Co-operation and Development's Development Assistance Committee
OPM	Oxford Policy Management
PC	Pilot Cities
PPP	Public-Private Partnership
QA	Quality Assurance
QC	Quality Control
RAG	Red Amber Green
SWM	Solid Waste Management
TA	Technical Assistance
TC	Technical Cooperation
TCMF	Transformational Change Measurement Framework
ToC	Theory of Change
ToT	Training of Trainers
TS	Types of Sources
TSU	Technical Support Unit, Mitigation Action Facility
UNEP	United Nations Environment Programme
WTE	Waste to energy incineration (both with the generation of electricity and capture of heat for district heating or other uses)

1 Introduction

This document presents the findings of the **Final Evaluation and Learning Exercise (ELE) of the China Integrated Waste Management (IWM) Project**. The ELE was undertaken during the period March-July 2023. A mid-term ELE of the project was conducted in 2021 and can be found on the Mitigation Action Facility website.

1.1 Overview of the project

China has experienced rapid urbanization over the past thirty years, and China's urban population now accounts for more than 60 per cent of the country's total population. The country's rapid economic development and rising living standards, as a result of urbanisation, have led to municipal solid waste (MSW) becoming a major concern for Chinese cities, where waste generation rates have increased substantially. It is anticipated that municipal waste will continue to increase at an accelerated rate in tandem with continued economic growth and rising consumption.[2] China has passed a number of laws to promote waste management, and this has led to a remarkable waste management transformation in the past decade. However, Chinese cities face significant obstacles to improving waste management performance due to a lack of comprehensive systems for waste separation, collection, transportation, treatment, and recycling and a lack of public awareness and participation.

The main goal of the China Integrated Waste Management Project (referred to as 'the project') is to support transforming the solid waste management sector in Chinese cities into a low-carbon, modern, integrated environmental service sector. The project runs from September 2017 to October 2023, including a no-cost extension of the implementation period by one year, due to the global COVID-19 pandemic effect. The project budget is EUR 8 million.

The project is designed around replicable integrated waste management (IWM) pilots in 5 cities, Suzhou, Xi'an, Tai'an, Lanzhou and Bengbu, covering a combined population of 18 million. These cities were selected competitively based on geographic location, size, economic development status, waste management status, and track record with modernising solid waste management. The main project components include the provision of technical assistance and training to pilot cities in areas related to the Best Available Technology (BAT) and Best Environmental Practice (BEP) in IWM and the implementation of replicable and financially sustainable business models, development of Key Performance Indicators (KPIs) for assessing the integration of municipal waste management systems, and conducting Life Cycle Assessments (LCA) of various waste management solutions to visualise improvements and compare results to baseline.

An important component of the project was the development of a Measuring, Reporting and Verification (MRV) system to enable an analysis of GHG mitigation effects of different IWM solutions,

[2] National Development and Reform Commission, MOHURD (2021): The Development Plan for Sorting and Treatment Facilities of Urban Domestic Waste of "14th Five-Year Plan".

intending to help to both inform city government decision-making and link solid waste management improvements to the Chinese carbon market. **Also covered by the project was a strong focus on private sector training and mobilisation**, supporting interest, viability and implementation of additional Public-Private Partnership (PPP) and Build-Operate-Transfer (BOT) models for collection/transportation and treatment of MSW.

Generally, projects funded by the Mitigation Action Facility are formed by a Technical Cooperation (TC) and a Financial Cooperation (FC) Components. In this case, however, the project budget only finances the TC Component activities, while the investments in infrastructure and technical operations in the cities are financed by ordinary budget transfers from the national government to the cities. For this reason, **the project has no FC Component.** This implies that the project relies on close coordination between the implementation organisation (GIZ) and national ministries, especially the Ministry of Housing, Urban and Rural Development (MoHURD) and the Ministry of Environment and Ecology (MEE).

The main Project Partners are the MoHURD, and the China Association of Urban Environmental Sanitation (CAUES). The project was designed in consultation with national government policymakers and planners and is structured to create mutually reinforcing information exchange and practical results on the ground. This close coordination is both an implicit and explicit strategy for the upwards dissemination of project results in the form of evidence and national policy advice. This was expected to be an important source of project impact.

The remainder of this section summarises the project's Theory of Change (ToC).

The problem

China's urban domestic waste generation has increased annually from 2011 to 2019, exhibiting an overall linear growth trend. In 2011, 164 million tons of municipal solid waste were generated, compared to 242 million tons in 2019, an increase of 1.48 times and an annual growth rate of 4.74 per cent.[3] In 2020, due to the epidemic's effects, the annual generation of municipal solid waste was 235 million tons, a decrease of 2.87 per cent from 2019. China is presently one of the countries that generates the most domestic waste globally. As urbanisation continues, the amount of domestic waste will increase and its composition will become more complex. Notably, comparing with the waste's increasing trend, the overall level of waste treatment in China is still relatively lagging in terms of waste segregation efficiency, appropriate financeable technologies, backend treatment capacity, as well as sectoral prevention of climate change impact, and there is still a significant shortage of relevant technical apparatus and professionals.

Waste management confronts numerous obstacles in the context of low-carbon and green development objectives. At the start of the project, a broad range of waste management challenges were identified, including a lack of appropriate national policies and regulations to guide and enforce integrated waste management systems, a lack of awareness of the GHG emission contribution of solid

[3] HUANG, YANG (Sustainable Development, 2022-12): Current Situation and Prospect of Municipal Solid Waste Treatment in China.

waste and the extent to which different IWM solutions could lead to reduced climate impact, a lack of awareness, incentivisation and support by city government officials and technical staff in more sustainable solid waste management approaches. There were also many cultural, behavioural, information, and communication-related barriers to more sustainable waste management practices, evident from the lack of waste management awareness in key aspects, such as segregation of waste types, across the general urban population in China.

These challenges were manifested in a range of negative solid waste outcomes, including inefficient waste treatment practices and high operations costs, inadequate use of innovative technologies that can enable more sustainable waste management, the lack of knowledge to understand the GHG emissions in the waste sector of a specific city or district and therefore inability to link actions to the nascent carbon market in China and the lack of interest and investment by the private sector in IWM solutions and services.

These factors have resulted in severe environmental pollution, high rates of GHG emissions, particularly CO2 and CH4 resulting from poor waste management practices, including extensive use of landfill, **and economic losses resulting from poor waste management practices**, making cities much less attractive for citizens and businesses. At the same time, due to these negative outcomes, there was increasing demand from the government and citizens for more sustainable and integrated solid waste management practices, which the project has aimed to support.

Impact and outcomes

The overall impact of the project, as set out in the Theory of Change, is the transformation and integration of the waste sector that improves performance, reduces CO2 emissions, attracts and maintains private sector participation and improves resource efficiency and circularity. Below this impact statement sit two outcomes:

- **Outcome 1:** The project has reduced GHG emissions in China's waste sector;
- **Outcome 2:** The project has increased the attractiveness of IWM and Waste to Energy (WTE) systems as a financially interesting low-carbon investment fields.

The ToC also includes five intermediate outcomes (IOs) designed to demonstrate the project's early signs of sustained impact. These include an initial commitment to replication of the project solutions, including the MRV, by 11 additional cities; IWM best-practice embedded in relevant national and pilot city (PC) policies and strategies; and a functioning MRV system in place, which the city staff can operate without the support of the project. In addition, IOs were designed to demonstrate shifting values in support of IWM by city staff and other relevant stakeholders, and new private sector models starting to be adopted.

The project's causal pathways at mid-term

To address the problem and barriers by delivering what presented above, the ToC is designed around five main causal pathways to achieving the project outcomes. These five pathways progress from outputs to intermediate outcomes before influencing the two main outcomes of the project. It should be noted that there is some overlap in how outputs and intermediate outcomes link to the two

outcomes. Outcome 1 is generally achieved via causal pathways 1, 2, 3 and 4. Outcome 2 is generally achieved via causal pathways 3, 4 and 5.

- **Causal pathway supporting Intermediate Outcome 1:** Pilot cities benefit from support to conduct a carbon emission and IWM baseline, learn from the knowledge of European experts experienced in IWM on how to develop an IWM strategy, and implement physical system diversification and improvements, organise segregation of food/organic waste and other waste streams of MSW, resulting in a functioning IWM system in their cities. It is expected that the functioning IWM in PCs would lead to the expression of interest by 11 additional cities to replicate the application of MRV system and other IWM solutions (Intermediate Outcome 1), resulting in the further reduction of GHG emissions from MSW (Outcome 1).

- **Causal pathway supporting Intermediate Outcome 2:** Pilot city experiences implementing IWM approaches promoted by national policy guidelines will provide evidence to further influence national policymakers. Furthermore, the project supports the pilot cities in building capacity to promote and implement segregation of four waste streams: kitchen waste, recyclables, hazardous waste and residual waste, at source, including training of trainers (ToT), teaching citizens about segregation of waste fractions and creating high awareness of the waste system in general, and promotes increased connectivity between cities and private businesses via an active WeChat platform, so that PCs will have a greater capacity to implement national policy guidelines on IWM. This is designed to lead to the IO of IWM approaches being anchored in national policy and local PC policies and strategies.

- **Causal pathway supporting Intermediate Outcome 3:** If PCs have support from project experts to produce a carbon emissions baseline, they can better understand the need for more rigorous monitoring and are ready to learn how to introduce a robust MRV system from international and national experts. Once staff in the PCs understand the benefit of better monitoring and its relation to climate finance potential, then they and their contractors and investors will be motivated to attend training so that they have a key tool in hand to measure, monitor, and verify emissions, which will allow them to mobilise climate finance through proven emissions reductions, a key milestone to gain access to climate finance. This results in the IO of a functioning MRV in place.

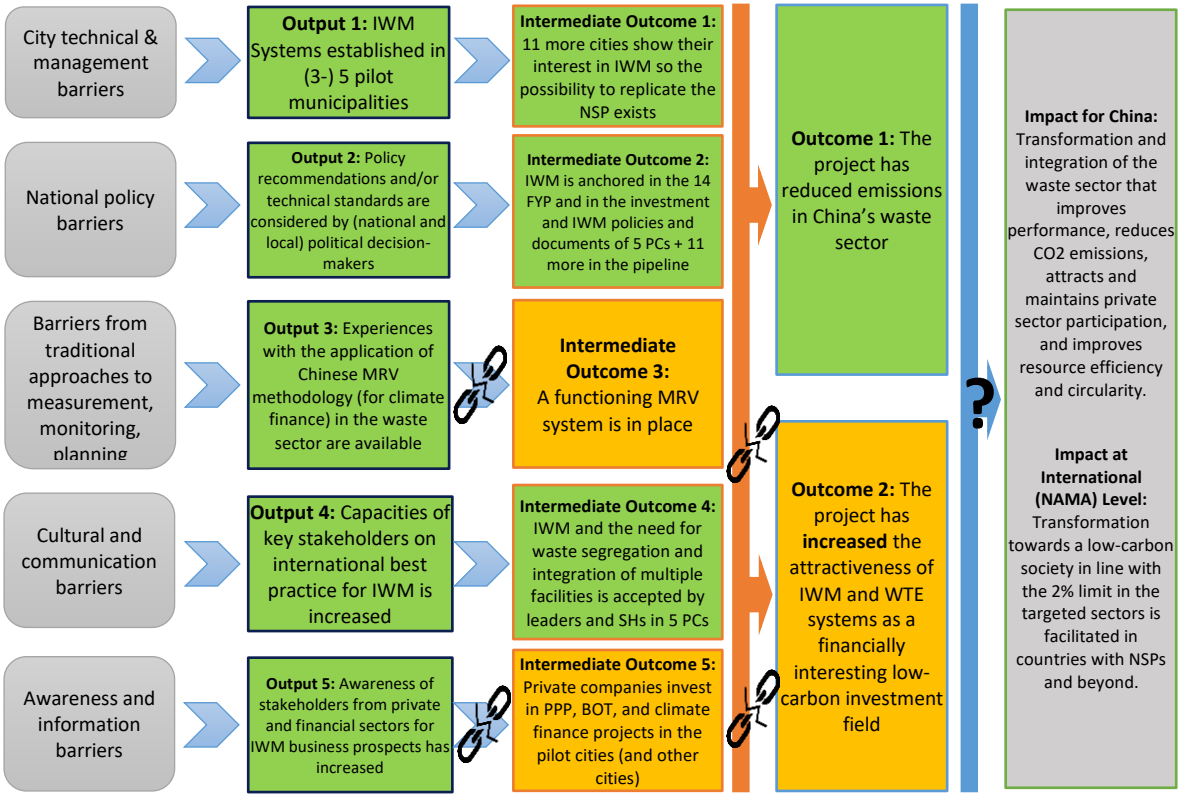
- **Causal pathway supporting Intermediate Outcome 4:** As the project develops the capacity of waste management professionals in the public sector (specifically national ministries and PC staff), as well as in the private sector, and supports PC governments to enable a behavioural change in waste segregation efforts, then segregation will be proven to be a large-scale success enabling waste management efficiency and showing convincingly that segregation works. A demonstration effect from the PCs will strengthen the interest of other cities to adopt similar approaches and encourage businesses to invest in relevant services in the IWM value chain. This results in the IO of IWM principles and the need for waste segregation being accepted as the basic necessary system by PC leaders and stakeholders.

- **Causal pathway supporting Intermediate Outcome 5**: If there is sufficient and effective promotion, education, publications, study visits, WeChat forum communication, training, capacity development in relevant business models, and assistance to businesses on IWM as a

low-carbon development strategy and a new investment opportunity, it will attract business and financial sector investors to deliver relevant infrastructure and services in the PCs. Furthermore, if China's Certified Emission Reductions (CCER) system is functioning, this will further improve the commercial viability of IWM operations and incentivise private sector investment in IWM and climate finance. This results in the IO of private companies investing in PPP, BOT and climate finance projects in PCs and other cities.

The results of the mid-term assessment of the project's causal pathways are illustrated in Figure 1. The figure uses a Red-Amber-Green (RAG) rating to illustrate the strength of causal pathways according to the evidence collected by the mid-term ELE following the scale: Good / Very good = Green; Problems = Amber; Serious deficiencies = Red; Not enough info to rate = Grey.

Figure 1. Overview of the Project's Causal Pathways Assessment at Mid-Term



At the mid-term review, the project had made good progress with providing technical assistance (TA) to the five PCs around IWM solutions and developing and implementing the MRV. However, the review flagged a lack of evidence around the causal pathways leading to IOs 3 and 5. Therefore, while all aspects of the ToC have been examined, the critical causal pathway aspects that have received the strongest attention by this final evaluation include the presence of a functioning MRV in the PCs and linkages with this and carbon trading, enabled by CCER or a similar platform (linked to IO 3); and the effectiveness of the project in raising awareness and catalysing new business opportunities for the private sector, and the extent to which private sector investment can be attributed to the project activities (linked to IO 5).

