NAMA Facility

China Integrated Waste Management

Mid-term Evaluation and Learning Exercise (ELE) Report & Management Response

September 2021

NAMA Facility

On behalf of

Supported by:

Federal Ministry for Economic Affairs and Climate Action

Department for Business, Energy & Industrial Strategy

Danish Ministry of Climate, Energy and Utilities

European Commission

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

on the basis of a decision by the German Bundestag

Overview

- Management Response: response to the recommendations made by the evaluation team in this Evaluation and Learning Exercise (ELE) report. Jointly written by the NAMA Support Project (NSP) and the Technical Support Unit (TSU) of the NAMA Facility.

- Evaluation and Learning Exercise Report: external and independent evaluation conducted by the consortium AMBERO and Oxford Policy Management.

NAMA Facility

On behalf of Federal Ministry for the Environment, Nature Conservation and Nuclear Safety | Department for Business, Energy & Industrial Strategy | Danish Ministry of Climate, Energy and Utilities

ELE of the NSP China Waste Management - Management Response

Draft Version 31 May 2021

1 Background

In 2020, the NSP China Waste Management was subject to an independent mid-project Evaluation and Learning Exercise (ELE) conducted by an evaluation team led by AMBERO Consulting. The ELE report is published on the NAMA Facility's website.

The NSP and TSU to provided responses to the recommendations made by the evaluation team in their ELE report.

2 Response to Recommendations

Recommendations	Management Response		
Recommendation 1	Activities	Responsible Entity	Timeline
Put maximum effort into re-thinking and restoring TA assistance team to develop full IWM strategies, including governance, finance and institutional aspects and 20-year projections of quantity, composition, and GHG impacts. *	The Sino-International Technical Consortium added another domestic expert to the team in February 2021, as the international experts are still unable to visit China. The Chinese experts will conduct the site visits for data collection in May-June and share their findings with the international members to further strengthen their work in China. The NSP is also considering shifting more efforts of the Consortium from the technical support to the governance and institutional aspects of the IWM system, this will be further discussed with the International Technical Team. Moreover, the NSP is contracting a cost analysis center to conduct a full cost assignment of the MSW management in the demonstration cities and improve the financial aspect of the IWM systems.	NSP	May - June 2021 July 2021 June 2021
Recommendation 2	Activities	Responsible Entity	Timeline
Put more focus on developing publications for Chinese cities	In April 2021, the localisation and publication of the Chinese version of		April 2021

** Note: the NSP considers that this recommendation is difficult to be fulfilled and covered under the current NSP framework without a project extension.*

(outside of the PCs) on the broad interpretation of IWM, including references to existing articles and books in the international solid waste literature on planning, scientific research on emissions and solid waste system performance and governance.	the UN-Habitat's "Waste Wise City Tool (WaCT)" has been completed by the NSP team. The tool contains a step by step guide to assess a city's municipal solid waste management performance through Sustainable Development Goals. The Chinese version is distributed through the NSP's dissemination channels. The NSP is considering the possibility on the translation and localisation of the UNEP Global Waste Management Outlook (2020). In cooperation with the Hanns-Seidel-Stiftung (HSS), the NSP prepared the content of the student's textbook about the 17 SDGs of the United Nations and their link to waste management topics, while HSS was responsible for the content of the respective teacher's edition, both of which will be published in August 2021.	NSP	August 2021 August 2021
Recommendation 3	Activities	Responsible Entity	Timeline
Commission or agree to co-finance translation to Chinese of key articles and books on IWM in European languages. This provides a deeper level of information to anchor the NSP experience.	As mentioned above, the NSP supported UN-Habitat with the translation of the Chinese WaCT version. Additionally, an online seminar was conducted on May 20, 2021, where representatives of Chinese cities got comprehensive instructions on implementation of the tool. Also, the translation of the UNEP Global Waste Management Outlook (2020) is planned.	NSP	May 2021 August 2021
Recommendation 4	Activities	Responsible Entity	Timeline
Stimulate virtual city twinning and horizontal information exchange between Chinese cities and European cities, at least as long as COVID travel restrictions are in place. CAUES is the Chinese national member of the International Solid Waste	This recommendation will be adopted by firstly fostering the knowledge and data exchange between the five demonstration cities; secondly inviting representatives of the demonstration cities to several (online) seminars to	NSP	Since April 2021

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Association, which has a project on circular and low carbon cities, that could be interesting for Chinese Zero Waste cities and also for the PCs.*	share their city's waste management experience with other Chinese cities. Furthermore, in May 2021, an online seminar was organised with the support of UN-Habitat to connect and share experiences of the demonstration cities with UN "Waste Wise Cities". Twinning with European cities will be considered in the future implementation period. Finally, contact and linkages with ISWA circular and low carbon cities will be further discussed.		
Recommendation 5	Activities	Responsible Entity	Timeline
Share the results of MRV monitoring of GHG emissions in the solid waste sector in the PCs more broadly with other Chinese cities, building on the positive experiences with horizontal information exchange in the NSP.	The NSP is continuously presenting the MRV results of the demonstration cities to waste sector stakeholders and other Chinese cities during several events and distribution channels. Recently, the NSP presented the MRV methodology and results during the International Environmental (IE) Expo in Shanghai and will present at the coming CAUES Incineration Symposium in Hangzhou in June 2021.	NSP	Since April 2021
Recommendation 6	Activities	Responsible Entity	Timeline
Put more emphasis on the links between waste management and climate change and bring the discussion and dissemination forward in conferences, training, and publications, because the cities have needs and motivation about climate action and are looking for information.	Against the background of China's 2030 carbon peak and 2060 carbon neutrality target, the NSP organised several activities to link waste management with climate change mitigation. In April, the NSP training "Low-carbon waste management of the MSW treatment industry under the carbon peak target and carbon neutrality vision" was successfully held with over 30 participants. The Ministry of Human Resources and Social Security (MOHRSS) of the People's Republic of China issued an official certification to those who passed the final training exam.	NSP	Since April 2021

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	The NSP is working on a report and analysis of China's 13th and 14th Five-Year-Plan under the background of waste management and climate change mitigation to further outline the low-carbon development in the sector. In July 2021, the NSP will conduct the Train-the-Trainer program to educate waste management experts and operators, thus disseminating acquired knowledge to other Chinese cities.		July 2021 July 2021
Recommendation 7	Activities	Responsible Entity	Timeline
Strengthen lines of communication between the NSP and MOHURD and MEE, so that the CCER scheme and the NSP are coherent with each other.*	The NSP results are exchanged with MoHURD at the yearly steering committee meeting and will be strengthened further with the support from CAUES, which has regular exchange meetings with MoHURD. The NSP conducted an informal exchange with MEE on the MRV methodology and IWM NAMA project results. The potential reopening of the CCER system in March 2021 was also discussed. The potential link with the Zero Waste Cities was also brought up in the meeting, and the MRV and NSP results were appreciated. However, the zero-waste city has a larger boundary, including not only MSW but also many kinds of industrial waste and agriculture waste, etc, so a more systematic methodology is still needed for the zero waste topic.	NSP	April 2021
Recommendation 8	Activities	Responsible Entity	Timeline
Develop training and support materials for cities and potential new private and financial sector partners (also internationals investing in China) that could make use of a variety of climate and green finance funds, not only	The NSP is in close contact with the Asian Infrastructure Investment Bank (AIIB) and KfW Development Bank to share project results and experiences with them and identify climate and green financing options jointly.	NSP	Since March 2021

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CCER. For example, some climate finance may be possible from other MEE initiatives, with a focus on reducing methane by improving landfills and implementation of AD and GHG sinks.			
Recommendation 9	Activities	Responsible Entity	Timeline
Fast-track the activity of preparing IWM strategies in the 5 PCs and at the same time include additional cities in an activity to prepare IWM strategies. One approach would be to shift this activity from the international TA team to CAUES and support it from the International Solid Waste Association, of which CAUES is the Chinese national member.	The NSP is preparing support on IWM strategies for the demonstration cities as well as disseminating material to additional Chinese cities by establishing online training courses from Adelphi, which has shifted from the onsite training due to the limit of COVID-19. The online courses will be further transferred to CAUES to enhance the dissemination of the IWM concepts and strategies.	NSP	Since January 2021
Recommendation 10	Activities	Responsible Entity	Timeline
Explore the use of compost to sequester CO2 in soils and work with MEE to include this in the CCER system. *	The NSP finalised the comprehensive Organic Waste Treatment Technology Evaluation, which includes an indicator system for GHG emission mitigation. Based on the final report, the NSP will develop technical standards and policy recommendations for China's organic waste treatment industry.	NSP	Since May 2021
Recommendation 11	Activities	Responsible Entity	Timeline
In the coming private and financial sector IWM activities, intensify those to organise business demo tours to pilot cities, and develop data for investment and operations – the tool has proven to be useful to policymaker and private sector.	The business model is under preparation, and is expected to be published by the end of 2021, and disseminated to the cities thereafter.	NSP	December 2021
Recommendation 12	Activities	Responsible Entity	Timeline
Stimulate research and publications about the improvements in and climate benefits of diverting kitchen waste and organics away from	The NSP finalised the Organic Waste Treatment Technology Evaluation report, which includes the methodology of a full life cycle analysis to evaluate the climate	NSP	Since March 2021

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incinerators to AD and composting.	action benefits by treating the organic fraction of MSW.		
Recommendation 13	Activities	Responsible Entity	Timeline
Stimulate research in China and the translation of international research results on the benefits of sequestration of CO2 in soils enriched with compost and fertilizer from AD sludges.	The translation of German Biomass Act and the Compost quality control system have been finished and published. Other publications benefitting to knowledge around this topic will be further localised.	NSP	Since 2019
Recommendation 14	Activities	Responsible Entity	Timeline
Move on the intention to pilot Pay as You Throw (PAYT) in the PCs, as the "edge of the wedge" of discussing IWM sustainable financing in cities.	The demonstration cities showed great interest in the sustainable financing of the IWM system since 2020 and during the Steering Committee Meeting in April 2021. The NSP will finish the cost analysis of the MSW management sector, and further guide and support the cities to the possibility of implementation of different waste charging mechanisms.	NSP	Since April 2021
Recommendation 15	Activities	Responsible Entity	Timeline
Develop more activities monitoring the specific impacts of diversification, including scientific articles about its impacts. For example, the IWM approach raises questions on the place of incineration in an IWM system, and research on its impacts on efficiency and energy generation of existing incinerators could be useful.	The NSP contracted several research institutions and universities to conduct reports about the Chinese waste sector. The Technical University of Denmark and Beijing Normal University analysed the GHG emission reduction of waste management activities in the two demonstration cities Bengbu and Suzhou, using the methodology of the full life cycle analysis. Tsinghua University analysed and evaluated the organic waste treatment technologies in the Chinese market. Both research results will be published through the scientific channels of the universities. Finally, greater efforts will be put towards the mitigation effect and integrated waste management.	NSP	Since November 2019
Recommendation 16	Activities	Responsible Entity	Timeline
Research and establish a GHG emissions reduction model for	This is the hot topic currently for the MSW management sector, especially	NSP	Since April 2021

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the recycling sector and private enterprises to be included in CCER. *	given the background of carbon peak and carbon neutral strategy. For the MRV of the recycling rector, the barrier is the obscure baseline to which the GHG reduction is not easy to compare due to lack of data management in the recycling sector. This has been targeted by the NSP in the first step. The introduction of WaCT and Wasteaware KPI systems are all going towards solving this problem. More discussions will be organised with different stakeholders to agree on the next agenda. This is an important step towards formalising the still informal recycling sector.		
Recommendation 17	Activities	Responsible Entity	Timeline
Research the efficiency, effectiveness and impact of the private recycling sector in the PCs (and in general), and model potential gains from formalising and integrating the informal recycling activities and monitoring them with MRV.*	The NSP is cooperating with the local governments of the pilot cities to improve the database for the informal recycling sector. In addition, the NSP plans to support the utilisation of WaCT to further quantify the contributions of the informal sector to the recycling rate.	NSP	2022
Recommendation 18	Activities	Responsible Entity	Timeline
Work more closely with recycling enterprises, as part of inclusive IWM governance that makes space for private sector participation in several ways.	The NSP is promoting the integration of the private sector using the Private-Public-Partnership (PPP) model, which mainly involves waste treatment enterprises. The NSP is already connected to recycling enterprises and will follow-up with their participation in the PPP model.	NSP	2022
Recommendation 19	Activities	Responsible Entity	Timeline
Ask for an extension of the NSP for two years. *	The proposal for an NSP extension is under preparation. The drafted proposal will be submitted to the TSU in the second half of the year 2021.	NSP	Second half of 2021
Recommendation 20	Activities	Responsible Entity	Timeline
Strengthen the institutional position of CAUES as the long-term institutional home for capacity building, training, and IWM strategy preparation.	The NSP signed an implementation agreement with CAUES to ensure long-term project activities even beyond the NSP implementation period.	NSP	August 2020

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Recommendation 21	Activities	Who	When
Link with 11 next stage cities in time for the TA2 to do a series of training on how to make an IWM Strategy and focus on Zero Waste/Zero Harm including CO2 and other GHG aspects. *	The Train-the-Trainer program of the NSP will qualify 20 waste management experts and operators to further disseminate the IWM strategy with the focus of the MSW harmless treatment and low-carbon development of China's waste sector.	NSP	July 2021
Recommendation 22	Activities	Responsible Entity	Timeline
Talk to the 15 Chinese Zero Waste cities and link them to the project. *	The NSP is already connected to the Zero Waste Cities to find synergies to the NSP. The Solid Waste and Chemicals Management Center of MEE is responsible for the initiative in China. The NSP invited them to share their activities during the International Conference on Waste Management and Technology 2021, which is sub-organised by the NSP.	NSP	June 2021
Recommendation 23	Activities	Responsible Entity	Timeline
Expand the role of CAUES on producing standards for IWM.	During the work plan preparation for 2021, the NSP agreed with CAUES to strengthen the implementation of technical standards and policy recommendations in the current year.	NSP	Since January 2021
Recommendation 24	Activities	Responsible Entity	Timeline
Work with CAUES to create an IWM Planning Guide tailored and adapted to Chinese circumstances – with some sections newly written and some translated from English and/or German.*	An IWM guideline is planned by the NSP to be delivered by the Sino-International Technical Consortium based on the overall improvements in the five pilot cities. However, the work schedule has been delayed due to COVID-19 related travel restrictions. Furthermore, together with CAUES, a publication on IWM Guide should be drafted by the end of the project.	NSP	Since January 2020
Recommendation 25	Activities	Responsible Entity	Timeline
Develop a line of shorter publications or internet-based training modules focusing not on substance, but methods: e.g. full-cost analysis, lifecycle assessment (LCA), activity-based costing, PAYT, waste	This part will be further adapted in the online courses provided by Adelphi (Train-the-Trainer), and also for the online training programmes in the following implementation period.	NSP	Since April 2020

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characterisation and composition, UNFCCC-compliant MRV guidelines for the waste sector.			

Overarching Recommendation for a 2- year extension:

Recommendation	Activities	Who	When
Necessity for a two-year budget-neutral extension for the NSP.	In line with the NAMA Facility's amendment policy, an NSP can submit a request for extension of the implementation period to the TSU. Donors have the possibility to approve (with or without conditions) or reject the request.	TSU, Board	Depending on when an extension request will be submitted by the NSP

** Note: the NSP considers that this recommendation is difficult to be fulfilled and covered under the current NSP framework without a project extension.*

Mid-term Evaluation and Learning Exercise of the China Integrated Waste Management (IWM) NAMA Support Project

NAMA Support Project Evaluation and Learning Exercises for the NAMA Facility

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Final Report

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Disclaimer

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 NAMA Facility and/or of the NAMA Support Project under evaluation.

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Preface

The NAMA Facility is a joint initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), UK's Department for Business, Energy and Industrial Strategy (BEIS), 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 NAMA Facility was established in 2013. The NAMA Facility's vision is to accelerate carbon-neutral development to keep temperature increases to well below two degrees Celsius by supporting NAMA Support Projects (NSPs) that effect sector-wide shifts toward sustainable, irreversible, carbon-neutral pathways in developing countries and emerging economies. All NSPs with an overall duration of more than three years are subject to a mid-term and to a final evaluation and learning exercise.

The NAMA Facility's Technical Support Unit (TSU) functions as the secretariat of the NAMA Facility. The TSU commissioned AMBERO and Oxford Policy Management to conduct mid-term and final Evaluation and Learning Exercises (ELEs) for NSPs from calls 1, 2, 3 and 4.