1.2 Focus of the Evaluation and Learning Exercise

In accordance with its Terms of Reference (ToR), this ELE seeks to address the following general ELE Questions (ELEQs):

- Has the project achieved its planned results?
- Has the project started to trigger transformational change?
- What can be learnt from the project?

The additional elements/questions to be considered in this ELE are:

- What are the key factors for successfully finalising a project?
- If possible, discuss the influence of the project with or without the FC Component.

The General ELEQs presented above were broken down and operationalised into specific ELEQs answered in this report. Table 1 maps the general and specific ELEQs against the Organisation for Economic Co-operation and Development's Development Assistance Committee's (OECD DAC) evaluation criteria[4], widely used as international standards for evaluating development interventions. Reference to the relevant report section where each ELEQ / evaluation criterion is treated is also given. Finally, the specific ELEQs were broken down further into sub-questions, which are included in the official ELE Matrix, approved by the Technical Support Unit (TSU) of the Mitigation Action Facility, and reported in Annex B.

Table 1. General and specific ELE questions and their link to the ELE Report sections

General ELE Question	Specific ELE Question	Evaluation criteria (relevant ELE Report section)
Has the project achieved its planned results?	To what extent does the project address an identified need from relevant government and waste management stakeholders?	Relevance (Section 3.1)
	To what extent has the project achieved intended (and unintended) outcomes?	Effectiveness (Section 3.2)
	To what extent was the delivery of outputs timely and to expected quality standards?	Efficiency (Section 3.3)
Has the project started to trigger transformational change?	What evidence is there that the project has been contributing to the intended impact in the ToC (incl. transformational change)?	Impact (Section 3.4)
	What is the likelihood that the outcomes will be sustained after the end of the project funding period?	Sustainability (Section 3.5)
What can be learnt from the project?	What key lessons can be learnt to benefit from this project's legacy or other projects funded by the Mitigation Action Facility in achieving their results?	Learning (Section 5.1)

[4] Relevance, Effectiveness, Efficiency, Impact, Sustainability. The ELE Team added a 6th criteria, namely Learning.

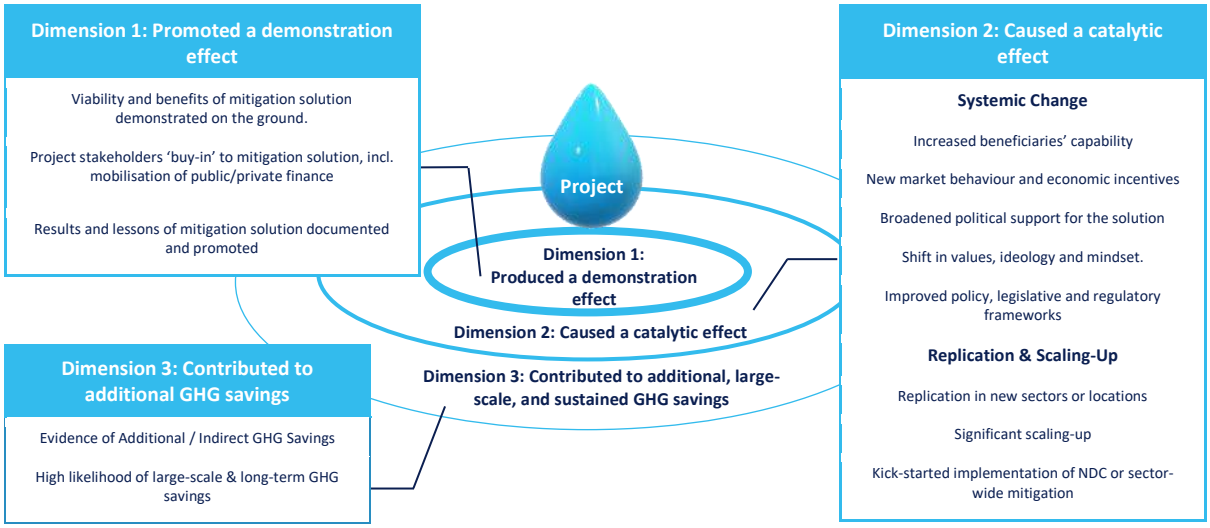
1.2.1 ELEs' Transformational Change Measurement Framework

Enabling transformational change is one of the key aims of the Mitigation Action Facility and, therefore, of this project. The Mitigation Action Facility defines Transformational Change as "*Catalytic change in systems and behaviours resulting from disruptive climate actions that enable actors to shift to carbon-neutral pathways".* [5] The Mitigation Action Facility Theory of Change explains how transformational change is expected to be achieved through its outputs and outcome.

The Theory of Change is broad, and transformational change can be achieved through projects in different ways. Figure 2 illustrates three dimensions that interact and reinforce each other to produce project-induced transformational change. Each project will work on different elements of the three dimensions to define its pathway to or "recipe" for transformational change. A more detailed explanation of the ELEs' Transformational Change Measurement Framework (TCMF), summarised in Figure 2, is presented in Annex A.

The ELE used the TCMF to assess the project's progress towards its impact in Section 3.4. In particular, in the evidence gathered through the ELE, the evaluators have looked for "signals" of the materialisation of the three dimensions, and classified them as early, interim, and advanced signals according to the definitions in Table 2. Table 3 shows the minimum level of signals of each of the three transformational change dimensions that projects are expected to have achieved by respectively their mid-point and end-point.

Figure 2. Transformational Change Measurement Framework for projects



[5] https://mitigation-action.org/wp-content/uploads/Mitigation-Action-Facility_TC-factsheet.pdf.https://www.nama-facility.org/concept-and-approach/transformational-change

Table 2. Transformational Change "Signals" assessment by ELEs

Signal level	Definitions
No evidence	Evidence suggests little to no progress is being made in line with the ToC causal pathways to Transformational Change.
Early signals	There is emerging evidence of the transformation related to the dimension, or the foundations for the transformation have been laid by the project. Still, no signals of the change are present.
Interim signals	Evidence shows some signals that the transformation related to the dimension is underway, and it is likely to continue.
Advanced signals	Evidence shows strong signals that the transformation related to the dimension is underway, and there is little doubt that it will continue.

Table 3. Minimum expected signals of project-induced transformational change

Dimension	Mid-point	End-point
1: Promoted a demonstration effect	Interim signals	Advanced signals
2: Caused catalytic effect	Early signals (of one or more of the types of possible changes)	Interim signals
3: Contributed to additional GHG savings	None	Early signals

2 Methodological approach

2.1 Criteria and scoring system

The ELE used the standardised ELE methodology and tools to carry out this Final Evaluation. These include the ELEQs, sub-questions, evaluation criteria, and TCMF. The evaluation criteria are presented in the ELE Matrix (Annex B). This matrix formed the empirical basis for formulating the evaluation findings, from which the conclusions were drawn, which served as evidence and a logical basis for formulating the recommendations. Based on the ToRs questions, tailored questions were developed to collect the answers directly from the stakeholders via key informant interviews.

2.2 Evaluation Approach

2.2.1 Data identification and collection

The data collection tools comprised desk review and key informant interviews as summarised below:

- The ELE team collected and reviewed the preliminary data from the project documentation in the ELE desk review phase (see list of consulted documents in Annex C).
- To ensure the data's accuracy, completeness, and quality and to obtain additional information, the ELE team conducted a field mission to Beijing, Suzhou, Xi'an and Lanzhou to facilitate interviews with stakeholders, using prepared questions in line with the ELEQs. The interview list is included in Annex C, also disaggregated by gender (see Table 4).

Table 4. Overview of the number of interviews and interviewees by sampling category

	Project Team	Project Stakeholders	Third Parties	TOTAL
No. interviews	2	16	5	**23**
No. interviewees	4	21	5	**30 (11 are women)**

2.2.2 Data Analysis

The ELE team then analysed the quantitative data collected in the desk review and interview phase. For sound interpretation of qualitative data, the evaluators cross-checked, analysed and compared (triangulation of data or sources of information) the documentation prepared by the project and the interview findings. The data was analysed in a disaggregated manner to the greatest extent possible, considering the opinions of the different groups, including those defined by gender (see Table 5 for a summary of the procedure followed).

Table 5. Summary of the ELE Analysis Methodology

Integrating Primary & Secondary Data	Evaluating the Strength of Evidence	Draft Contribution Story
Tailor analytical tools	Assess the strength of evidence of common themes using the scorecard in Table 6.	Draft contribution stories in the ELE report for each ELEQ and causal pathway
Tidy up notes	Identify concurrent/alternative explanations in ToC causal pathways	Final QC / QA
Data mining and evidence mapping from interviews and docs along ELEQs	Agreement on the contribution of a project vs context	
Extract positive and negative common themes for each ELEQ	Perform process tracing formal tests of causal pathways	
Consolidate and cross-check common themes.	Develop a figure with a RAG rating of causal pathways.	
1st Quality Control (QC) / Quality Assurance (QA)		

Table 6. Scorecard for assessing the strength of evidence

Quantity (number of sources reporting the evidence)	Variety (number of types of sources (TS) reporting the evidence)		
	1 TS only	**2 TSs**	**3 TSs**
1 interview only	Single source		
2 interviews	Weak evidence	Medium evidence	
3+ interviews	Medium evidence	Strong evidence	Very strong evidence

2.3 Quality control

The ELE report followed the required structure and editorial format, responded to the ToR and answered all ELEQs. A quality control process was conducted throughout the ELE process. It was verified that the data were collected from sufficient and appropriate sources, that findings were validated through cross-checking information and that the findings, lessons learned, and conclusions were coherent. The ELE team cross-checked all project information to ensure consistency between the sections of this report and the original data. All comments from the Mitigation Action Facility and the project team were addressed.

2.4 Limitations

The final ELE has been conducted per the typical ELE framework and project scope. However, as always, there are aspects that can be improved. As such, the following limitations should be recognised:

1. **Reservations towards the ELE process and purpose by local stakeholders concerned with the ELE, initially with high sensitivity:** The ELE approach is necessary for monitoring and tracing the project results. While this is well-recognized by the GIZ team, the evaluation and learning process is still new for many Chinese stakeholders involved in the project. In many cases, it is regarded as an examining or supervision process, which results in limitations to the openness of interviewees in discussing the project constraints and learning points for future improvement.

2. **Limited availability of interviewees:** Several scheduled interviews were conducted with secondary information providers, such as newly positioned or supporting staff. Five interviews were conducted via a written response. This limited the completeness and depth of the views for certain questions.

3. **Language and cultural differences:** The ELE is a very well-structured initiative with its own set of terms and processes that are unclear to many external stakeholders. The ELE team tried to localise many of these terms into an understandable and practical language instead of presenting the process only as an “evaluation” tool. However, in some cases, the translation between languages may have resulted in a filtering of stakeholder responses that slightly altered the direct intended meaning, although the likelihood of this happening and leading to different findings is not considered to be significant by the ELE team.

3 Key Findings

In this section, the ELE team presents the main findings of the ELE. These are structured according to the ELEQs in Table 1. At the beginning of each section, a RAG rating of the strength of the project's contribution story to the ToC and the OECD DAC criteria is included, following the scale: Good / Very good = Green; Problems = Amber; Serious deficiencies = Red; Not enough information to rate = Grey.

3.1 Relevance of the project

Relevance	1. To what extent did the project address the identified needs of waste management stakeholders?

The mid-term ELE found that the project was formulated in consultation with the relevant national government and the planners and was well aligned with relevant national policies related to solid waste management and circular economy. This is confirmed by the final ELE as well. Notable policy synergies include:

- China's Nationally Determined Contributions (NDC);
- 2030/60 Goal announcement: China's CO2 emissions to peak before 2030 and carbon neutrality to be achieved by 2060;
- 14th Five-Year Work Plan on the Construction of Zero-Waste Cities, building 100 zero-waste cities by 2025; and
- Carbon strategy enforcement to be linked with local government performance evaluation.

Alignment with these policies has enabled strong motivation for engagement by the PCs and for other interested cities to learn from the project's outputs and communications channels. There is evidence that the TA is well-received by the PCs and waste management authorities, particularly guidance on IWM WTE, BAT and GHG emission reduction and trading/MRV, and the capacity development approach (i.e., training needs assessment).

The project reflects the government's priority to modernise municipal solid waste management and increase the emphasis on and investment in waste segregation. For example, the strategy to select PCs in different regions, and support them in setting up professional waste sorting and providing training, education and projects, serves the national government's priority to spread these practices throughout all cities in China. Large and mega-cities were already starting to work on segregation, but project pilot medium-sized cities were only in the embryonic stage when the proposal was written.

The cities have been strategically selected to serve as regional demonstrations of new approaches and technologies. According to the "2020 National Annual Report on the Prevention and Control of Solid Waste Pollution in Large and Medium-sized Cities in China" published by the Ministry of Ecology

and Environment of China[6], Suzhou's municipal solid waste production ranks seventh among the 196 large and medium-sized cities in China, with a production volume of 5.95 million tons in 2019. According to the "Announcement on the Prevention and Control of Environmental Pollution by Solid Waste in 2021"[7], Xi'an's per capita waste generation of 0.82 kg is tenth among the eleven major cities in China. In addition, Tai'an, Bengbu, and Lanzhou each have regional representation and influence on neighbouring smaller cities, and their local administrations are placing a greater emphasis on waste segregation management and low-carbon development. The criteria for the selection of the demonstration municipalities also considered the size and location (geography and climate) of the municipalities and the state of on-going planning, as well as technical and financial ambitions regarding the establishment of integrated waste management systems. Consequently, the pilot city selection is seen to be representative and pertinent.

The project is also relevant to the private sector wanting to learn about technology from Western European countries and receive technical assistance to understand how to apply it. A particular area of private sector interest is innovative cost-recovery and revenue-earning models that can be applied to MSW management. The project also helps PCs understand how to implement China's national policies in practice, testing better models and techniques to train local staff and trainers to reach citizens and monitor the impact of better segregation on treatment plant efficiency and emissions.

As the project appears to be highly relevant to national policies and the local needs of the PCs and other relevant stakeholders and it comprehensively supported the city governments to better understand and implement the relevant national policies, a green RAG rating has been given to the relevance criterion.

3.2 Effectiveness of the project

Effectiveness	**2. To what extent has the Project achieved intended (and unintended) outcomes?**
	Outcome 1: The Project has reduced emissions in China's waste sector
	Outcome 2: The Project has increased the attractiveness of IWM and WTE systems as a financially interesting low-carbon investment field

The 2021 mid-term ELE findings, which focused on progress against the outputs (see Figure 1 for a list of the outputs), can be summarised as follows. For **Output 1**, significant progress had been made towards the project goal of climate-friendly integrated waste management systems in the five PCs. The introduction of IWM approaches to the physical system of waste management had been well-received by the PCs, implemented, and led to new insights on the collection and management of various materials streams.

[6] MEE (2020): National Annual Report on the Prevention and Control of Solid Waste Pollution in Large and Medium-sized Cities in China.

[7] http://www.envirunion.com/newsinfo-35755.html.

Related to **Output 2**, close coordination between the project team, national policy-makers, and CAUES has resulted in upward and outwards diffusion of the most basic principles of IWM, specifically, the need to diversify the treatment infrastructure, segregate materials at source, manage them separately, and optimise processes within and between facilities.

Under **Output 3,** the project had provided TA in the PCs to produce a CO2 baseline and introduce MRV methodologies for calculating CO2 and CH4 reduction and other GHG monitoring (including N2O). All five PCs had received an introduction to MRV, which improved their regular reporting on emission reductions. Third parties were interested in the MRV system and its potential for enabling carbon emissions trading as a business model. However, the limitations in the availability of the CCER (the ETS at China's national level) meant that climate finance business models were neither visible nor available to business and financial sector stakeholders.

For **Output 4**, capacities of key stakeholders (such as businesses and citizens) concerning international best practices for IWM were seen to have increased through training and awareness activities supporting municipal staff and trainers to work with citizens, schools, non-governmental organisations (NGOs), and associations, as well as specific capacity development activities engaging and involving business and financial sector stakeholders in meetings and digital events. Project activities had reached a rich variety of stakeholders who were positive about the possibilities of IWM in their activities and spheres of influence. Study visits and regional activities attract interest and visitors from other cities.

Under **Output 5**, project activities reached the business and financial sectors through a very active WeChat platform to answer business questions, combined with other social media and physical events, including visits to the PCs. Potential PPP and BOT partners from shareholder-owned companies had been supported to analyse the Chinese waste sector's business environment and market potential. The review found that the project had stimulated the private sector to lead in building anaerobic digestion projects, using mixed or kitchen waste to produce fertiliser and soil amendments, and generating electricity from their biogas and fertilisers for soil remediation.

The final ELE has revealed a continuation of many of these themes, including the challenges related to the uptake of carbon finance, due to the continued unavailability of the CCER. Based on the final ELE findings, the assessment of the extent to which the project has achieved Outcome 1 and 2 is provided in the following sections, as well as external project factors and any unintended outcomes.

3.2.1 Outcome 1: The project has reduced emissions in China's waste sector

In China, about 1.2% (2010)-1.4% (2014) of the total CO2-equivalent (CO2e) emissions originated from the waste sector[8,9]. By 2030, China's rapid urbanisation is expected to reach 1 billion urban citizens, which will increase – together with changing consumer behaviour – the amount of MSW to be collected and treated. Within this context reducing GHG emissions related to the waste sector is

[8] https://unfccc.int/sites/default/files/resource/China_NC3_Chinese_0.pdf.

[9] https://www.giz.de/en/worldwide/63747.html.

extremely important and the project has performed well in this regard. **The project has contributed to a cumulative direct reduction of 5,921,720 tCO2e since 2019, as per its core mandatory indicator M1.** This greatly exceeded the original target of 433,100 - 736,270 CO2e by the end of the project**.** The total emission reduction can be broken down into the following:[10]

- Around 1,900,000 tCO2e savings achieved in the five municipalities in 2022
- Around 2,300,000 tCO2e in 2021
- Around 1,600,000 tCO2e in 2020
- A minor part of less than 100,000 tCO2e in 2019.

In 2022, the highest achievement of around 885,000 tCO2e reductions (46%) came from the largest demonstration city, Xi'an, closely followed by Suzhou with 602,000 tCO2e (32%). The CO2e reductions in the other three demonstration cities amount to 341,000 tCO2e (18%) in Bengbu, 65,000 tCO2e (3%) in Tai'an and 14,000 tCO2e (1%) in Lanzhou.

Outcome 1 has been supported by four of the project components and causal pathways (Outputs and IOs 1, 2, 3 and 4). This result was achieved through robust technical advice from the project, resulting in IWM improvements in all demonstration cities. An important aspect of the project's contribution to the reduced GHG emissions outlined above has been supporting the PCs in waste segregation management and circular economy measures. This has been supported by implementing the WASTEAWARE indicator system[11] to assess and guide IWM activities. The project has made excellent progress in raising awareness and building the capacity of city staff, as well as institutional frameworks in the PCs that support more effective IWM systems to be implemented. In terms of mitigation results, the large majority of GHG reductions were achieved in Xi'an (accounting for 64% of the total) and Suzhou (accounting for 18%) due to upgrades of existing and/or construction of new waste treatment and disposal facilities supported by the project. For example, in Suzhou, two kitchen waste treatment plants were constructed in 2020 with continuous GHG emission reduction; the total estimated emission reduction of these two plants in 2022 is 78,530 tCO2e. Another example is the project assistance to Suzhou city government and relevant stakeholders on the construction of a landfill gas power plant at Qizishan in 2019 (including improved data collection on landfill gas leakages), which led to an estimated GHG emission reduction of 17,357 tCO2e just in the 2019-2020 reporting period.

Some of the project activities contributing to the awareness raising, training and capacity building of city governments and private sector entities in low-carbon IWM approaches include five annual low-carbon IWM conferences in different cities, five international cooperation sub-forums as side events of the CAUES annual conference, and the organisation of more than 30 workshops and seminars.[12] Most of these occurred before the COVID-19 pandemic, which required switching to increased participation in online events and live streaming as new media sources. Indeed, an audience of 87,966

[10] Source: project Annual Report 2022 and project M&E Plan 2022.

[11] WASTEAWARE is a benchmarking system backed by the project for measuring and monitoring waste management systems in Chinese cities. It was developed over a period of 10 years through a multi-agency, expert-led process.

[12] Project Practice and Outcomes Summary (2023): China MSW Integrated waste management: Towards the low-carbon integrated waste management.

was reached through online events facilitated by the project.[13] The project also supported awareness-raising activities for stakeholders on waste segregation, supporting Xi'an in building an education centre and creating a special handout for waste segregation education.

The development of the MRV system has further supported the ability to define a baseline of waste management-related GHG emissions in a city and then measure subsequent progress in reducing emissions. The MRV system also provides a tool to support city government decision-making on how best to transition to low-carbon IWM solutions. The MRV system functions in the waste sector for each of the five PCs. However, the evaluation has found that more robust capacity development on data collection and verification processes is necessary to support the MRV in some of the cities' waste management authorities (MRV implementers).

The project has developed two policy recommendations, which have been reflected in the revision of a technical standard and a national law, as described below:

- In 2019, the project team contributed to revising the Pollution Control Standards for Municipal Solid Waste Landfills, which MEE and the General Administration of Quality, Supervision Inspection and Quarantine had initially issued. In particular, the project recommended strengthening the focus on landfill pollution control during the design, construction and operation phases.

- In 2020, China updated its Law on "Prevention and Control of Environmental Pollution by Solid Waste", in which recommendations were provided to MoHURD by the project, including introducing Extended Producer Responsibility (EPR) schemes to achieve a circular economy.[14]

Also, in 2022, two national and 29 sub-national institutions received technical assistance from the project on the IWM systems' improvement and the waste sector's low-carbon development through roundtable discussions, workshops, training or conferences. **The project also drafted five technical standards to promote low-carbon development in the Chinese waste sector.** The standards are based on the MRV model developed by the project and the lessons learnt from the seven MRV monitoring tours since the start of the project in the five demonstration cities. **The standards are drafted leading by CAUES, which are currently under review by a national expert team. As a result, the following standards are likely to be adopted on a national level, which has the potential to affect a greater scale of GHG emissions across the waste sector in China**:

- GHG emission accounting and reporting for the construction of recycling facilities
- GHG emission accounting and reporting of WTE plants
- GHG emission accounting and reporting of organic waste treatment plants
- GHG emission accounting and reporting of sanitary landfills
- GHG emission accounting and reporting of waste collection and transportation systems.

[13] Source: project Annual Report 2022 and project M&E Plan 2022.

[14] Source: project Annual Report 2022.

Influencing national policy is a robust and lengthy process, and there is no guarantee that the project will be able to carry these technical standards through to influence national policy in the time left. Yet, there is a high chance that at least some of these standards will be officially adopted by CAUES.

Based on the factors explained above, including the considerable capacity development of PCs in low-carbon IWM, the development of the MRV and the resulting ability of PCs to reduce GHG emissions beyond the project target, and the national policy-related influence of the project, the ELE team assigns a green rating to the effectiveness in achieving Outcome 1.

3.2.2 Outcome 2: The project has increased the attractiveness of IWM and WTE systems as financially interesting low-carbon investment fields

The project has partially achieved this outcome. Outcome 2 is supported by several project components and causal pathways linked to Outputs 3 and 5, in particular. **There is some evidence that the project has made an important contribution to the awareness of private sector entities in commercial opportunities, and subsequent investment, related to IWM and WTE systems. Indeed, the project states that it has mobilised EUR 712.4 million in investment for MSW facilities or other activities within the project boundary. This is more than double the intended target of EUR 300 million (Core Mandatory Indicator M5).** This has been supported through a comprehensive programme disseminating relevant information on commercial opportunities and approaches and related business models to private sector stakeholders and finance providers. The project has also delivered 23 tailor-made events for the private sector, focusing on low-carbon development and the implications for innovative services in the IWM sector. There is also evidence that the project has established connections between investors, banks and waste management-related companies.

Having said that, the ELE team notes that it is challenging to link the large investments in IWM infrastructure, including WTE incinerators, directly to the project support. While the project has played an important role in raising awareness among private sector stakeholders, many other factors are likely to have influenced these actors, including a significant national government push on sustainable waste practice during the project duration, resulting in CNY 30 billion (about EUR 3.8 billion) invested in China's waste management sector between 2016 and 2020.[15]

There have also been some positive enabling environment changes facilitated by the project, such as improved access to finance for IWM. There is strong evidence of the contribution of project activities to the increased awareness and interest of the private and financial sectors to waste management. For example, Suzhou Rural Commercial Bank provided a separate fund of 1.2 M EUR to GIZ as a TA provider to lead the textile industry's low-carbon transition, focusing on improving energy efficiency and material utilisation. Furthermore, some banks in some pilot cities (such as Xi'an) are now more active in providing loan support to IWM investments.

Combined with the project's activities in developing the capacity of city governments in the PCs, **there is strong evidence that the project has enabled a more conducive environment for the private sector**

[15] Source: project Annual Report 2022 and project M&E Plan 2022

to play a role in waste collection, transportation, processing and other aspects of the IWM value chain.

However, several aspects continue to constrain the causal pathways from the project outputs to Outcome 2. Firstly, it is important to note that private investment into IWM and WTE systems still largely relies on public finance subsidies. The project spent time analysing these challenges and found that with the existing waste treatment subsidy model (up to EUR 55 per ton), it is financially attractive to promote the construction of new kitchen/organic waste treatment facilities. The current fees and subsidies also triggered a broad shift from landfill to WTE treatment. However, the study found that it remains difficult to enhance the cost-effective transition to the 3Rs (Reduce, Reuse, Recycle) with current subsidies. Furthermore, there are uncertainties in how sustainable the subsidies will be over time. Experts in the field, therefore, urge city governments to develop a waste disposal charging system to reduce the need for subsidies.[16,17]

Because of the uncertainty in the subsidies, it is rare for companies to invest in the sector by themselves without the reassurance of a Public-Private Partnership (PPP) or government funding to subside earnings from waste processing activities. While Intermediate Outcome 5 was related to PPP and BOT models, there is little evidence that the project has enabled significant change in related business models applied in the PCs, which can help overcome the need for subsidies. However, according to the interviews, we believe the project is playing a "trigger" role in promoting the formation of innovative business models that are still nascent globally in the IWM sector, or at least business models that haven't been tried in a certain city. For example, according to the interview with project personnel in Tai'an, it was found that benefiting from this project, the Tai'an government started considering deploying the industrial chain projects around vegetable waste recycling to create new IWM-related business models and achieve green and low-carbon development.

Secondly, the project was not able to fully exploit the role of carbon trading to incentivise private sector investment in IWM activities. While the project has made strong progress in developing the MRV and implementing this at the city level, although the data collection and verification capacity of city governments is still rather thin in some cities, **the continued absence of the CCER means that carbon credits cannot yet be used to incentivise commercial activity. Even if the carbon trading system was in place, it seems likely, based on evidence from other contexts, that the potential carbon trading income would still be low for waste. There is also a concern that the MRV is designed to measure reduced emissions at the city scale, whereas carbon credits for specific IWM projects would need their own project-level MRV system.**

To conclude this section on the effectiveness of the project towards achieving Outcome 2, the ELE team offers some considerations on the impact on the project's effectiveness of not having an FC Component. **Without an FC Component of the project, the project has likely found it harder to link its actions directly to the stated intentions of stakeholders.** While Chinese Government co-financing

[16] CAUES (2020): Will the subsidies for waste incineration power generation decline?

[17] Energy Industry Branch of China Industrial Development Promotion Association (2022): Evolution and impact analysis of power price subsidy policy for waste incineration power generation.

has fulfilled the stakeholder's needs linked to project TC Component activities (e.g., waste segregation schemes and multiple facilities integration for IWM systems are established in 5 pilot municipalities; capacity building activities for upscaling the tested IWM system to other cities in China are well promoted), there is still a significant financial gap to fulfil the solid waste processing capacity gap in some cities. The project has aimed to support and enable the leveraging of private investment to help close this gap. However, as discussed previously in this section, private sector investment is not yet very mature in relation to the project areas of interest. The sources of finance need to be diversified. Private sector entities show great interest in investing in IWM infrastructure and services. However, many still experience an obvious gap in engaging with relevant local government representatives and programmes or finance providers.

As such, additional project finances in the FC Component may have been very effective in facilitating the outcomes or strengthening the impacts. Using an FC Component to help de-risk private sector investment, perhaps via a concessional or blended finance model, to de-risk investment by covering any potential revenue gaps or first losses that a project may incur and thus to better introduce the technologies advocated by the project TA. However, this type of FC Component support would require significant additional financial resources and is not likely to be justified in China, where significant public and private sector investment is already occurring in the waste sector.

To sum up, despite the robust progress in raising awareness and, to some extent, increasing private sector intention to invest in the commercial opportunities related to IWM, the effectiveness in achieving Outcome 2 is reduced by the incomplete linkage between the MRV and the ability for private sector entities to increase their revenue via carbon credits, as well as the uncertainty about public subsidies. Therefore, the ELE team assigns an amber rating to the effectiveness in achieving Outcome 2.