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 NSPs' 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 **mid-term ELE of the China Integrated Waste Management NSP**. The report has been reviewed by Luca Petrarulo (Technical Lead, NSP ELE Team) and Katherine Cooke (International Expert A, NSP ELE Team). For further information, please contact vera@ambero.de.

Executive summary

This document presents the findings of the **mid-term ELE of the China Integrated Waste Management (IWM) NSP.** The ELE was undertaken during the period November 2020-February 2021. In accordance with the Terms of Reference[1], this ELE sought to address the following questions:

- Has the NSP been achieving its results?
- Has the NSP started to trigger transformational change?
- What was learnt from the NSP so far?

More information about the primary focus of this ELE, and on the methodology for the evaluation, can be found in Section 1.2 and Section 2, respectively.

In 2017, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH prepared and submitted to the NAMA Facility a proposal of the NAMA Support Project (NSP) "China Integrated Waste Management".

The China IWM NSP is focused on transforming the Chinese municipal solid waste sector into a low-carbon climate-friendly sector that offers attractive investment and participation opportunities to businesses and the financial sector. China's national policy institutions are committed to lowering emissions of CO_2 and other greenhouse gases (GHG) in many industrial sectors. Despite its low relative contribution to national CO_2 emissions, the solid waste sector emits significant amounts of methane and CO_2. The project activities are designed to stimulate a transformational change from current simple landfill and incineration treatment to an integrated waste management approach. The project has been written in consultation with national government policymakers and planners and is structured to create mutually reinforcing activities, capacity development, information exchange, and practical results on the ground.

A key hypothesis of the NSP is that a transition to IWM will increase the attractiveness for private service providers and investors, of a variety of waste treatment facilities, including waste-to-energy system. The goal is that business and financial sector stakeholders come to see the waste sector as a financially sustainable low-carbon investment. The project activities shown in the Theory of Change (ToC) (Figure 3) are built around concrete and practical actions in five Pilot Cities (PCs). NSP activities support the PCs to modernise both physical systems and governance aspects of municipal waste management by introducing the IWM approach and transferring key types of knowledge from more mature European IWM systems. Public and private up-scaling throughout China's waste management sector will be triggered by five replicable flagship cases of IWM systems and waste-to-energy technologies according to Best Available Technology (BAT) and Best Environmental Practice (BEP). Upward policy linkages in the form of policy advice provided to the Chinese government will support a further reduction in the existing market barriers currently hindering the sector's transformation. A unique feature of the NSP is that it has leveraged agreement from the Chinese

government that the PCs can draw on Chinese government public investment funds to allow the cities to rapidly develop new forms of waste collection and treatment, and introduce best available practices in the PCs. For this reason, the NSP neither includes nor needs a Financial Component.

The strategy for implementation of the NSP relies upon increasing the capacity of sector stakeholders through appropriate training approaches and building replicable examples of managed change in the five PCs. By enabling the sector to make use of new income streams from the energy and carbon markets, as well as a matching private sector engagement in existing networks, the NSP will support the upscaling of integrated waste management solutions in China.

Due to Covid-19 the mid-term ELE took place as a combination of online and offline examinations and interviews, and one full-scale field visit was made to a pilot city.

China IWM ELE had as its focus, six main Evaluation Questions (EQs):

1. To what extent does the NSP address an identified need (by national policy institutions, city government, citizens, and the private sector)?
2. To what extent has the implementation of the NSP been achieving intended outputs?
3. To what extent is the relationship between inputs and outputs timely and to expected quality standards?
4. What evidence is there that the NSP is likely to contribute to the intended impact in the ToC (incl. transformational change), as well as any unintended or unexpected ones?
5. What is the likelihood that the outcomes will be sustained after the end of the NSP funding period?
6. What key lessons can be learned to the benefit of this and other NSPs in achieving their results?

China IWM NSP seeks to address five main barriers that hinder the transformation of the waste sector to a robust, commercially attractive low-carbon development opportunity. These are:

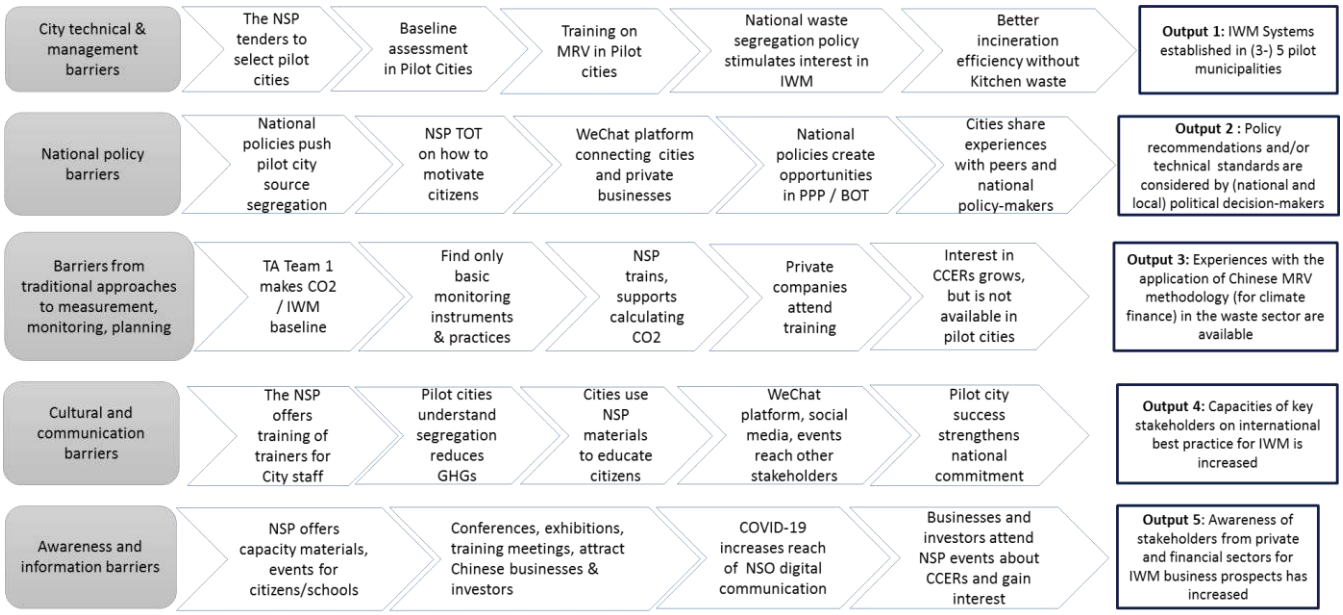
1. City solid waste management technical and management barriers
2. National policy barriers
3. Barriers associated with traditional approaches to measurement, monitoring, and planning
4. Cultural and communication barriers
5. Awareness and information barriers.

This NSP has focused on opportunities for climate gains in the process of modernising and transforming the municipal solid waste sector. Therefore, barriers to taking advantage of those opportunities represent the NSP's point of departure and the start of the causal pathways in Figure ES-1.

The NSP proposal identified key opportunities for supporting medium-sized cities to reduce emissions by engaging in a shift from solid waste disposal and treatment focusing on landfills and incinerators, to an Integrated Waste Management approach with a strong focus on environmentally sound treatment and recovery of specific waste streams, with less waste requiring disposal, and less land devoted to disposal activities. The project is aligned with national waste management and circular economy policy, and positions itself as supporting pilot cities in replicable experiences of

modernising their waste systems. The results in each city should reduce emissions, increase efficiency, improve governance, and involve more stakeholders, including citizens, businesses, and institutions, in waste activities. Key goals include upward policy linkages and spreading awareness.

Figure ES-1: The five causal pathways of the Theory of Change of China IWM NSP and its outputs



The status of the NSP's current contribution to Outputs (Figure 3) is that all outputs have been achieved.

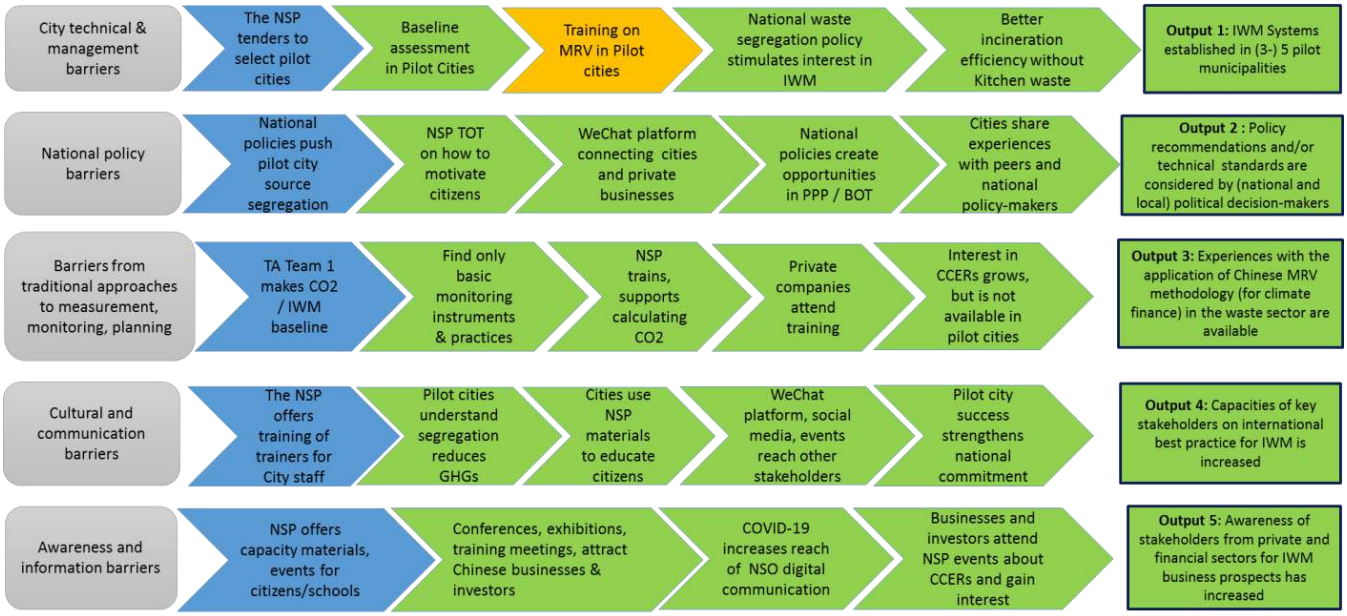
- **Output 1**: Significant progress has been made towards the project goal of climate-friendly integrated waste management systems in the five PCs. The cities have been strategically selected so that they serve as regional demonstrations of new approaches and technologies. The introduction of *IWM approaches to the physical system* of waste management has been well-received by the PCs, implemented, and has led to new insights on the collection and management of various materials streams. The introduction of *IWM governance ideas* that stimulate institutional and financial reforms is on the project agenda for the coming years but has been delayed by the travel restrictions for international consultants as a consequence of the COVID-19 pandemic.
- **Output 2**: Close coordination between the NSP team, national policy-makers, and the Chinese Association of Urban Environmental Services (CAUES) has resulted in upwards 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.
- **Output 3**: The NSP has provided TA in the pilot cities to produce a CO_2 baseline and introduce MRV methodologies for calculating CO_2 and CH_4 reduction and other GHG emissions (e.g. N_2O is also discussed). All five pilot cities have had an introduction to MRV, which has improved their regular reporting on emissions reduction. Third parties are interested in MRV and its potential for enabling carbon emissions reduction trading as a business model. But the limitations in the availability of China Certified Emission Reduction (CCER) linked to the Chinese Emission Trading System (ETS) mean that climate finance business models are not yet visible, nor available to

business and financial sector stakeholders, and remain challenges for the remaining years of the NSP.

- **Output 4**: Capacities of key stakeholders, including citizens and businesses, to appreciate international best practice for IWM have increased through training and awareness activities, supporting municipal staff and trainers to work with citizens, schools, NGOs, and associations, as well as specific capacity development activities engaging and involving business and financial sector stakeholders in meetings and online events. A rich variety of stakeholders have been reached by project activities, and are positive about the possibilities of IWM in their own activities and spheres of influence. Study visits and regional activities are attracting interest and visitors from other cities.
- **Output 5:** NSP activities have reached the business and financial sectors through a very active WeChat platform with Q&A to answer business questions, combined with other social media and physical events, including study visits to the PCs. Potential Public-Private Partnerships (PPP) and Build-Operate-Transfer (BOT) partners from shareholder-owned companies have been supported to analyse the current business environment and market potential of the Chinese waste sector. Stimulated by the NSP, the private sector has taken a leadership role in building anaerobic digestion (AD) projects, using kitchen and restaurant waste to produce fertilizer and soil amendments, and generating electricity from their biogas.

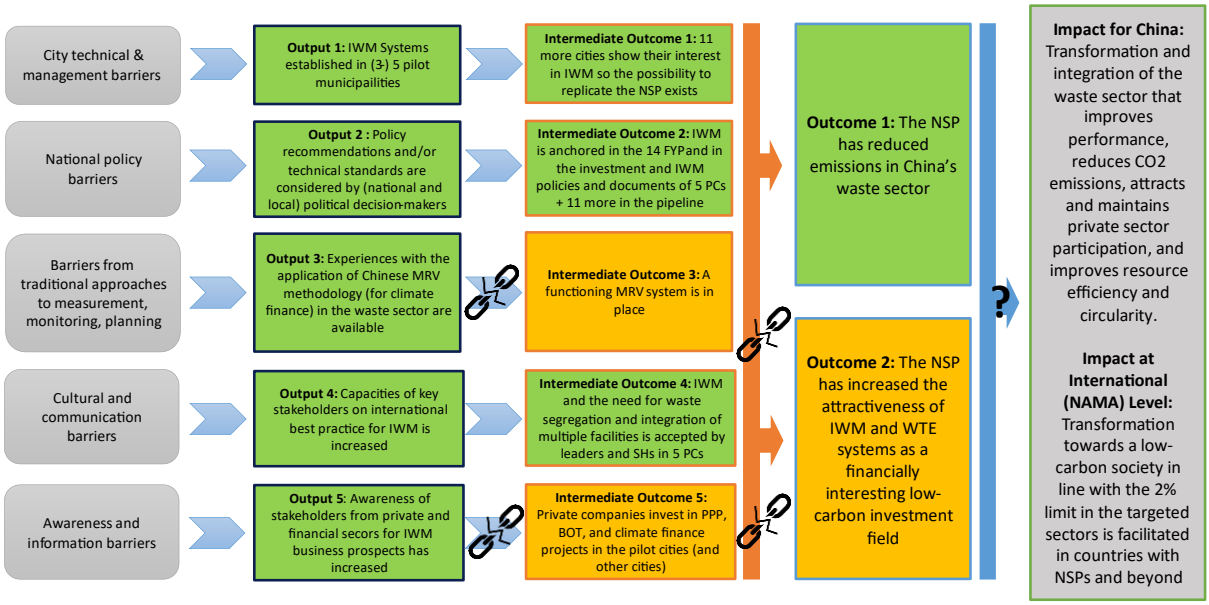
Even though Figure ES-2 shows that all five outputs have been achieved, several clouds on the horizon may represent risks for the NSP to achieve its intermediate and project outcomes and impacts. The figure takes us back to the NSP Theory of Change to evaluate to what extent the original causal pathways and assumptions behind them have held true. The delay in one critical activity supporting Output 1 could create problems in achieving two intermediate outcomes, as well as project outcomes and impacts. Without the training on MRV, the causal chain leading from NSP activities and deliverables to cities and the private and financial sectors pursuing climate finance could be at risk. This is because MRV is a critical element in cities' and private service providers being able to produce due diligence that could qualify them for emissions credit. At mid-term there is still time for MRV to be put in place, and for cities to apply for CCERs, once that system re-opens. So while at mid-term this delay should be understood as a warning signal it has not yet definitively affected the NSP's ability to achieve all outputs.

Figure ES-2: Overview of NSP causal pathways assessment to output level at mid-term



At the same time the identified risks associated with intermediate Outcomes 3 and 5, as well as project outcomes and impacts, are closely associated with unforeseen external circumstances. To better understand these potential risks for achieving outcomes and impacts, a third version of the causal pathways assessment, **Figure ES-3** was created to project the effects of breaks in the causal chain beyond the output level.

Figure ES-3: Mid-term assessment of causal pathways from outputs to impact



Thus, to achieve outcomes, the delayed activities in relation to the MRV system, as well as the ISWM strategy, should be prioritised. If that can occur, then the breaks in the causal chains can be avoided.