3.2.3 How external factors impacted the project's effectiveness

In terms of negative external factors, the mid-term ELE noted the significant impact of the COVID-19 pandemic on the project, including border restrictions that prevented international experts from visiting the project team and PCs in person, as well as domestic travel and event restrictions, which greatly reduced the ability of the GIZ project team to engage with stakeholders in-person in China. However, **the impact seems to have been mitigated** via the team and relevant stakeholders rapidly becoming used to using digital solutions for meetings and events, including some of the online live-streaming events.

The final ELE found a number of **positive external factors** which had a bearing on the project outcomes. **The increased reliance on digital solutions and social media** associated with COVID-19 positively impacted the project's ability to disseminate its news and information and attract interest

in the project, especially among the private sector. For example, over 158,000 online visitors have watched five online webinar series on integrated waste management facilitated by the project.[18]

The conducive waste management policy environment in China, as summarised in Section 3.1 on Relevance, was also a positive external factor. The project made the most of the positive momentum across China towards more effective IWM systems. For example, from June 2017 to 2019, the government scaled up its waste segregation system support programme from 46 to 300 cities. **However, this significant shift in national policy towards more sustainable and integrated waste management practices also makes it more challenging to clearly attribute project outcomes, as mentioned above, in relation to the private sector investment achievements.**

3.2.4 Unintended outcomes

The ELE identified one positive unintended outcome, which is the replication of the MRV model into the textiles sector. Local banks received project's advice to invest in the low carbon transition of the textile industry focusing on the improvement of energy efficiency and material utilisation in Shengze County. Suzhou Rural Commercial Bank has established carbon emission monitoring and management tools, built a "textile industry energy consumption and carbon emission monitoring platform", established carbon accounts for local textile enterprises, issued "carbon credit code 1.0" enterprise rating standards, and designed "carbon credit financing" innovative products, dedicated to serving the daily operations of enterprises and the construction of carbon reduction projects. **No unintended negative outcomes were found.**

3.2.5 Assessment of overall Effectiveness

To sum up, based on the above-mentioned evidence and analysis on project outcomes, the project has proved positive progress in line with the ToC causal pathways, and the underlying assumptions have held as valid and accurate. The project outcomes have largely met the project outcomes and very likely the upcoming maturing carbon trading agenda in China will lead the project-built capacities on private sector investment in IWM forward. **The ELE team gives a green rate to overall project effectiveness.**

[18] Broken down as follows: 57,000 online visits were recorded for the waste management business model salon held in October 2020; 35,000 online visits were recorded for the salon on the theme of plastic recycling under waste segregation held in November; 21,000 online visits were recorded for the waste management theme; 23,000 online visits were recorded for the sustainable fashion theme held in March 2022, and 22,000 online visits were recorded for the business model tools theme held in February 2023.

3.3 Efficiency of the project

Efficiency	3. To what extent was the delivery of outputs timely and to expected quality standards?

The mid-term ELE in 2021 found that most inputs occurred on time and aligned with the proposal and the planning. However, at mid-term, two of the critical outputs related to climate financing and MRV measurement of climate impact changes in cities were delayed. Since these delays were largely attributable to external circumstances, particularly COVID-19 and the institutional challenges around the CCER, the review concluded that the project was doing its work efficiently and on time. The high-quality standards were still to be proven at the output level and depended on the expanded implementation of IWM beyond the physical system.

The final ELE finds that the chosen implementation mechanism has generally been conducive to achieving the expected outcomes. The project modality has allowed the processes tested in PCs to inform national policy. While the PCs have benefited from the direct engagement of the project activities, the evidence and learning gained from this process have been fed back to CAUES and MoHURD.

Stakeholders have been participating and collaborating actively in the intervention. The project has strongly engaged with relevant national stakeholders such as MoHURD and CAUES. It has also received strong participation and support from the PC stakeholders. However, there is a range of levels of responsive engagement from the cities, which appears to be linked to their resources and capacity in IWM. There is evidence that the project also acts as a multi-party bridge or convening force for the government, international organisations, and pilot cities, helping to enable knowledge exchange and coordination. However, there have been some differences in the responsiveness of the PCs. Leading cities in this topic, such as Suzhou, have been very responsive, while less-developed cities like Tai'an have lagged in proactive engagement with the project team.

The final ELE also aligns with the mid-term findings regarding recognising the high standard of the project's organisation, communication and reporting processes. The delivery of outputs and intermediate outcomes, including budget expenditure, was conducted and achieved in a timely way, in line with the project. This is demonstrated through the high level of satisfaction of the project's direct beneficiaries. City governments, key advisors and other directly involved beneficiaries and stakeholders (such as cooperating universities) expressed that they have been satisfied with the quality of project support and outputs. For example, trainings, including training materials, were delivered to a high standard. The stakeholders interviewed were all satisfied with the project in terms of demonstrating international best practices via the knowledge management and sharing component and providing solutions as part of the TA by Chinese and international experts. The quality of the project operations was also reflected in the organisation, facilitation and strong participation in the final project event, held in Beijing on 18 and 19 May 2023.

Communication and visibility were implemented efficiently via a comprehensive communications strategy. WeChat has provided the principal platform for disseminating news, information and events to a wide audience. By the end of the project, the WeChat group had 4,900 followers. The official project website has attracted 14,593 visitors with 3,694 downloads of awareness-raising materials

and knowledge products related to IWM. The project's public WeChat account has been accessed more than 170,000 times.

As noted in Section 3.2.3, the COVID-19 pandemic markedly affected the project delivery. The five-year timeline for the project, designed to start in 2017 and finish in 2022, was stretched to October 2023 due mainly to the pandemic and some early contracting delays at the start of the project. **However, the effectiveness and efficiency of the measures adopted to reduce the delays are positive and appear to have greatly mitigated the potential negative impact on the project implementation.** The ELE has found that the risk mitigation plan and actions were well implemented, helping to reduce COVID-19 impacts, such as travel disruption of the project team and international experts. The key delay was the introduction, by international consultants, of IWM governance ideas that stimulate institutional and financial reforms. There is little evidence of the impact of this, as digital solutions enabled international experts to engage with the relevant stakeholders and project team, resulting in the delivery of relevant TA to the PCs and continued work on drafting technical standards as outlined in Section 3.2.

The final ELE has also assessed the extent of cost-efficiency related to the project's TC Component. The TC Component has been appropriate to the project's scope and objectives.

Based on the factors explained above, such as the high standard of project management skills, communication with government counterparts and key stakeholders, and delivery of high-quality deliverables, the ELE team assigns a green rating to the Efficiency criterion.

3.4 Impact of the project

Impact	4. What evidence is there that the Project has been contributing to the intended impact in the ToC (incl. transformational change)?

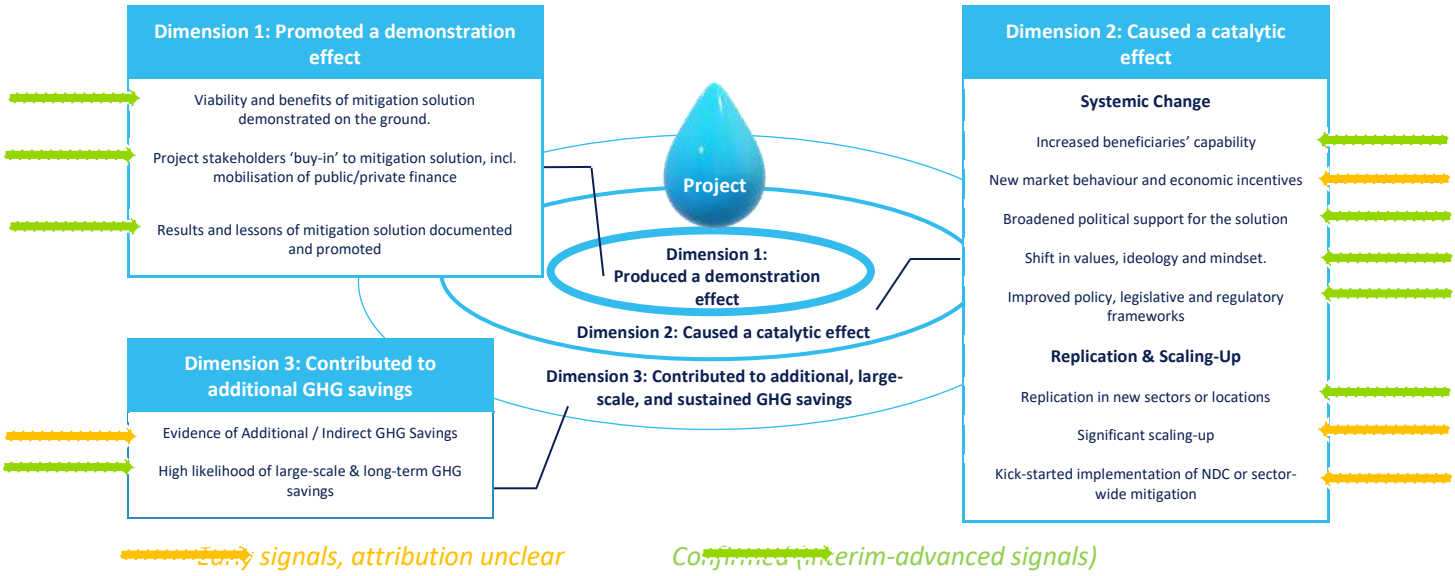
The mid-term ELE found that the project was on track to contribute to transformational change in the solid waste sector. By especially pursuing IOs 1, 2, and 4, which focus on the IWM impacts on the physical waste management system, the project would ultimately contribute to transformational change in the sector's GHG footprint, especially in terms of CO_2 and CH_4, the GHGs most closely associated with solid waste management. However, at mid-term, more time was needed for the project to work through the more complex and politically sensitive governance aspects of IWM, especially those related to institutional reform and sustainable finance. Some progress has been made in the governance aspects of inclusivity through the project's broad outreach to citizens, municipal officials, civil society and the business sector.

Moreover, according to the 2021 ELE report, it was uncertain whether the reliable and predictable implementation of IWM in the solid waste system could lead to securing climate financing as a form of transformational change. Such progress would depend on a national carbon trading platform becoming active, which was highly uncertain. Therefore, the mid-term concluded that the likelihood that the project would succeed in making contributions leading to IOs 3 (a functioning MRV system is in place) and 5 (private companies' investments in IWM) was questionable.

The final ELE built on this assessment and used the ELE Transformational Change Measurement Framework explained in Section 1.2.1 and in more detail in Annex A to evaluate the transformational

change potential and likelihood of the China IWM project. **The ELE found that the project has robustly advanced under Dimension 1 (Promoted a demonstration effect) with more mixed results under Dimension 2 (Caused a catalytic effect) and 3 (Contributed to additional GHG savings)**, as summarised in Figure 3 and discussed in detail below.

Figure 3. Assessment of the project's ability to trigger transformational change



Source: Consultant's analysis, based on ELE Framework

3.4.1 Dimension 1: Promoted a demonstration effect

Viability and benefits of mitigation solution demonstrated on the ground: Best-practice approaches to reducing GHG emissions in IWM practices have been promoted and implemented in the five PCs. Via the MRV and related training, the project has delivered a robust approach to measuring GHG emissions of the waste management sector in cities, supporting decision-making to select the most appropriate IWM options in a specific context. The project has successfully demonstrated this in the five PCs, which appear enthusiastic to use this approach in the future.

Results of mitigation solution documented and promoted project stakeholders 'buy-in' to mitigation solution: There is strong evidence that the training and technical assistance provided by the project to the PCs has greatly influenced the awareness and buy-in of city staff to low carbon IWM solutions (see section 3.2.1).

The project successfully attracted the cities in China to apply the IWM as a low-carbon development solution; disseminated the IWM practices and knowledge via the capacity building and knowledge sharing platforms. The lessons learned and deliverables also have been used as the inputs for the national programmes and policy development in waste management sector, also in other sectors. The project demonstration effect will last beyond the project duration. **There are therefore advanced signals that the Dimension 1 aspects of transformational change are underway.**

3.4.2 Dimension 2: Caused a catalytic effect

Systemic change

Systemic change underway to enable widespread adoption of mitigation solution: It is clear that IWM has been transformed across all cities in China during the project duration. In the PCs, the extent to which elements of this transformation can be attributed to the project is difficult to assess. However, it is clear that specific aspects such as the development and use of the MRV, which is an important aspect of how cities can measure their climate impact in the waste management sector, is purely attributable to the project. The project has also been instrumental in raising awareness about low-carbon waste management techniques and the private sector's role in helping deliver IWM services, such as anaerobic digestion for kitchen and organic waste and WTE for residual waste.

New market behaviour and incentives: While the project has raised awareness of commercial opportunities in the IWM sector, there is little evidence of transformational change in terms of new market behaviour, as discussed in Section 3.2 in relation to subsidies in the sector. The carbon market aspects have also not yet been realised, due to the CCER-related constraints, as described above. There are early signals of potential transformational change impact, but the attribution is unclear.

Broadened political support for the solution: The project has achieved strong outcomes in terms of raising awareness and garnering support in the PCs for low-carbon IWM solutions, assisted by robust analysis and decision-making support that the MRV enables.

Increased institutional capacity and management practices: Training and building institutional capacity has been a strong focus of the project in the PCs around best-practice solutions, such as the WASTEAWARE indicator system and the development of the MRV system. This has generally been delivered robustly and well-received by city staff. However, interviews have shown that some cities are still unclear on the MRV data collection process, raising concerns about the extent to which the process is transformational.

Shifts in values, ideology and mindset: The project has greatly contributed to increased knowledge and awareness of best practices in IWM approaches and the rationale for implementing them at the city level in the five PCs. This has been reinforced by the institutional development of the approaches to implementing IWM and the MRV system and the assignment of 'Carbon Manager' titles to 168 city staff members, boosting motivation and buy-in.

Improved policy, legislative and regulatory frameworks: As mentioned in Section 3.2.1 , the project has developed two policy recommendations, which have been reflected in the revision of a technical standard and a national law, and made a number of technical recommendations which could further influence national policy if accepted by policy-makers. This represents strong initial signs of transformational change achieved by the project in terms of policy reform.

Replication and scaling-up of mitigation solution and/or project

Replication in new sectors of the mitigation solution and/or project itself: The MRV approach implemented by the project has been replicated in the textile sector in Shengze County in Suzhou. Supported by the open-source nature of the MRV, this is an encouraging sign that the solution can be transferred much more widely in China across other sectors beyond IWM.

Significant scaling-up of the mitigation solution and/or project itself: There is compelling evidence that the project has played a pivotal role in raising awareness among public and private sector entities about the commercial opportunities in IWM and WTE systems. This awareness is likely to have facilitated the public and private investments, with the project having successfully mobilised fund for MSW facilities and other activities in '11 + 5' Zero-Waste cities and regions over China (see section 3.2.2). The project has secured a written form of interest from 11 other cities, including the major cities of Guangzhou, Hangzhou, Dalian, Xiamen, and Shenyang. They appear keen to explore the mitigation solutions developed by the project, in particular the MRV tool and data collection process. If implemented, this will represent a significant replication achievement by the project. Replication could be enhanced even further if the MRV system is taken up by the national government and cascaded to all cities in China. As mentioned in Section 3.3, related project recommendations to the national government are currently under review and may influence national policy in the near future. However, this remains uncertain.

Kick-starting and influencing sector-wide mitigation: There are limited signs that the project is able to directly influence sector-wide mitigation. However, the project has played an important role in testing new approaches in PCs and feeding back evidence and learning, particularly on the MRV, to national government entities such as MoHURD, with support from CAUES. This bottom-up process can support the wider implementation of the mitigation solution promoted by the project if the Chinese Government sees value in it.

As per the evidence mentioned above, the project demonstrated the benefits and solutions of IWM in five PCs with different technical focuses and approaches, which has helped to catalyse low-carbon waste management solutions in cities. There are a few elements, such as significant scaling-up, wider mitigation in the waste sector, as well as new models of private sector investment and economic incentives, that were not clearly proved within the project duration. However, many positive changes occurred and there are foundations for mid and long-term impact. **There are therefore interim-signals that the Dimension 2 aspects of transformational change are confirmed.**

3.4.3 Dimension 3: Contributed to additional GHG savings

Evidence of Additional / Indirect GHG savings*:* There are no signs of additional GHG savings arising from the project beyond those achieved in the five PCs and recorded under the Core Mandatory Indicator M1. However, these would be realised if the recommended policy reform mentioned above were replicated by or cascaded down to a much wider range of cities in China.

High likelihood of large-scale & long-term GHG savings: While there are no signs yet of additional GHG savings due to the project, there is a strong likelihood that it can enable additional and potentially large-scale and sustained GHG emissions savings in the near future. As the project has fed into the evidence process of national policymakers, there is a strong chance that the MRV approach to support measurement and decision-making related to GHG emission in IWM can be rolled out in many cities across China. However, this depends on CAUES proactively driving this forward beyond the end of the project. With the indicated support of the 11 other cities to explore and adopt the measures promoted in the five PCs, there is a strong chance that this will support further evidence that IMW is an effective GHG emissions mitigation solution with wider co-benefits and should be applied more widely.

Overall, additional GHG savings are only envisaged well beyond the end of the project and are reliant on the uptake of project approaches and solutions in the 11 additional cities. Additional GHG savings would be further amplified if national policy changes influenced by the project are adopted and cascaded down to a wider range of cities. **There are therefore early signals of the Dimension 3 aspects of transformational change.**

Core Mandatory Indicator M3 Score: Following the instructions from the TCMF in Annex A, the ELE team has assessed the evidence to assign a value to the Core Mandatory Indicator M3[19] and compare it with the indicator's self-assessment given by the project team (i.e. score 2 at the end of 2022). Having assessed the progress made by the project and based on the evidence described above, the ELE team assigns a **score of 3** - ***Tentative evidence of change – transformation judged likely*** **-** to the Impact criteria. Positive aspects include: i) clearly demonstrating the effectiveness of IWM as a mitigation solution with strong buy-in from the Project Partners and the PC governments; ii) starting to cause a catalytic effect in terms of raising the awareness of citizens and the interest of the private sector in IWM; iii) supporting the change of crucial enabling regulations and policies; iv) and obtaining written commitment from an additional group of 11 cities to use the project-backed MRV system and IWM best practices. The score is constrained by a lack of traction in enabling carbon market activity and the limited ability to introduce new business models in the waste sector.

In conclusion, the evidence confirms that the project achievements along the transformational change measurement framework are of the levels expected at the end of the project (see Table 3). Therefore, based on the matrix in Table 10 of Annex A, the ELE team is comfortable with marking the Impact criterion for the China IWM project as green.

3.5 Sustainability of the project

Sustainability	5. What is the likelihood that the outcomes will be sustained after the end of the Project funding period?

The mid-term ELE in 2021 found that the main conditions for the project to be sustainable rest with the ability to access CCER financing and involve the relevant private and financial sectors in IWM investment and related carbon market revenue. It also identified the need to complete the IWM-related governance system modernisation that was just starting during that review. For three of the five outputs (Outputs 1, 2 and 4), the likelihood of them being achieved at the outcome level and sustained beyond the project period was recognised as extremely high. However, to some extent, key sustainability risks were found to lie in the project's success in terms of physical system efficiency at the output level. First, there was a risk that cities seeking to replicate the experiences of the five PCs would only focus on the "narrow" physical system gains without creating the necessary enabling

[19] The Core Mandatory Indicator M3 reads: "Degree to which the supported activities are likely to catalyse impacts beyond the projects (potential for scaling-up, replication and transformation)". The project team is asked to self-assess it using the following 0 to 4 scale: 0 = Transformation judged unlikely; 1 = No evidence yet available; 2 = Some early evidence suggests transformation likely; 3 = Tentative evidence of change – transformation judged likely; 4 = Clear evidence of change – transformation judged very likely.

environment conditions. Secondly, without clear examples of monitoring and institutional and financial reforms at the city level, the enthusiasm of the private sector to get involved in organic and hazardous waste treatment and recycling might have been stifled by an over-investment and resulting over-capacity for incinerators.

The final evaluation broadly validates the points above and provides some important updated findings on aspects related to the sustained impact of the project. Many positive factors are likely to support sustained impact. Firstly, it is clear that the city governments in the PCs strongly bought into the project processes and are likely to continue to operate them. As such, waste segregation management and carbon emission reduction will likely continue in the five PCs.

The MRV process is robust and well-designed, which has been a significant achievement of the project. However, it is complex, and interviews showed that some cities are not yet confident in the necessary data collection processes. The project team states that the MRV cannot be simplified to better fit the context of capacity of specific cities, as it is necessarily a standardised and in-depth assessment of GHG emissions across relevant waste management aspects.

To some extent, the Carbon Manager training certification, implemented by the project, helps to engrain project processes and improve the confidence and motivation of city staff. From 2021 to 2023, 5 special training sessions on low-carbon comprehensive management of the household waste treatment industry were held, and 168 trainees from the government and enterprises received the vocational training certificate of "Carbon Manager".

However, the lack of a suitable carbon trading platform is a critical missing link between the MRV process and the project's outcome related to greater investment by private sector entities in IWM facilitates and services. The CCER is still on hold. This was identified as a risk in the mid-term review and continues to block the full realisation and sustainable impact of the project's carbon trading and private sector activity aspects.

Furthermore, even if the carbon trading platform was in operation, there are several concerns about how effective carbon trading may be in raising additional revenue for IWM projects. Firstly, the MRV is designed for a city to assess and aims to reduce its GHG emissions over time in comparison to a baseline. Transferring the methodology to the project level would not be straightforward. Secondly, there is increasing evidence, as highlighted by the project team, that carbon credit revenue from waste management projects is limited compared to the more substantial amounts available for renewable energy generation and conservation of forest assets. Consequently, the model of carbon trading may not be as transformational and sustained as originally anticipated for the waste sector. **However, the process will still positively add value to commercial models in the sector.** Since the segregation and recycling of municipal solid waste is a comprehensive system project, it is also a matter of public livelihood. Therefore, under the guidance of the life cycle assessment (LCA) methodology) used in the MRV, the promotion of carbon emission reduction in waste management will help indirectly promote carbon emission reduction in other industries and sectors (such as the electrification of waste removal vehicles, etc.), therefore further catalyse a scale up effect.

Finally, an additional positive aspect of the MRV is that it is an open source and can be used by other stakeholders in the waste management sector and other sectors, such as the textile sector in Shengze County in Suzhou. This is likely to enable the support and promote the low-carbon

development of textile enterprises. As the base of China's textile industry, Shengze has begun to promote green carbon emission reduction in textile enterprises.

There is also reasonable evidence of the project sustaining its impact due to the replication of project approaches and best-practice. Firstly, the project has met its IO target of 11 additional cities confirming their interest in learning from and implementing aspects of the Project. These include large cities such as Shenzhen and Hangzhou and smaller cities such as Taizhou. The cities have signed a memorandum of understanding (MoU) indicating they are willing to explore and replicate the MRV and other aspects of IWM best practices that the project has advocated for. Secondly, there is limited evidence of some knowledge transfer to the MEE-leading '11 + 5' Zero-Waste cities and regions in China, a flagship initiative to accelerate the development of a green, low-carbon circular economy system in China. Thirdly, there is evidence that smaller cities in the provinces of the five PCs are learning from the project outputs. For example, government officials in Lanzhou, the capital city of Gansu Province, have presented the project approach and learning points to several other smaller cities. Finally, although the impact is likely minor, there is also ongoing communication with other international and national programmes, such as a World Bank project on circular economy solutions in Shanxi and Jiangsu province, on how the project objectives and approaches can be continued via their workstreams.

It is also important to note that the project website contents (https://www.iwm-nama.org/) have been officially handed over to the Project Partner CAUES in March 2023 for future use. All contents, including the knowledge centre of the former website, have been transferred to the new website (https://iwm-nama.caues.cn/), which will continue to be used as a technical informative platform. This will continue to provide valuable knowledge to public and private sector stakeholders over the medium term.

Based on the positive evidence explained above the ELE team assigns a green rating to the Sustainability criterion.

4 Conclusions

Now that the evidence collected and analysed by the ELE has been explored, this section goes back to the project's Theory of Change to test to what extent the original causal pathways and assumptions behind them (see Section 1.1) have held.

Figure 4. Overview of Project Causal Pathways Assessment at End-Point

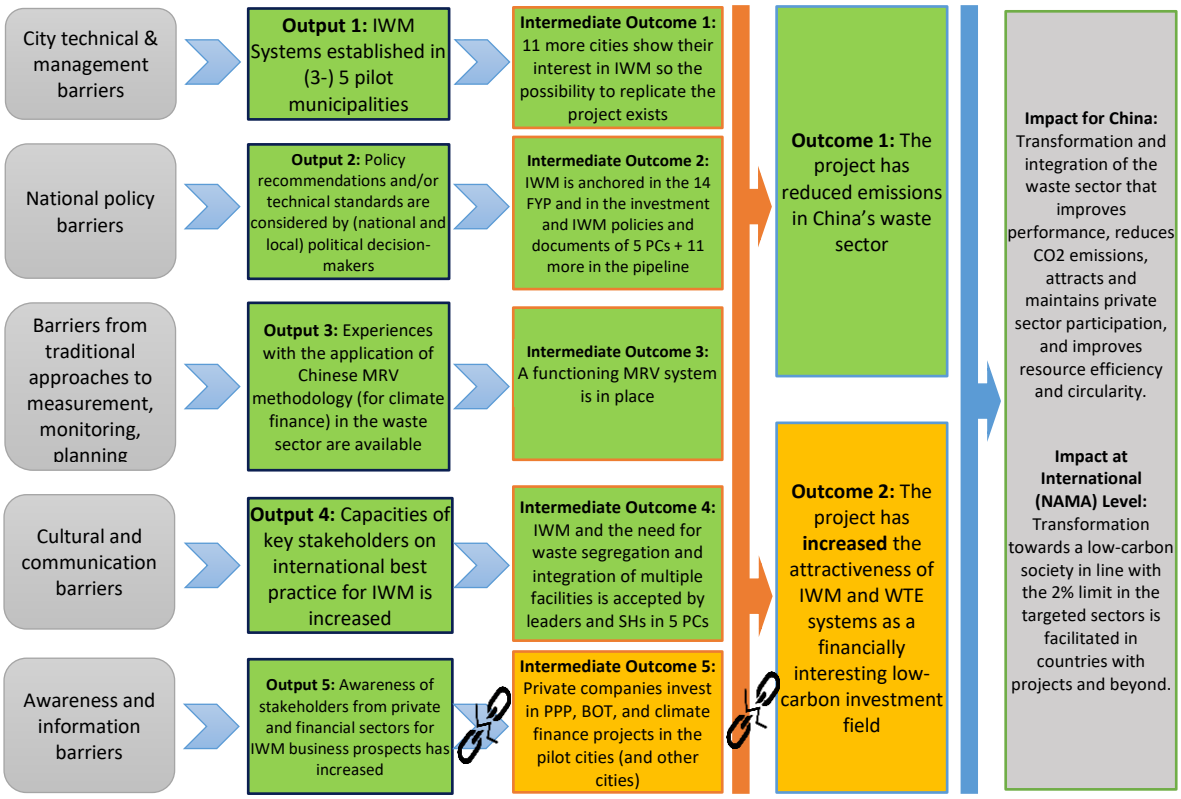


Figure 4 presents an overview of the project's progress along its ToC causal pathways towards its intended outcomes. The RAG rating uses the same scale as the previous section (i.e. Good / Very Good = Green; Problems = Amber; Serious deficiencies = Red; Not enough info to rate = Grey), and the colours of the Outcomes' shapes are the same colours used in Section 3.2 to rate the project's achievements for each Outcome. This is to be read as an assessment of the project's situation at this point, i.e. at the end-point. An overview of the five causal pathways is set out below, assessing the extent to which the causal pathways have held.

Causal pathway supporting Intermediate Outcome 1: There is strong evidence that the project has helped to establish IWM systems in the five PCs. This has been achieved via training and capacity development as well as the implementation of the WASTEAWARE indicator system to assess and guide IWM activities. The system implemented in the five PCs evokes interest in the 11 additional cities, as per Intermediate Outcome 1. However, the ELE team points out that IO 1 (i.e., interest shown) is not a very strong sign that sufficient capacity has been developed in the 11 additional cities. The causal pathway linking establishing and demonstrating IWM in the five PCs to their effective replication in 11 additional cities is not yet proven. However, there are early signs of a commitment from the 11 cities.

Causal pathway supporting Intermediate Outcome 2: A number of policy recommendations have been adopted by the national government, and several more are under review by national government reviewers, with the potential to further influence national government policy with evidence from the five PCs. City governments have adopted the principles of IWM. This results in a strong anchoring of IWM in policy and strategy, as per IO 2.

Causal pathway supporting Intermediate Outcome 3: The MRV has been well designed and implemented, resulting in a good demonstration of the approach, evidence, and learning of its application in Chinese cities. The MRV system is functioning in the waste sector for each of the 5 PCs, and therefore IO 3 can be ranked in green at the Final Evaluation stage. The causal pathway is largely valid, but there are some concerns with regard to capacity of PCs' governments to continue to collect data and use the MRV effectively and consistently, hence the broken link in Figure 4.