In terms of the project's sustainability, if the outcomes are achieved, there are good chances they will be sustained in the longer term. This is because the NSP's sustainability is anchored in the

changes that it has supported in the five PCs, as well as in the close links between the NSP team and national policymakers.

First, the very large number of new facilities that have been built and started operation in the five cities as a consequence of the project, will serve to anchor sustainability. The NSP's successful strategy of working with five PCs spread among key Chinese regions has ensured that the project is -- quite literally -- grounded in local solid waste operations and also that its successes are well-recognised.

Secondly, the ELE team found that the strong connection between the NSP and policy institutions, especially the Ministry of Housing and Urban Development (MOHURD) and CAUES, has both shaped the NSP proposal and ideas, and is ensuring good coordination and upward policy linkages.

Finally, the ELE team has distilled recommendations that were jointly developed with the NSP team during the Validation Workshop.

Lesson	Recommendations
RELEVANCE	• Put maximum effort into re-thinking and restoring TA assistance team to develop full IWM strategies, including governance, finance and institutional aspects and 20-year projections of quantity, composition, and GHG impacts. • Put more focus on developing publications for Chinese cities (outside of the PCs) on the broad interpretation of IWM, including references to existing articles and books in the international solid waste literature on planning, scientific research on emissions and solid waste system performance, and governance. • Commission or agree to co-finance translation to Chinese of key articles and books on IWM in European languages. This provides a deeper level of information and experience to anchor the NSP experience. • Stimulate virtual city twinning and horizontal information exchange between Chinese cities and European cities -- at least as long as COVID travel restrictions are in place. CAUES is the Chinese national member of the International Solid Waste Association, which has a project on circular and low carbon cities, that could be interesting for Chinese Zero Waste cities and also for the PCs. • Share the results of MRV monitoring of GHG emissions in the solid waste sector in the PCs more broadly with other Chinese cities, building on the positive experiences with horizontal information exchange in the NSP. • Put more emphasis on the links between waste management and climate change and bring the discussion and dissemination forward in conferences, training, and publications, because the cities have needs and motivation about climate action and are looking for information. • Strengthen lines of communication between the NSP and MOHURD and MEE, so that the CCER scheme and the NSP are coherent with each other.
EFFICIENCY	• Develop training and support materials for cities and potential new private and financial sector partners (also internationals investing in China) that could make use of a variety of climate and green finance funds, not only CCER. For example, some climate finance may be possible from other MEE initiatives, with a focus on reducing methane by improving landfills and implementation of AD and GHG sinks. • Fast-track the activity of preparing IWM strategies in the 5 PCs and at the same time include additional cities in an activity to prepare IWM strategies. One approach would be to shift this activity from the international TA team to CAUES and support it from the International Solid Waste Association, of which CAUES is the Chinese national member. • Explore the use of compost to sequester CO_2 in soils and work with MEE to include this in the CCER system. • In the coming private and financial sector IWM activities, intensify the activities to

	organise business demo tours to pilot cities, and develop data for investment and operations – a tool that has proven to be useful to policymaker and private sector.
EFFECTIVENESS	• Stimulate research and publications about the improvements in and climate benefits of diverting kitchen waste and organics away from incinerators to AD and composting. • Stimulate research in China and the translation of international research results on the benefits of sequestration of CO_2 in soils enriched with compost and fertilizer from AD sludges. • Move on the intention to pilot Pay as You Throw (PAYT) in the PCs, as the "edge of the wedge" of discussing IWM sustainable financing in cities. • Develop more activities monitoring the specific impacts of diversification, including scientific articles about its impacts. For example, the IWM approach raises questions on the place of incineration in an IWM system, and research on its impacts on efficiency and energy generation of existing incinerators could be useful.
IMPACT	• Research and establish a GHG emissions reduction model for the recycling sector and private enterprises to be included in CCER. • Research the efficiency, effectiveness and impact of the private recycling sector in the PCs and in general. Model potential gains from formalising and integrating the informal recycling activities and monitoring them with MRV. • Work more closely with recycling enterprises, as part of inclusive IWM governance that makes space for private sector participation in several ways. • Ask for an extension of the NSP for two years (see Section 6.3.1).
SUSTAINABILITY	• Strengthen the institutional position of CAUES as the long-term institutional home for capacity building, training, and IWM strategy preparation. • Link with 11 next stage cities in time for the TA2 to do a series of training on how to make an IWM Strategy and focus on Zero Waste/Zero Harm including CO_2 and other GHG aspects. • Talk to the 15 Chinese Zero Waste cities and link them to the project. • Expand the role of CAUES on producing standards for IWM.
LEARNINGS	• Work with CAUES to create an IWM Planning Guide tailored and adapted to Chinese circumstances – with some sections newly written and some translated from English and/or German. • Develop a line of shorter publications or internet-based training modules focusing not on substance, but methods: e.g. full-cost analysis, lifecycle assessment (LCA), activity-based costing, PAYT, waste characterisation and composition, UNFCCC-compliant MRV guidelines for the waste sector.

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List of abbreviations

AD	Anaerobic Digestion
BAT	Best Available Technology
BEP	Best Environmental Practice
BOT	Build-Operate-Transfer
CAUES	China Association of Urban Environmental Sanitation
CCER	China Certified Emission Reduction
CDM	Clean Development Mechanism, a previous climate finance facility
CNY	Chinese Yuan Renminbi = about 13 Eurocents at time of this writing
COVID-19	Corona Virus Disease 2019
DAC	The Development Assistance Committee of the Organisation for Economic Co-operation and Development (also referred to as OECD DAC)
ETS	Emissions Trading System
ELE	Evaluation and Learning Exercise
ELEQ	Evaluation and Learning Exercise Question
EUR	Euro
FC	Financial Component (not part of this NSP)
FW	Framework
FYP	Five-year plan
GHGs, GHG	Greenhouse Gases
GIZ	Gesellschaft für Internationale Zusammenarbeit
IWM	Integrated Waste Management
KfW	KfW Development Bank (KfW – Kreditanstalt für Wiederaufbau)
KII	Key Informant Interview
Logframe	Logical Framework
M&E	Monitoring and Evaluation
MOHURD	Ministry of Housing and Urban Development

MRV	Measuring, Reporting, and Verification
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contributions
NSP	NAMA Support Project
NS	NSP Stakeholder
NT	NSP Team
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
TC	Technical Component
ToC	Theory of Change
ToT	Training of Trainers
TP	Third Party
TS	Types of Sources
TSU	Technical Support Unit, NAMA Facility
WTE	Waste to energy incineration (both with the generation of electricity and capture of heat for district heating or other uses)

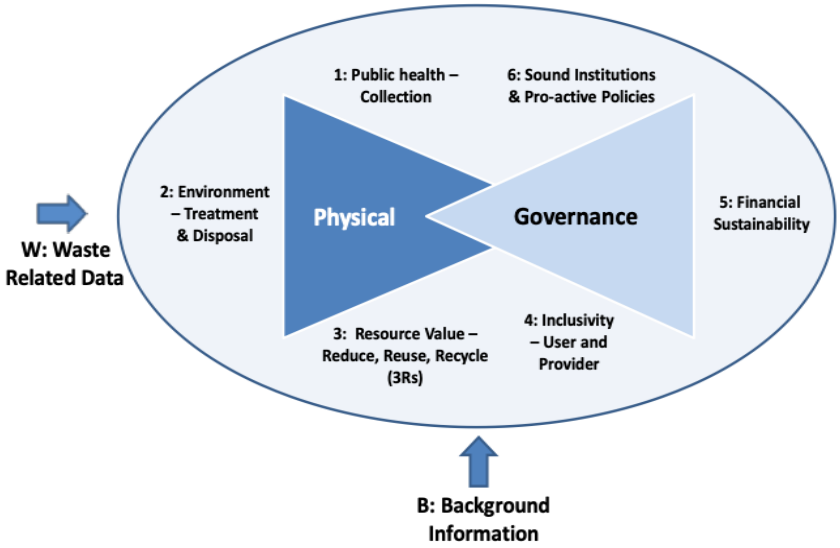
1 Introduction

1.1 Overview of the NAMA Support Project

The main goal of the China Integrated Waste Management NAMA Support Project (NSP) is to transform the solid waste management sector in Chinese cities to a low-carbon, modern, integrated environmental service sector. The project is designed around replicable integrated waste management (IWM) pilots in 5 cities, chosen competitively and based on geographic location, size, economic development status, waste management status and track record with modernising solid waste management. The structure of the project is that the Technical Component project activities are financed by the project budget, and 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 Financial Component. This also means that the project relies on close co-ordination between the NSP team and national ministries, especially the Ministry of Housing, Urban and Rural Development (MOHURD) and the Ministry of Environment and Ecology (MEE). The NSP has been written 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 and is predicted to be an important source of its impact.

The NSP aims to stimulate a transition in China to Integrated Waste Management, a concept based on the solid waste management developments in high-income countries in Europe, North America, Asia, and Oceania in the period 1985-1995. Figure 1 describes the key elements and public policy sectors involved in the IWM concept as applied in Europe.

Figure 1. Integrated Sustainable Waste Management (IWM) Two Triangles.



Source: Global Waste Management Outlook 2015

Indeed, **the NSP's relation to climate change mitigation is anchored in the requisite system shifts, associated with Integrated (Sustainable) Waste Management. Reflecting the professional experience of the two European ELE team members, and with reference to the proposal for the NSP, these system shifts can be summarised as follows:**

1. **A shift in the physical system of waste collection and disposal, from reliance on controlled and uncontrolled *land disposal* to manage all waste, to a mixed (integrated) approach that combines various types of *materials and energy recovery*** with a much more limited reliance on final controlled land burial. The *environmental driver* for this shift was, and remains, the need to limit contact between complex waste materials and the environment, and specifically to minimise emissions of waste to the ground- and surface water. The *climate driver* relates to the greatly reduced production and release of CH_4 (methane), a powerful Greenhouse Gas (GHG), attributable to the reduction in uncontrolled and controlled disposal. In addition reducing other impacts, such as the flow of waste to water with related eutrophia. In China, this shift has taken the form of a massive investment in incineration and energy recovery and results in the Chinese policy claim of *zero environmental harm* (a translation of the English *Sound Environmental Management* from Chinese back to English). It refers to limiting environmental impacts from waste management activities.
2. **A second shift in the physical system from incineration (controlled combustion) with and without energy recovery, to material recovery for both recyclables and organic materials**, motivated in part by the extremely high per-tonne costs of waste to energy incineration and engineered disposal. This shift has indirect climate impacts on several fronts, that contribute to a major *system shift* from disposal-oriented waste management to waste management that follows *the' waste hierarchy'*, with 'waste prevention' at the apex and 'disposal' at the base. Especially this second shift can be understood, on a system level, as ***breaking the disposal monopoly*** and **moving from *management of waste* to *management of resources that would otherwise become waste*.**
3. **These two developments have tended, in most high-income countries, to create several important shifts at the governance level.** Specifically, IWM (sometimes called integrated solid waste management (ISWM) in the development co-operation context) involves a **shift from *facilities and investment planning* to a focus on the creation of a city solid waste and resource management**, i.e. an *Integrated Waste Management Strategy***.** In general, an IWM strategy is likely to include:

    a. Creation of *targets for recovery of recyclable materials and organics* that motivate waste managers to invest in both the knowledge and behaviour of waste generators and the physical systems necessary for segregating the recoverable materials and collecting them separately from waste. GHG emissions reduction targets would fall into this governance category.
    b. Creation and/or strengthening of monitoring, measurement, and reporting requirements for cities and their institutions, to enable benchmarking whether the targets are being met.
    c. Creation of *marketing relationships*, first for recyclables, between the *solid waste system and the private recycling sector* on the one hand, and secondly, for kitchen and garden

waste and other organic materials, between the *solid waste system and the agricultural and silvicultural sector* on the other.

d. Creation of *occupations and institutional features* necessary to manage resources, which were not necessary when the "core business" of waste managers was limited to disposal.

e. An institutional shift from strictly *public works focus* on public health, operations and investment to a multi-disciplinary *system focus* on all aspects of waste and recycling, including how to predictably manage separation at source, and thus connect users of the system to the needs for *diversion from the disposal*, and how all the different parts of the system relate to each other. This often results in creating an integrated organisational and institutional profile, and an integrated budget. When *activity-based costing* is added, the solid waste or environmental institution learns to flexibly shift resources from disposal to recycling or management of organics, as a response to the changing flows of materials coming from households and businesses.

f. The need for budgetary flexibility often creates a shift towards *institutional consolidation*, with the creation of (for example) a *materials management department* or an *integrated recovery and management division* with its own management and a new organogram, offering the waste and materials manager more bureaucratic reach and flexibility to respond to changes in the flows of waste and materials.

g. Increased *inclusivity* for the roles of *system users* (the clients, the users of the services) and *system providers* (the professionals, both public and private, who collect, process, dispose and/or market the materials). Inclusivity results in new openings and a variety of economic niches for private companies and entrepreneurs (including informal or independent recyclers) to participate as economic stakeholders in the integrated waste and materials systems.

h. An *institutional awareness* of the dangers of over-investment in disposal hardware, as the increasing focus on materials recovery, can create an over-capacity of continuous feed facilities (such as incinerators) that put pressure on the institution to limit flows going to batch processes such as materials recovery.

The implicit and partially explicit goals of the NSP are to motivate all of these shifts in the pilot cities (PCs), so that there are living demonstrations of IWM in Chinese cities, and to show that these shifts, in combination, create a low-carbon and modern waste sector. The project approach is to choose demonstration cities and engage international consultants from Europe (where this IWM transition happened between 1985 and 2005) to support cities to create IWM strategies, guide them through this transition in a managed way, and demonstrate for both national officials and other stakeholders that IWM is not only useful but essential, in modern waste management.

Although the proposal is not very specific about the concept of low-carbon waste management, the ELE team expects that the **main causality paths between the China IWM NSP and GHG emissions reduction** to be:

- Continuing to decrease the amount of waste going to land disposal

- Optimisation of collection, storage, transport, and other logistical processes depending on liquid fossil fuels for vehicles
- Increased efficiency in energy generation from combustion in waste-to-energy plants, caused by re-directing organic waste and recyclables to other forms of treatment
- New energy generation from directing organic waste to anaerobic digestion (AD) increased sequestration of CO_2 in soils through the processes of composting and land application of compost in agricultural and horticultural processes
- Measuring, Reporting, and Verification (MRV) methodologies, leading to improved monitoring and measurement of all aspects of waste management, so improvements in efficiency and GHG savings can be documented
- Over the longer term, create records of avoided emissions from the extraction and production processes, which are avoided through circular processes that lengthen the useful lives of materials and products through waste prevention, re-use, repair, and recycling.

In practice, the activities and outputs of the China IWM NSP in the five PCs have "touched" primarily the physical system. This means that the governance system shifts remain as future activities to be supported by the international Technical Assistance (TA) consulting teams. Specifically, the five PCs have started, with the diversification of facilities and operations, and are experiencing the effects of the breaking of the disposal monopoly, but are doing this without the benefit of an IWM strategy document that "connects the dots" between the physical and governance systems. The unintended effect of this is that the transition is more chaotic and less well documented than if they were following a strategy, but also that there has perhaps been more room for learning and experimentation.

The five-year timeline for the project, which was designed to start in 2017 and finish in 2022, has been affected by some administrative delays in the contracting process in the early years, and, since February 2020, by the COVID-19 pandemic. More information on COVID is presented in Chapter 4.

1.2 Focus of the Evaluation and Learning Exercise

In accordance with the Terms of Reference (ToR) for the Evaluation and Learning Exercise (ELE) as a whole, the specific ELE for the China IWM NSP seeks to address the following questions:

- Has the NSP been achieving its results?
- Has the NSP started to trigger transformational change?
- What was learnt from the NSP so far?

This ELE is the first to be done at mid-term, while the previous ones were all final evaluations. Therefore, it focuses primarily on project outputs rather than outcomes and impacts. The outcomes and impacts in this study will be evaluated only in terms of ‘signals’ as to whether the NSP is on the path to achieving these results. Moreover, since the China IWM NSP has no Financial Component, this ELE covers the Technical Component only.

The general ELE Questions (ELEQs) presented above were broken down and operationalised into specific questions, that are answered in this report. In the table, the questions have been mapped against the Organisation for Economic Co-operation and Development’s- Development Assistance

Committee's (OECD DAC) evaluation criteria[2], which are widely used as international standards for evaluations of development interventions. Finally, the specific ELEQs were broken down further into sub-questions, which are included in the official ELE Matrix, approved by the NAMA Facility Technical Support Unit (TSU), and reported in Annex A.