Causal pathway supporting Intermediate Outcome 4: Capacity building in best practice approaches for IWM has been achieved for city government and private sector stakeholders. There has been a positive shift in awareness and values in all five PCs relating to the importance of IWM approaches and the ability to plan and implement them in practice. The causal pathway is largely valid, making PCs rapidly accept the need to implement IWM approaches.

Causal pathway supporting Intermediate Outcome 5: The project has carried out impressive awareness-raising and matchmaking activities for the private sector. There is some established evidence that the project has had a positive influence on how the private sector sees opportunities in the IWM sector. However, there is insufficient evidence that this has translated into a notable increase in each PC's PPP and BOT projects in the IWM sector. There is also a lack of clarity on the extent to which the private sector investments within the project boundaries can be directly attributed to the project. However, it is clear that public and private sector stakeholders have much appreciated the project awareness-raising and matchmaking activities. Regarding the carbon trading aspects, this link has not yet been proven due to the CCER being on hold and questions about the commercial impact of carbon credit revenues, even if trading was possible. There is also uncertainty about using the MRV system at the city level, as opposed to the need to measure GHG emission reduction at the project level.

Overall assessment of the causal pathways to outcome level

What transpires from Figure 4 and the assessment of the causal pathways above is clear evidence that Outcome 1 of the project can be partially attributed to the project outputs. This is clear from the high standard of delivery by the project in terms of capacity development to PCs, awareness raising and behavioural change support to citizens and other stakeholders and sharing of best practice approaches, all of which have supported PCs to implement low-carbon waste management solutions. There has also been a positive influence in terms of evidence from the PCs being transferred to the national policy level via CAUES. In this way the project is able to achieve more transformational impact as similar approaches can be cascaded from CAUES and via national government requirements across a much broader range of cities.

There is less evidence that the project has fully achieved the outputs and intermediate outcomes leading to Outcome 2 of the project. There is no strong evidence that the project activities focused on raising awareness of stakeholders from the business and financial sectors have resulted in the

desired increase of PPP and BOT projects in the IWM sector. There is also a lack of linkage between the MRV, carbon trading and increased commercial incentive for companies to invest in IWM.

It is challenging to ascertain the extent to which some of the project-related outcomes, such as stronger city government capacity in IWM approaches and policy, as well as private sector investment into IWM infrastructure and services, can be attributed to the project, as opposed to being caused by the greatly increased national government focus on sustainable waste management that has been manifested across the country during the project's implementation period.

However, overall, it is clear from the evidence, gathered from interviews in particular, that city government stakeholders have been grateful to receive much-needed support from the project to help them respond to national government advice on implementing waste segregation systems and downstream IWM solutions that enable low-carbon and more sustainable waste management. The project has played an instrumental role in helping raise awareness of the importance of IWM approaches and develop capacity in terms of practical steps that public and private sector stakeholders can take to make robust progress in these areas. **This has greatly contributed to the recorded GHG emission reductions in the five PCs.**

The project has contributed significantly to the evidence-based process of national waste management policy-making, raising awareness in both the public and private sectors. It has demonstrated that IWM is an effective solution for mitigating GHG emissions, with wider co-benefits that can be extended across five PCs and other industries, including textiles. The project also promoted the MRV approach, which can be implemented in numerous cities across China to support GHG emission measurement and decision-making via IWM. There is strong potential for additional, larger-scale GHG emission savings should the policies recommended by the project be replicated or cascaded to a broader range of cities within China. This suggests a high likelihood of significant, long-term GHG savings beyond the project's conclusion. **Consequently, the project has created a catalytic effect, fostering wider transformational change in GHG mitigation across China's waste sector.**

5 Lessons and recommendations

5.1 Key lessons

The evidence gathered during the ELE, along with the key findings presented in Section 3 and the conclusions in Section 4, have been used by the ELE Team to draw the lessons below. The learning points are structured by: 1) Lessons for the project partners for sustaining the project's legacy; 2) Lessons for the Mitigation Action Facility for the review, approval, and management of future interventions; and 3) Lessons for improving other or future projects' design and implementation in a similar sector, under the Facility.

5.1.1 Lessons for the Project Partners for sustaining the project's legacy

- **Lesson 1: Partnership with both national and city-level political decision-making bodies, enabling engagement and communication, can facilitate further improvements to national policy.** The project approach of working at the local level with five PCs as well as working at the national level with CAUES and MoHURD is seen to be effective, enabling evidence from the cities to influence national policy and supporting cities to implement IWM guidance that national policy-makers have already determined. Continuing these connections after the project has ended, via the leadership of CAUES, is likely to continue to lead to project impact as additional evidence can be collected from the PCs to support national policy development.

- **Lesson 2: The MRV is complex for cities to implement, and significant capacity development and hand-holding are required for sustained impact.** The technical support provided by the project has facilitated the development of carbon emission reduction verification and IWM-related tools such as the MRV system. The MRV is complex, with many data requirements and strong capacity required to effectively use the outputs. Strong and ongoing support is needed to ensure that city staff can use the MRV effectively.

- **Lesson 3: Carbon trading is challenging due to external factors and is not a significant revenue generator in the MSW sector.** The project experience has provided useful learning in the processes related to carbon trading for the waste sector. A trading platform must be in place, and the lack of CCER in China has been a constraint. At the same time, private sector investment may not be as widely mobilised and are unlikely to support projects' commercial feasibility as expected due to the relatively low waste sector carbon credits. Ideally, CAUES can support carbon trading in the sector when CCER becomes available to continue exploring its effectiveness in China's waste sector.

- **Lesson 4: There is a likely mismatch between the city-level MRV and carbon trading at the project level**. The MRV system developed by the project is a city-scale assessment, whereas carbon trading will rely on a more granular project-specific assessment of GHG emission reductions. There is a lack of clarity among stakeholders on bridging this gap, which is part of the casual pathways towards implementing carbon credits by the private sector. Clarifying this

will be an important part of related work on the project's legacy and can perhaps be supported by CAUES.

- **Lesson 5: Cities seeking to replicate the experiences of the five PCs must create the necessary enabling environment conditions**. There is a risk that cities may only focus on the "narrow" physical system gains without the wider reforms and enabling environment such as staff capacity development, MRV implementation, training to ensure implementation, etc.

- **Lesson 6: There are significant opportunities to continue replicating the project approach in other industries to measure and manage GHG emissions**. The project has shown the value of applying the MRV system and LCA approach in the textile industry in Suzhou's Shengze County (Wujiang District). This has helped to prove the value of the project approach, and opportunities should be sought to enable further replication of the approach across the waste, textile and other sectors in China.

- **Lesson 7: Sharing project resources and insights with other development partners can encourage continued impact and synergies.** Several projects that have similar objectives to this project are ongoing or just starting at the time of the final ELE. There is great value in sharing insights and tools with such projects to enable continued impact and encourage synergies. For example, project-developed tools and conceptual knowledge were shared with China's World Bank plastic waste reduction project, including Xi'an as a focus city.[20] There are also synergies with the ongoing Rethinking Plastics - Circular Economy Solutions to Marine Litter project, implemented by GIZ in China in several cities such as Xiamen.[21]

5.1.2 Lessons for the Mitigation Action Facility for the review, approval, and management of future interventions

- **Lesson 1: Aim for clear attribution of project indicators where possible**. Some indicators are difficult to be directly attributed to the project, such as private sector investment mobilised in waste management infrastructure (Core Mandatory Indicator M5). However, this may be linked to the fact that this project only had a TC Component. It is possible that in more "typical" Mitigation Action Facility projects with an FC Component as well, attributing changes in the mobilisation of investments to the project would be more straightforward.

- **Lesson 2: Synergies with other international projects can extend the project results and create new project opportunities**. Similar to the point mentioned above in Lesson 7, enabling greater connection with other projects is valuable and can lead to efficiencies and more rapid outcomes. The Mitigation Action Facility can play an important role in linking similar projects across its global portfolio. The GIZ project team in China would have been grateful for any

[20] Supporting Plastic Waste Reduction in China's Shaanxi Province.

[21] Rethinking Plastics project website.

connections to other relevant mitigation projects related to waste management to enable knowledge exchange.

- **Lesson 3: It is crucial having an implementation organisation suitable for stakeholder management and influencing**. As demonstrated by the effective implementation by GIZ, it is important that future projects are also led by implementing organisations that can demonstrate the ability to build and maintain relationships with national and sub-national governments, enabling effective capacity development and influencing policy reform.

5.1.3 Lessons for improving other or future projects' design and implementation

- **Lesson 1: Projects should focus on the whole business model, enabling environment, and the technology to be promoted/scaled up**. It is important for projects to link together the different relevant stakeholders, such as investors, technology providers, public funders, and public participation, across the value chain of IWM to enable GHG emission reduction. For instance, an FC Component can potentially play a role in helping de-risk private sector investment. Still, it should be applied in contexts where public and private sector funding is relatively scarce compared to wealthier Chinese cities.

- **Lesson 2: Long (or continuously phased) project timeframes are necessary to influence and build city governments' capacity**. The process of influencing national policy is not straightforward in China, even with evidence from demonstration cities. In a sustained process, it needs continued effort and strong relationships with relevant national government entities. The 6-year project in China has enabled the influence of national policy-making to some extent, and this consideration on sufficient timelines should be applied to other relevant Mitigation Action Facility projects. It is also very important to have a suitable project partner who can convene and influence national-level stakeholders. MoHURD and CAUES have played the project partner role very well in China.

- **Lesson 3: Consider a broader scope for emissions reduction in IWM projects**. As mentioned by the project team in the latest Annual Report[22], in order to influence a broader range of emissions sources related to MSW, projects in the sector should consider expanding the IWM system boundary, including construction and demolition (C&D) waste and expanding from municipal to industrial waste with priority on plastics management and pollution control.

- **Lesson 4: It is important to build on existing or past Mitigation Action Facility projects which work on similar sectors, targets, approaches, or technical fields**. This will help carry on the past project results and lessons learned to impact the project fund better.

- **Lesson 5: It is important to map the synergies and cooperation with other international and national projects/actions to enlarge the project's impact and achievement**. Similar projects should design in-sector sharing or regional/global learning activities with other relevant

[22] Source: project Annual Report 2022 and project M&E Plan 2022.

Mitigation Action Facility projects globally or with sector-related projects in their countries or region of operation to ensure synergies and efficiencies can be achieved.

5.2 Recommendations

The recommendations that result from the lessons were discussed in the Validation Workshop with the project team and have been refined through additional discussions within the ELE team.

5.2.1 Recommendations to the Project Partners for sustaining the project's legacy

The following recommendations are provided to the national Project Partners to support actions that can help sustain the project's outcomes in the long term and foster the envisaged transformational change. The ELE team does not expect to receive an official management response to these recommendations from the Project Partners but hopes they will take them into consideration while planning their next steps in IWM.

- **Recommendation 1: Maintain the availability of a platform to disseminate the best practices and knowledge developed by the project.** Much valuable material has been gathered and developed by the project. CAUES should commit to maintaining the project platform for sharing with relevant audiences. This can help to multiply the project deliverables (such as the training materials, case studies, and tools) in a larger scope and to sustain the project's impact.

- **Recommendation 2: Continued knowledge management and capacity-building activities for city staff and other relevant stakeholders should be delivered by CAUES.** It is anticipated that CAUES can continue implementing the transformational work the GIZ started. This should include supporting PCs to maintain capacity for data collection to support the reliability and quality of the MRV system.

- **Recommendation 3: Maintain the policy-making participation channels within and between the national and local government levels**. CAUES can help enable the consistency of transferring the project practices and deliverables (policy recommendations, technical standards, MRV methodologies) in the future policy development in the waste management sector, GHG emission mitigation, and emission trading system, such as providing project experiences as inputs for the national (CCER group methodology on waste related carbon emission reduction) MRV in order to support the profitability of IWM by selling the carbon credit.

- **Recommendation 4: Aim to find a new owner (likely to be CAUES) for the technical network in China that the project has developed.** Valuable cooperation with Chinese research academies, universities, international and national experts, NGOs, financial institutions, carbon trading agents, industry sectors, and media has been enabled. Linkages between these organisations have helped strengthen the capacity for waste management, waste to resources, climate financing, public awareness raising and propagation, sustainability, and climate mitigation actions. Details of this network and its key representatives should be shared with CAUES, if possible, to support their future efforts to continue to implement the project objectives.

- **Recommendation 5: Continue to support and facilitate private sector finance in IWM infrastructure and services.** CAUES can also be encouraged and supported by GIZ to encourage greater volumes of private-sector investment in IWM-related carbon reduction solutions. The Project Partner can continue supporting PCs and other relevant stakeholders on topics such as suitable commercial models, enabling environment reforms, including subsidies, and supporting project preparation and approval. CAUES could also review how much carbon trading will change the business model to leverage the carbon revenue in the waste sector.

5.2.2 Recommendation to the project team for finalising project implementation

- **Recommendation 1: Liaise with international organisations and platforms to share the project knowledge and findings.** In the closing months, the GIZ project team can share relevant knowledge, insights and findings with partners implementing similar projects related to a circular economy, waste management, and climate mitigation and adaptation. Such partners include UNFCCC, UNEP, UN-Habitat, World Bank, and EU programmes.

- **Recommendation 2: Discuss with the Mitigation Action Facility the possibility of receiving a costed extension of the project** to focus on supporting the uptake of the demonstrated IWM solutions by the most promising group of the 11 cities and, to a minor extent, potential replication in other sectors. Other financial recourses shall be also sought for supporting such extension and replication.

- **Recommendation 3: Review the GHG mitigation opportunities in waste management-related sectors, such as textiles waste and plastics**, and potentially apply for a new Mitigation Action Facility-funded project to build on the success of this project.

5.2.3 Recommendations to the Mitigation Action Facility for the review, approval, and management of future interventions

The following recommendations are made to the Mitigation Action Facility to help improve the relevant processes of future interventions.

- **Recommendation 1: Enable engagement and knowledge sharing across the Mitigation Action Facility's portfolio.** Support projects in the Mitigation Action Facility portfolio to consult one another and share relevant knowledge, such as 1) case studies to be published and disseminated via the Mitigation Action platform; 2) best practices and lessons learned to be exchanged among projects in similar sectors. Indeed, it was reported that the project could have benefited from greater exchange on relevant sectoral and project management topics with other projects in the Mitigation Action Facility.

Annex A Capturing Project-induced Transformational Change

Introduction

This brief guidance was developed by AMBERO/OPM outlining a framework to consistently evaluate Mitigation Action Facility-funded projects' progress towards bringing about transformational change.

Transformational change is embedded in the Mitigation Action Facility's goals, and Theory of Change (ToC), and projects are the main way through which the Mitigation Action Facility will achieve this transformational change. Therefore, the projects must aim to achieve this level of change, and the Evaluation and Learning Exercises (ELEs) of such projects should evaluate their progress.