Table 1. General and specific ELE questions

General ELE Question	Specific ELE Question	OECD DAC Criterion
Has the NSP been achieving its results?	1. To what extent does the NSP address an identified need (by national policy institutions, city government, citizens, and the private sector)?	Relevance
	2. To what extent has the implementation of the NSP been achieving intended outputs?	Effectiveness
	3. To what extent is the relationship between inputs and outputs timely and to expected quality standards?	Efficiency
Has the NSP been achieving its results?	4. What evidence is there that the NSP is likely to contribute to the intended impact in the Theory of Change (incl. transformational change), as well as any unintended or unexpected ones?	Impact
	5. What is the likelihood that the outcomes will be sustained after the end of the NSP funding period?	Sustainability
What has been learnt from the NSP so far?	6. What key lessons can be learnt to the benefit of this and other NSPs in achieving their results?	Learning

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

2 Methodological approach

The ELE of the China IWM NSP was scheduled for two months, from mid-November 2020 to Mid-January 2021 with actual field work of 12 working days. This is longer than the standard period for an ELE for two reasons:

- The period spanned the European holiday period of Christmas and New Year, where the ELE team could not be expected to work, and
- Extra time was needed to process the majority of the interviews which were in Chinese since few NSP stakeholders or Third Parties could be interviewed in English, which required different arrangements compared to the previous ELEs that did not require interpretation and translation.

The ELE activities have been divided into four main phases with some additional sub-activities specific to the Chinese situation. What is presented here is an overview. A detailed methodology followed by the ELE is presented in Annex H.

1. **Phase1: Inception and evaluability.** This includes:
    a. Kick-off workshop and analysis of the documents, in the first weeks of the project
    b. Adjusting the ELE methodology to the Chinese NSP setting and conditions, starting immediately and continuing throughout the entire period,
    c. Producing the ELE matrix and the China ELE ToR, within the first two weeks of phase 1,
    d. Translating the ELE matrix and testing it in Chinese circumstances, and
    e. Organising and scheduling the interviews.
2. **Phase 2: Conducting English and Chinese interviews.** This phase has been referred to as *field work* in the previous ELEs, but due to COVID-19 it has consisted primarily of digital interviews with a few physical meetings and several field visits in the Pilot City of Suzhou. This phase consists of:
    a. Piloting the ELE matrix in 3-4 digital English interviews and 3-4 physical interviews in Chinese during a field visit to the pilot city of Suzhou
    b. Adjusting the ELE matrix by (1) adjusting the content based on learnings from those pilot interviews and (2) translating it to Chinese in the ELE matrix format
    c. Performing and taking notes on all additional English and Chinese interviews, with 20% in English and the rest in Chinese.
3. **Phase 3: Preliminary and Full Analysis.** The work includes:
    a. Preliminary analysis of interviews
    b. Drafting of the adjusted ToC and the Causal Pathways
    c. Intensive consultation within the ELE team focused on extracting common themes from the interviews. This included reviewing the ELEQ and the answers, in several sessions where Chinese and European team members discussed the questions and the answers and arrived at common themes
    d. Producing the Validation Workshop presentation and findings

   e. Conducting the Validation Workshop including presentation and discussion of the ELE preliminary findings with the NSP team
   f. Transferring the Validation Workshop presentation to a Word file, and asking the NSP team to validate this document, including making comments or corrections
   g. Completing the analysis, by filling in the Excel interview mapping
   h. Transferring the excel answers and sources to Annex C.

4. **Phase 4: Reporting and presentation.** In this phase the team worked on:
   a. Assessing and scoring the strength of interview evidence
   b. Completing the analysis in a variety of different forms, in order to be able to produce report figures, tables, and annexes
   c. Reflecting and reporting upon the methodological adaptations that have been necessary to conduct the China IWM ELE, in a situation where the geopolitics of the ELE, as well as language and cultural differences within the ELE team, played a quite significant role
   d. Assessing the achievements and learnings, using process tracing
   e. Completing the ELE report.

2.1 External circumstances and limitations affecting the ELE

2.1.1 Working in China

Before concluding the methodological section, a few words need to be said about the fact that this ELE was facing a number of external circumstances that had not emerged in previous ELEs, all of which took place in Latin America. Working in China required creative response of the ELE team and the ELE organisations on some fronts. Therefore, it is worth crystallising the **lessons for future ELEs**, which fall into five topic areas.

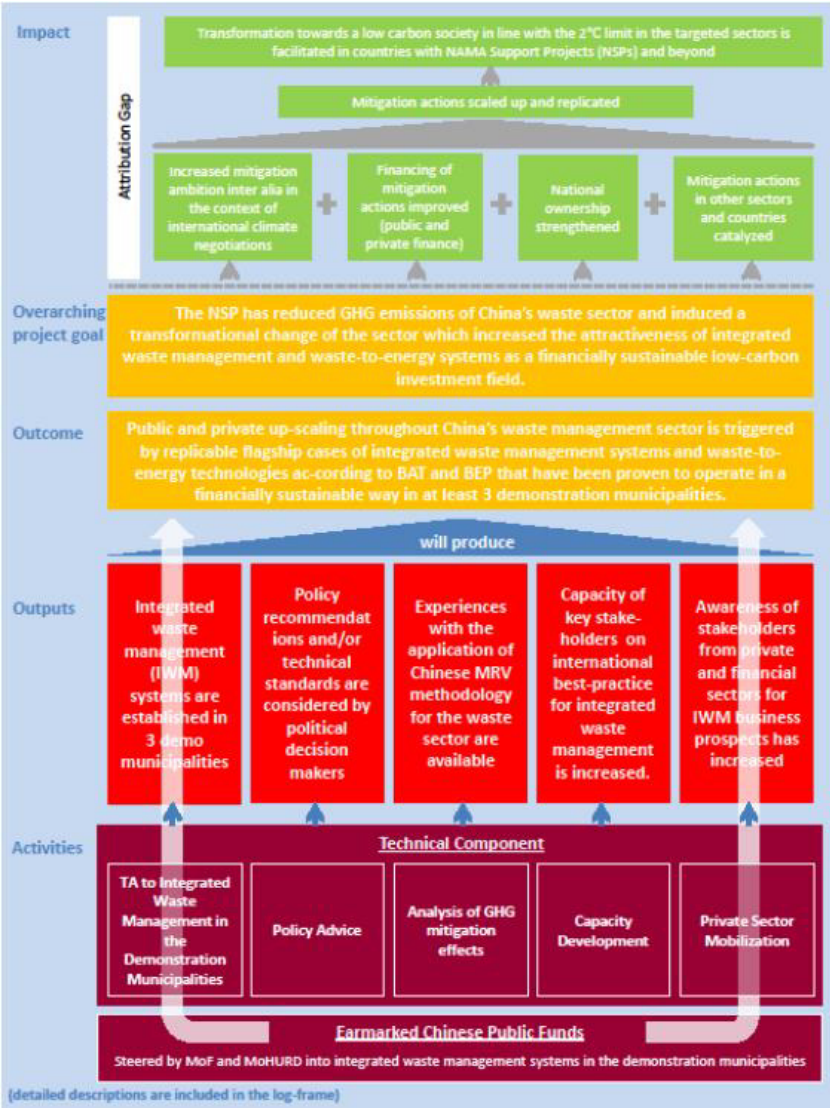
1. **Language**
2. **Public service culture**
3. **Digital communication**
4. **Due diligence of original interview dossiers**
5. **Working during COVID-19 second and third peaks in Europe**

The details are presented in Annex H.8.