In a way, key elements of transformational change are already monitored through the project's Mandatory Core Indicators M1-M5, part of the Mitigation Action Facility M&E Framework[23]. However, they only cover partial elements of transformational change. Therefore, clearer guidance is needed in identifying the signals or evidence of project-induced transformational change.

This brief document clarifies how transformational change is expected in projects. It guides both project and ELE teams in characterising the elements and evidence of project-induced transformational change.

Breaking down project-induced transformational change

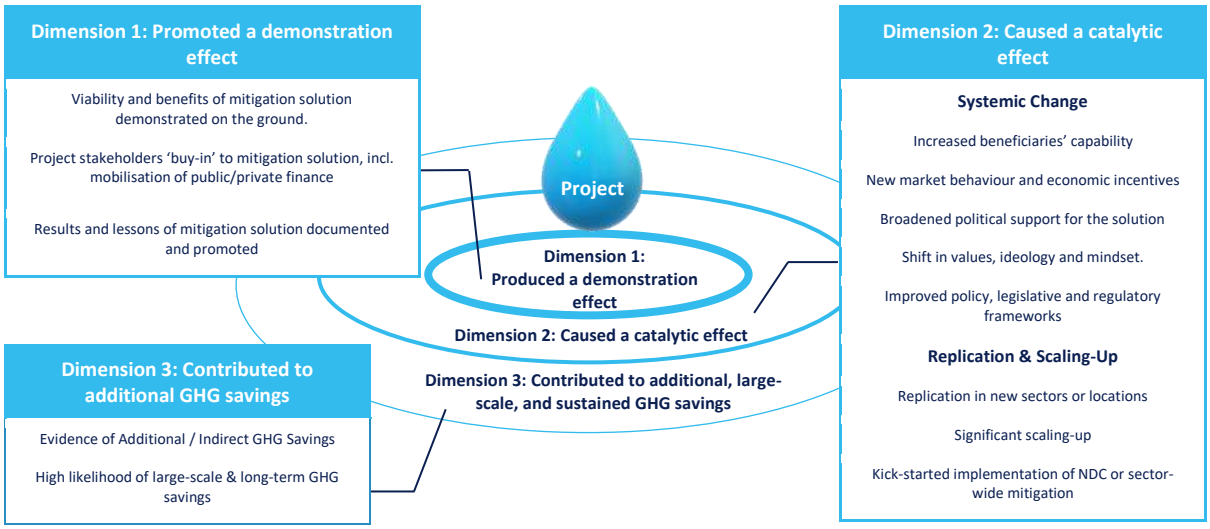
The Mitigation Action Facility defines transformational change as "*Catalytic change in systems and behaviours resulting from disruptive climate actions that enable actors to shift to carbon-neutral pathways*"[24].

The Mitigation Action Facility's ToC explains how transformational change is expected to be achieved through its outputs and outcome. The ToC is broad, and there are different ways transformational change can be achieved through the projects, which are simplified into the three *dimensions* summarised in the figure below.

[23] https://mitigation-action.org/our-approach/monitoring-evaluation-learning/

[24] https://mitigation-action.org/wp-content/uploads/Mitigation-Action-Facility_transformational change-factsheet.pdf

Figure 5. Dimensions of Project-induced Transformational Change



Three dimensions interact and reinforce each other to produce project-induced transformational change (Figure 5). These are described below, indicating what is expected to be achieved at the project's mid- and end-point (see Table 8 and Table 9 for more details on scoring criteria).

- **Dimension 1: Promoted a demonstration effect.** The most direct way in which a project can contribute to transformational change is to produce a demonstration effect which will imply that:
    - The project has **demonstrated** or proven the viability and benefits of a particular **mitigation 'solution' (e.g. models, practices or technologies)** through implementation on the ground (e.g. using pilot projects), thereby directly contributing to GHG emissions savings;
    - There is **evidence of buy-in by key project stakeholders**, e.g. by mobilising additional public/private finance along with the project Financial Cooperation Component;
    - The demonstrated **results and lessons of the mitigation solution have been documented** (e.g. in knowledge or communication products) **and promoted externally to a wider audience**.

  By mid-point, projects are expected to show interim signals of achieving this demonstration effect, which should have become clear evidence (i.e. advanced signals) by the end-point.

- **Dimension 2: Caused a catalytic effect.** To amplify the impact of the mitigation solution demonstrated (Dimension 1), the project needs to cause a virtuous catalytic effect in the operating country or region. This can take the form of one or more of the following catalytic changes:
    - **Replication and/or significant scaling-up** of the project's demonstrated solution in other sectors or locations or the project itself. This could include kick-starting sector-wide mitigation or the NDC; and/or
    - As a result of the project improving enablers and/or eliminating barriers to the uptake of the mitigation solution, it will result in wider **'systemic' change**, which could be supported by one or more of the following: a) Increased beneficiaries' capability; b) new market behaviour and economic incentives; c) improved policy, legislative and

regulatory frameworks; d) broadened political support for the solution; e) shift in values, ideology and mindset.

By mid-point, projects are expected to have produced some early signals of one or more of these changes (or that they are likely in the near future), which should have been strengthened into interim signals by the end of the project.

- **Dimension 3: Contributed to additional GHG savings**. As a result of contributing to Dimension 1 and Dimension 2, the project will indirectly influence *additional, large-scale and sustained GHG savings*[25].

  Projects are not expected to have achieved this during the project's lifetime. Yet, by the end of the project, there should be early signals of additional (i.e. indirect) GHG savings and evidence that these will become large-scale and sustained GHG savings in the future.

Box 1: Connection between transformational change Measurement Framework and Knowledge Management and Learning Strategy

One of the key objectives of the Knowledge Management and Learning Strategy (KMLS) is to ensure that learning from successes and failures is taken into account, changes are implemented accordingly, and innovative approaches are replicated. There is, therefore, an important connection between the ELEs and this strategy, and the learning documented through the ELEs is expected to be used by the Mitigation Action Facility in its function of 'Knowledge and Learning Hub' for the international climate finance community explained in the strategy. In particular, project-specific learning should be proactively shared and discussed with other projects (at least with those funded by the Mitigation Action Facility). The KLMS also expects to engage with and influence international debates on climate finance and transformational change. The Mitigation Action Facility will use and synthesise learning on supporting transformational change, documented through the ELEs, to inform this engagement.

Measuring project-induced transformational change

The transformational change dimensions come directly from the Mitigation Action Facility ToC. As the projects are expected to be aligned with the overall Mitigation Action Facility ToC, it should be possible to map the dimensions of transformational change in the project ToCs. All projects must monitor their progress using their Monitoring and Evaluation (M&E) Plans, including Mandatory Core Indicators and project-specific indicators.

The ELE teams will be evaluating and learning from the projects' progress in supporting transformational change, which will include reviewing progress against the indicators and milestones set out in their M&E Plans. In addition, this can be complemented (and verified) with more qualitative ELE questions and data sources. Table 7 below provides some guidance to ELE teams in terms of criteria and evidence for assessing the project-induced transformational change. This includes the three dimensions but also the scoring for the Core Mandatory Indicator M3, which can be seen as the

[25] Additional = the GHG savings achieved are in addition to those achieved by the direct implementation of the project. Large-scale = the additional GHG savings will have a significant impact on overall GHG savings in the geography/sector. Sustained = there is no chance of the GHG savings being reversed.

summation of results for the three dimensions.

Table 7. Guidance for ELE teams for measuring project-induced transformational change

Transformational change dimension	Element within transformational change dimension	Alignment with OECD DAC Criteria / ELE report section	Where should it feature in project ToC and M&E Plans	How to measure success	Expectations at mid-line and final ELE
1: Promoted a demonstration effect	**Viability and benefits of mitigation solution demonstrated on the ground**	Effectiveness	• Milestones set for outputs and/or Intermediate Outcomes (if used) should represent the scale of uptake needed to demonstrate the solution is viable (meaning it has been shown to work in practice at a large scale in diverse contexts and provide the expected economic, social and climate benefits) • Also aligns with M1: Reduced Direct GHG emissions and M2: Number of people directly benefiting.	*Quant*: Achievement of project milestones for the adoption of the mitigation solution by target users and resulting direct GHG emission savings Qual: Feedback from target users that viability and benefits have been demonstrated.	• Mid-point: Interim Signals • End-point: Advanced Signals
1: Promoted a demonstration effect	**Results of mitigation solution documented and promoted**	Effectiveness	• Milestones set for outputs on producing knowledge and learning documents and engaging with wider stakeholders to share this insight. • Seek alignment with the KMLS.	*Quant:* Achievement of project milestones for knowledge and communication products/activities *Qual*: Feedback from other stakeholders (e.g. other funders) on their awareness and understanding of the project and solution.	• Mid-point: Interim Signals • End-point: Advanced Signals
1: Promoted a demonstration effect	**Project stakeholders 'buy-in' to mitigation solution**	Effectiveness	• Milestones set for outputs and/or Intermediate Outcomes for the volume of finance expected to be mobilised and/or other	*Quant*: Achievement of project milestones for public and private finance mobilised Qual: Feedback from government and other	• Mid-point: Interim Signals • End-point: Advanced Signals

Transformational change dimension	Element within transformational change dimension	Alignment with OECD DAC Criteria / ELE report section	Where should it feature in project ToC and M&E Plans	How to measure success	Expectations at mid-line and final ELE
			examples of 'buy-in' (e.g. policy statement). • Also aligns with M4-5: Public and Private finance mobilised	stakeholders that they are convinced of the viability and benefits of the solution	
2: Caused a catalytic effect	**Systemic change underway to enable widespread adoption of mitigation solutions:** • Improved policy, legislative and regulatory frameworks • New market behaviour and incentives • Increased institutional capacity and management practices • Shifts in values, ideology and mindset • Broadened political support for the solution	Effectiveness	• Milestones set for outcomes should indicate what needs to change to enable widespread uptake of the mitigation solution.	*Qual*: Evidence of contribution to achieving expected systemic change and unexpected changes.	• Mid-point: Early Signals • End-point: Interim Signals

Transformational change dimension	Element within transformational change dimension	Alignment with OECD DAC Criteria / ELE report section	Where should it feature in project ToC and M&E Plans	How to measure success	Expectations at mid-line and final ELE
2: Caused a catalytic effect	**Replication and scaling-up of mitigation solution and/or project** • Replication in new sectors of the mitigation solution and/or project itself • Significant* scaling-up of the mitigation solution and/or project itself • Kick-starting and influencing sector-wide mitigation ** Significant compared to the size of the project and the overall target user group. For example, if the project promoted the installation of 2,000 Solar PV systems (representing approximately 2% of all target users), significant replication would imply that it has reached around 20% of target users. However, there is no quantitative target to meet, and a rationale can be provided to justify it meeting these criteria.*	Effectiveness Sustainability	• Milestones set for outcomes for replication/ scaling-up by others of project activities.	*Quant*: Volume of scaling-up (e.g. # of new geographies/ beneficiaries or $ of new funding) *Qual*: Feedback from other funders and programmes on the influence of the project in their decision to scale up activities and/or invest in the project's sector.	• Mid-point: Early Signals • End-point: Interim Signals

Transformational change dimension	Element within transformational change dimension	Alignment with OECD DAC Criteria / ELE report section	Where should it feature in project ToC and M&E Plans	How to measure success	Expectations at mid-line and final ELE
3: Indirectly contributes to additional, large-scale and sustained GHG savings	**As a result of the changes from dimensions 1 and 2, there is evidence of additional and potentially large-scale and sustained GHG emissions savings.**	Impact	• Milestones set for Impact should represent the scale of GHG emissions savings required for sector decarbonisation. • Also aligns with M1: Reduced Indirect GHG emissions and	*Quant:* Achievement of project milestones for indirect additional GHG emissions savings *Qual*: Given progress for dimensions 1 and 2, an assessment of the likelihood that this will result in additional GHG savings in the future. This is informed by feedback from wider stakeholders in the sector.	• Mid-point: No signals • End-point: Early Signals
Overall Transformational Change potential	**M3: Degree to which the supported activities are likely to catalyse impacts beyond the projects (potential for scaling-up, replication and transformation)**	Impact		*Mixed*: Based on whether the expected minimum level of signals for each transformational change dimension is found, the ELE gives: 1) a RAG rate to the 'Impact' evaluation criterion; and 2) a rate from 0 to 4 to the M3 indicator.	

Guidance for describing and scoring progress towards transformational change in ELE reports

Although transformational change is ultimately related to the project's Impact, **evaluating progress towards it cuts across different parts of the ELE report related to Evaluation Questions on Effectiveness, Sustainability and Impact (see table above).** In particular, the Effectiveness and Sustainability sections of the ELE report will describe key aspects of dimensions 1 and 2 (which relate to the projects' outputs, intermediate outcomes and outcomes). Therefore, the Impact section will provide an analytical synthesis of the three transformational change dimensions referring to the previously described evidence and assign an overall score to the project's transformational change potential. ELE reports' authors should avoid duplications across the sections and cross-reference to other relevant parts of the report if some of the evidence has already been discussed.

Each dimension should be described and assessed according to the following "signal levels":

Table 8. Transformational Change "Signals" assessment by ELEs

Signal level	Definitions
No evidence	Evidence suggests little to no progress is being made in line with the ToC causal pathways to Transformational Change.
Early signals	There is emerging evidence of the transformation related to the dimension, or the foundations for the transformation have been laid by the project. Still, no signals of the change are present.
Interim signals	Evidence shows some signals that the transformation related to the dimension is underway, and it is likely to continue.
Advanced signals	Evidence shows strong signals that the transformation related to the dimension is underway, and there is little doubt that it will continue.

ELEs expect projects to have achieved at least the "signal levels" in Table 9 by the project's mid-point and end-point for each dimension.

Table 9. Minimum expected signals of project-induced transformational change

Dimension	Mid-point	End-point
1: Promoted a demonstration effect	Interim signals	Advanced signals
2: Caused catalytic effect	Early signals (of one or more of the types of possible changes)	Interim signals
3: Contributed to additional GHG savings	None	Early signals

Within the relevant dimension's sub-sections, these signal levels should be presented and justified by referring to the evidence provided throughout the report (e.g. in the Effectiveness and

Sustainability sections). Below are some guiding questions to support this (aligned to measures presented in Table 7).

For presenting the evidence on **Dimension 1**, the report could provide a narrative answering the following questions:

- Is the project in line with the expected direct GHG savings per M1 and the number of beneficiaries reached per M2?
- Have the key project stakeholders (i.e. those closest to the project implementation) shown concrete evidence of buy-in/adoption of the project's mitigation solution? Is this demonstrated by public and private sector actors investing resources into it, as per M4 and M5?
- Is the project documenting the key results and lessons from the process of demonstrating the validity of the mitigation solution and sharing these with wider stakeholders?
- Do the answers to the above questions constitute interim/advanced signals of Dimension 1 for the mid-point and end-point ELEs, respectively?

Similarly, for **Dimension 2**, the narrative could present evidence around the following questions:

- Has the project contributed to improving/removing systemic enablers/barriers to the widespread uptake of its demonstrated mitigation solution? What wider effects might this produce?
- What is the evidence that the project's mitigation solution will be scaled-up and/or replicated in new sectors and/or locations?
- Is there evidence that the project has informed or kick-started the implementation of the NDC or sector-wide mitigation?
- Do the answers to the above questions constitute early/interim signals of Dimension 2 for the mid-line and end-point ELEs, respectively?

Concerning **Dimension 3**, as no signals are expected at mid-term, the following questions are suggested for the analysis in Final ELEs only:

- Is the project in line with the expected indirect GHG savings per M1?
- What is the evidence that the project's mitigation solution will generate additional and large-scale GHG savings in the long term?
- Do the answers to the above questions constitute early signals of Dimension 3?

Finally, the assessment would conclude by providing an overall rating of transformational change potential. This aligns with M3: "Degree to which the supported activities are likely to catalyse impacts beyond the projects (potential for scaling-up, replication and transformation)".

The project will likely have provided a self-score for M3 within their routine M&E reporting. Therefore, the ELE teams can discuss their rationale for this score with the project teams and then provide their own independent judgement of it.

To do this, the ELE authors should look back on whether the expected minimum level of signals for each transformational change dimension (Table 9) was found by the ELE and, on that basis, rate from 0 to 4 the M3 indicator using the scale recommended in the Mitigation Action Facility M&E Framework:

- 0 = Transformation judged unlikely;
- 1 = No evidence yet available;
- 2 = Some early evidence suggests transformation likely;
- 3 = Tentative evidence of change – transformation judged likely;
- 4 = Clear evidence of change – transformation judged very likely.

Based on that score, a Red-Amber-Green (RAG) rating will be assigned to the Impact evaluation criterion. The RAG rating can follow the guidelines in the matrix below (Table 10) while leaving some flexibility to account for the project-specific trajectories of progress.

Table 10. Indicative project's Impact RAG rating based on its M3 indicator score

M3 score	0	1	2	3	4
Mid-term ELE					
Final ELE					

Legend: 0 = Transformation judged unlikely; 1 = No evidence yet available; 2 = Some early evidence suggests transformation likely; 3 = Tentative evidence of change – transformation judged likely; 4 = Clear evidence of change – transformation judged very likely.

Annex B Evaluation and Learning Exercise Matrix

This evaluation and learning exercise matrix is based on the Theoretical Framework provided (version April 2022). It is a working tool that allows the evaluators to focus on a feasible target and assemble information for each question that can be synthesised in the final report, hence creating an integrative overview of the project at large.

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
			1 RELEVANCE		
1	To what extent did the project address the identified needs of waste management stakeholders?	▪ The project design responds to the beneficiaries' (waste management authorities) needs and strategic priorities at the time of adoption: ○ Reducing Greenhouse Gas (GHG) emissions from waste sectors in China ○ Triggering Integrated Waste Management (IWM) policies and MRV (Monitoring, Reporting and Verification) mechanism (ETS (Emissions Trading Scheme), CCER (China Certificated Emission Reduction)) in the waste sector.	▪ Technical assistance by the project to 5 pilot cities (PCs) addresses the key barriers to fostering GHG reduction and resource efficiency in the IWM sector. ▪ The project is aligned with China's Nationally Determined Contributions (NDC).	▪ Direct beneficiaries (government, waste management facilities, investors, local population) ▪ Project Team ▪ Technical Support Unit (TSU) ▪ Independent verifiers (5 cities target groups)	▪ Document review (Project proposal, progress reports, publications) ▪ National plans, strategies, and other policy instruments such as norms, standards, etc. ▪ Semi-structured key informant interviews (KIIs) ▪ In-depth interviews ▪ Context and data analysis ▪ Final closing event/documents

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
		○ Mobilising low carbon investment in IWM and WTE (Waste to Energy). ▪ Given the evolving challenges and priorities in China's waste management and climate adaptation sectors, the project continues responding to the abovementioned priorities.			
			2 EFFECTIVENESS		
2	To what extent has the project achieved intended (and unintended) outcomes?	▪ The degree to which there was evidence of the expected results / Interim Outcomes in the Theory of Change (ToC) (adjusted in mid-term ELE in 2021): ○ Interest in IWM from other cities is demonstrated ○ IWM is embedded in policy and investment decision ○ The MRV system in the waste sector is in function ○ The capacity and awareness of implementing and developing IWM fulfil the waste management needs	▪ The project activity implementation contributes towards outputs and outcomes.	▪ Project Team ▪ TSU ▪ Direct beneficiaries ▪ Independent verifiers	▪ Project proposal ▪ Progress reports ▪ In-depth interviews ▪ Semi-structured key informant interviews (KIIs) ▪ Data from project monitoring system / logframe ▪ Final closing event/documents

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
		○ Public and private finance is mobilised for low-carbon initiatives in waste-related sectors			
2.1	Were there additional outputs and/or outcomes obtained that were not planned in the project design (incl. unintended outcomes)?	▪ Evidence of the project's contribution to additional (intended and unintended) results exists. ▪ If there are positive unintended results, the project team has been able to capitalise on them to sustain the intended outcomes. ▪ If there are unintended negative results, the project team has been able to appropriately identify, address and learn from them.	▪ The project management is appropriately designed to identify, address/capitalise from, and learn from unintended outcomes.	▪ Project Team ▪ TSU ▪ Direct beneficiaries	
			3 EFFICIENCY		
3	To what extent was the delivery of outputs timely and to expected quality standards?	▪ Timeliness of the delivery of outputs and outcomes (incl. budget spending) ▪ If there are delays in the implementation, what have caused them (endogenous or exogenous factors), and how seriously have they impacted the project implementation? ▪ The effectiveness of the measures adopted to reduce the delays	▪ TC activities run smoothly, on time and budget. ▪ The COVID-19 impact is mitigated with catch-ups and modifications of activity scheduling.	▪ Direct beneficiaries ▪ Project Team ▪ TSU ▪ Independent verifiers	▪ In-depth interviews ▪ Semi-structured key informant interviews (KIIs) ▪ Project proposal ▪ Progress reports ▪ Data from project monitoring system / logframe

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
		▪ The level of satisfaction of the project's direct beneficiaries			
3.1	Was the project managed, coordinated, and implemented effectively?	▪ The chosen implementation mechanism is conducive to achieving the expected outcomes. ▪ Communication and visibility are implemented according to an integrated approach. ▪ Stakeholders are participating and collaborating actively in the intervention.	▪ Coordination and cooperation with stakeholders at the national or city level efficiently support the project outcomes.	▪Direct beneficiaries ▪Project Team ▪TSU ▪Independent verifiers	▪ Project proposal ▪ Progress reports ▪ In-depth interviews ▪ Data from the project monitoring system ▪ Semi-structured KIIs ▪ Project deliverables
3.2	Were the PC's financial needs on IWM addressed? How would having a Financial Cooperation Component within the project have influenced this?	▪ The extent of Cost- efficiency of ○ Technical Cooperation Component of Project ○ The investment of China government fund ○ Leveraged private investment ▪ Financial needs/alternatives to facilitate the outcomes or strengthen the impacts	▪ The public fund is allocated for meeting the PC projects' financial needs to achieve the expected GHG reduction target.	▪ Direct beneficiaries ▪ Project Team ▪ TSU ▪Independent verifiers	▪ Progress reports ▪ In-depth interviews ▪ Data from the project monitoring system ▪ Semi-structured KIIs
			4 IMPACT		

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
4	What evidence is there that the project has been contributing to the intended impact in the ToC (incl. transformational change)?	▪ According to the ELE Transformational Change Measurement Framework, the ELE will assess the strength of the evidence of the project-induced transformational change. The expectations for final ELEs are the following: ○ Advanced signals that the project has produced a demonstration effect (Dimension 1) ○ Interim signals that the project has caused a catalytic effect (Dimension 2) ○ Early signals that the project contributes to additional, large-scale, and sustainable GHG savings (Dimension 3).	▪ Direct: project activities boost low-carbon solutions in the waste sector and initiate the investment interest to bring additional large-scale and sustained GHG savings. ▪ Indirect: project initiatives build mitigation capacity in China and build up institutional capacities to undertake a larger number of IWM in the future.	▪ Direct beneficiaries ▪ Project Team ▪ TSU ▪ Independent verifiers	▪ Progress reports ▪ In-depth interviews ▪ Semi-structured KIIs ▪ Final closing event/documents
			5 SUSTAINABILITY		
5	What is the likelihood that the outcomes will be sustained after the end of the project funding period?	▪ The extent of the evidence supporting the project's sustainability (e.g. evidence of self-sustaining institutional structures, official standards and political and financial commitment of key stakeholders).	▪ The proposed policies, established facilities, institutional capacities, and operation mechanisms will carry out the project legacies. ▪ The capacities built for the beneficiaries will stay and serve other private	▪ Direct beneficiaries ▪ Project Team ▪ TSU ▪ Independent verifiers	▪ Progress reports ▪ In-depth interviews ▪ Semi-structured KIIs

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
		▪ There is little or no risk of backsliding or reversing.	or public-related initiatives beyond the scope and duration of this project.		
5.1	To what extent the project results were disseminated to other cities (regions) of China and enabled replication and scaling-up of the IWM actions?	▪ Availability of available resources for study, project design, capacity building activities, and investment	▪ The project helps build government will and public/private awareness to scale up the models of support and implementation.	▪ Direct beneficiaries ▪ Project Team ▪ TSU ▪ Independent verifiers/contractors	▪ Progress reports ▪ In-depth interviews ▪ Semi-structured KIIs
			6 LEARNING		
6	What key lessons can be learnt to the benefit of this or other projects funded by the Mitigation Action Facility in achieving their results?	▪ The project's generation of important lessons for 1) its legacy, 2) other projects and/or projects, 3) the Mitigation Action Facility as a whole. ○ Project design and update ○ Policy and institutional structure ○ Risk and challenges mitigation ▪ Capitalisation of the project outcomes: Case study, network etc.	▪ The project will generate important lessons to sustain its legacy, other projects, and the Mitigation Action Facility as a whole.	▪ Direct beneficiaries (including 5 PCs) ▪ Project Team ▪ TSU ▪ Independent verifiers	▪ Progress reports ▪ In-depth interviews ▪ Semi-structured KIIs ▪ Literature review
6.1	Was a knowledge management/sharing system established to meet the needs	▪ Availability of platform/access to the best practices knowledge for sharing with target groups	▪ The permanent knowledge-sharing platform is built up for	▪ Direct beneficiaries (including 5 PCs and other city target users) ▪ Project Team	▪ Progress reports ▪ Project deliverables ▪ In-depth interviews

ELEQ No.	Evaluation question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
	for low-carbon management via IWM by other cities?		the future, supporting the IWM in China.	▪ TSU ▪ Independent verifiers/contractors	
6.2	What were the key factors enabling to successfully achieve the project objectives?	▪ Evidence of major constraints and opportunities experienced (success and hindering factors) ○ Project management ○ Government endorsement ○ Stakeholder engagement ○ Etc.	▪ The project activities align with the government/city needs and development agenda, promote IWM with multiple effects.	▪ Direct beneficiaries (including 5 PCs) ▪ Project Team ▪ TSU ▪ Independent verifiers	▪ Progress reports ▪ In-depth interviews ▪ Semi-structured KIIs ▪ Final closing event/documents

Annex C List of ELE sources

C.1 Internal documents

1. Project Annual Report 2017, 2018, 2019, 2020, 2021, and 2022
2. Project Semi-Annual Report 2018, 2019, 2020, 2021, and 2022
3. Project Proposal-China Integrated Waste Management
4. Project Cost-neutral Extension Amendment
5. Mid-term ELE Report of China IWM
6. 2023 Project Practice and Outcomes Summary (China MSW Integrated waste management: Towards the low-carbon integrated waste management)

C.2 Public documents

1. China's waste incineration situation
2. Market Prospect and Investment Strategic Planning Analysis Report of China's Waste-to-energy Industry
3. Lanzhou domestic waste segregation 1353 working method
4. Evolution and impact analysis of power price subsidy policy for waste incineration power generation
5. Final event presentations (“Integrated Waste Management and Low-carbon Development: China and the World”, “Towards a Low-carbon and Sustainable MSW Management”, “Integrated Waste Management and Low-carbon Development: Demo Cities”, “Outlook for Green Development of Environmental Sanitation in China – Business Model Discussion”, “Accounting and Standard System of Emission Reduction in the Context of Waste Sorting and Segregation”, “New Topics of MSWM: Plastic Pollution Control and Marine Litter Reduction” and “Environmental Education and Public Awareness Raising”. ）

C.3 List of organisations interviewed

Institution	Position
Project Team	
GIZ	Project director of Project
	Specialist
CAUES	Vice President and Secretary General
	Senior Engineer
Project Stakeholder	

Waste Segregation Service Centre Xi'an	Director
	Deputy Director
Division of Environmental Sanitation Management Bureau of Suzhou	Deputy Director
	Director of Solid Waste Management Center
Lanzhou Municipal Commission of Urban Management	Deputy Director
	Waste Segregation Section Chief
Lanzhou FengQuan Environmental Protection Group Company Limited	Deputy General Manager
Tai'an Municipal Comprehensive Service Centre of Urban Management	Deputy Director
	Chief
Bengbu Municipal Bureau of Urban Management	Head of Amenities and Environment Management Section
Division of Environmental Sanitation Management of Bengbu	Sanitation Management Section Chief
	Deputy Chief of Sanitation Management Section
China Urban Construction Design and Research Institute (CUCD)	Director of Sanitation Centre
Consultant	Independent Consultant
SinoCarbon Innovation & Investment Co., Ltd.	Director, Carbon Investment Banking & International Business Unit
SinoCarbon Education & Training Co., Ltd.	General Manager
Beijing Normal University	Associate Professor
University of Science and Technology Beijing	Associate Professor
Beijing Institute of Urban Management	Senior Engineer
China Urban Environmental Sanitation Association Certification Centre (CUESC)	General Manager
Hyva Mechanics (China) Co. Ltd.	Technical Director
Third-Party	
Technical University of Denmark (DTU)	Professor
International waste management expert	International waste management expert
China Urban Construction Design and Research Institute (CUCD)	Chief Engineer, Advisor
Word Bank	Environment Officer
Green Finance advisor	International Green Finance Expert