3 The NSP China IWM Theory of Change

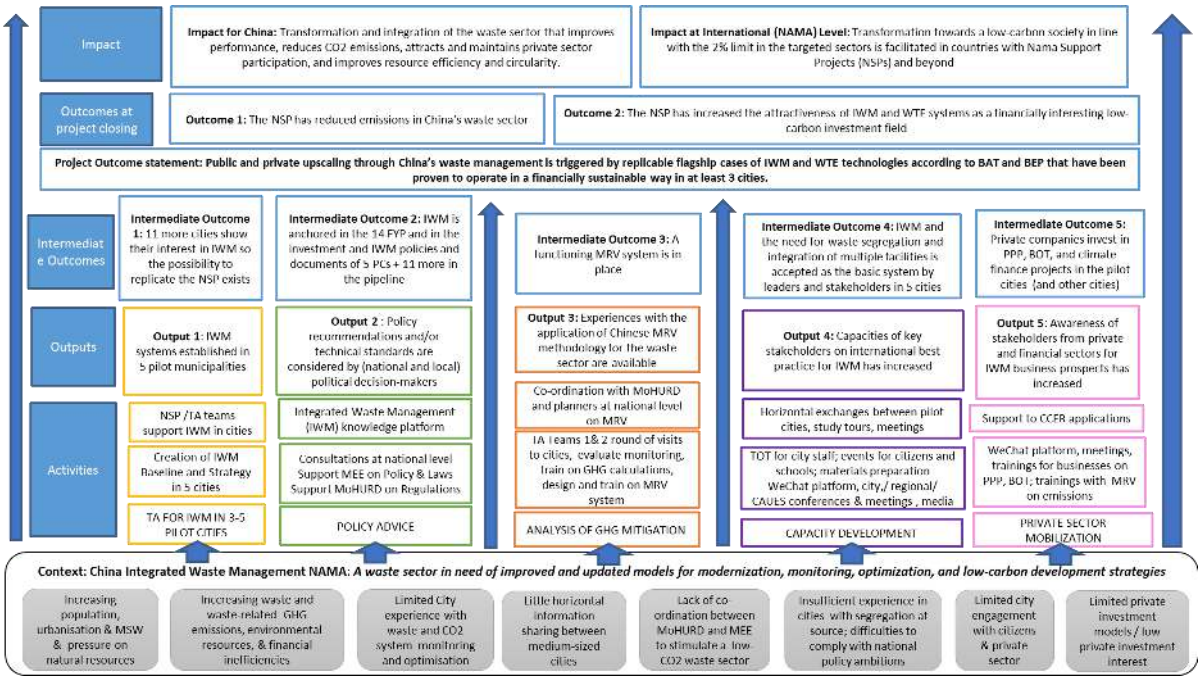
The NSP included a Theory of Change (ToC) diagram in its Proposal (Figure 2).

Figure 2. China IWM NSP ToC (original version)



Based on that, during the inception phase and through communications with key NSP team members during and following the Kick-off Workshop, the ELE team was able to elaborate a new version of the ToC with more detail in terms of **context, activities and causality**. This is presented in Figure 3 and Annex A. This version of the ToC was presented and validated in the Validation Workshop. The NSP team made a small number of additions, corrections, and nuances, and then declared that they were very satisfied with how the ELE team understood their project.

Figure 3. China IWM NSP ToC as elaborated by the ELE Team



The problem that the NSP was designed to address

Most NSP proposals identify a problem as their point of departure. The China IWM NSP, in contrast, is context- and opportunity-driven rather than problem-driven, and weaknesses in the enabling environment are the point of departure. The core elements shown in grey at the base of Figure 3 are a classic list of characteristics that typify the waste management sector in emerging economies, before the series of changes that -taken together - combine to produce an IWM system.

IWM, integrated waste management, sometimes referred to as ISWM, integrated sustainable waste management, is a framework for understanding modernisation and upgrading of solid waste systems, and also for guiding development co-operation interventions, ISWM is presented in Figure 1 as two triangles, the left-hand triangle representing the *hardware* or physical system of technologies and operations, and the right-hand triangle representing the *software*, or governance, management and finance. IWM is the basis for the *WasteAware Indicators* benchmarking system which represents the conceptual basis for the NSP, as discussed in the NSP proposal, and so is important to understanding the ToC.

The physical system of IWM hardware is technology-based, with investments and operational decisions about collection and removal driven primarily by the *public health driver* illustrated in Figure 1. A short explanation of this concept that underlies the ToC is useful, especially since this NSP is the first that focuses on the waste sector as a landscape for climate-friendly development, specifically low-carbon development. Two others can learn from this evaluation and the experience of the China NSP: one in India which entered implementation last year, and one in Mozambique which is still in the Detailed Preparation Phase.

The *environmental driver* in the left-hand triangle identifies public health as the driver for waste collection policies, environmental protection as driving disposal upgrading (and avoided CO_2 and CH_4), and the resource management driver as stimulating segregation and separate management of

kitchen waste and recyclables. This driver is operating in terms of the overarching goal of Chinese waste policy, sound environmental management (of collection and disposal), communicated by the NSP team as *zero environmental harm*. The extension of the operational conception of "operational harm" or sound environmental management, has not until recently, extended to include GHG emissions associated with waste management, specifically CO_2 and CH_4.

The right-hand triangle is about the "software" or governance system of IWM, with points of the triangle representing inclusivity, sustainable finance, and sound institutions and pro-active policies. In recent elaborations of ISWM, the right-hand triangle is presented as a pyramid, with the fourth point being transparent information and data management, including monitoring.

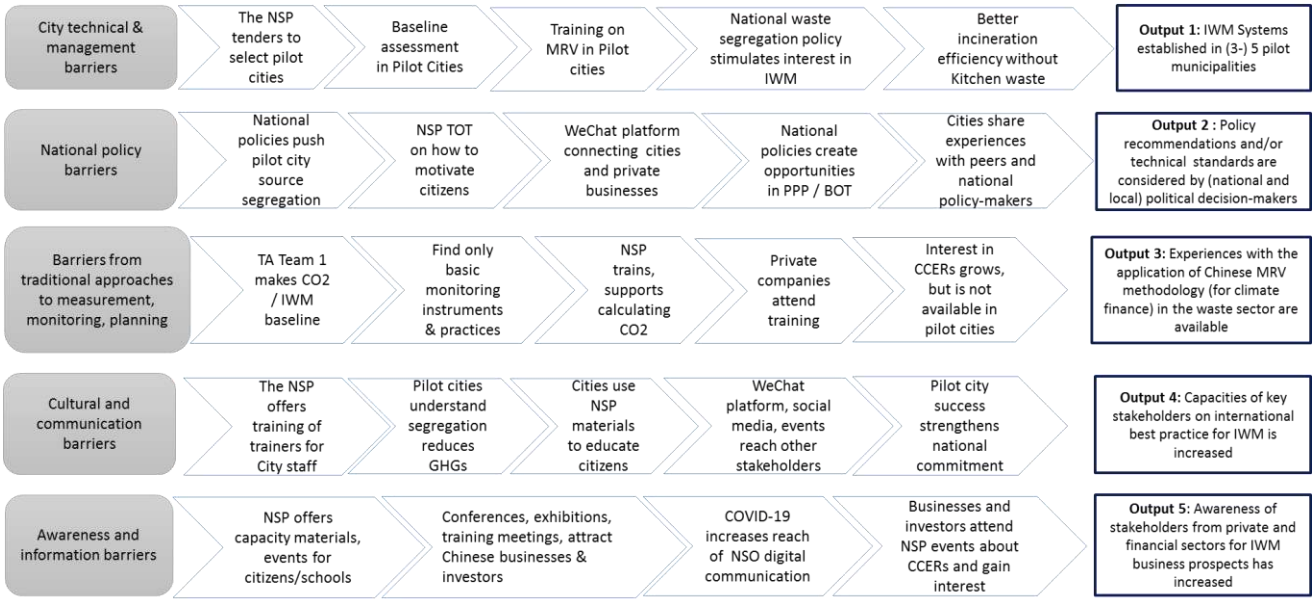
All of these IWM elements come into the NSP ToC, either explicitly or in terms of causal pathways and approaches. The IWM interventions in Output 1, on pilot cities, are in the first instance focused on diversifying the physical system, introducing segregation and more efficient collection, strengthening environmental performance, and integrating segregation of kitchen waste and recycles into the cities' systems to recover those resources.

Governance software is also part of the work with the pilot cities, and in the proposal is designed to cover inclusivity, financial sustainability, and sound institutions and pro-active policies. Specifically, ToC outputs and impacts focusing on citizens are responding to the concept of *user inclusivity*, that is, including system users in decision-making and capacity development. The business and financial sector Outputs 3 and 5 serve the interest of *provider inclusivity*, broadening the base of service providers in waste systems and recycling. Financial and institutional governance have a limited representation in the ToC and the proposal, for example in the financial projections in Annex 8a of the proposal which focus on financial sustainability or the discussion of users paying through a Pay as you throw (PAYT) fee system. In the ToC planning, IWM governance issues are very important in output 2, affecting national policy (upward policy linkages), and in Outputs 3 and 5, about leveraging climate finance and improving management, measurement and monitoring through introduction of MRV technologies. The specific activities concerning governance are not so specific in the ToC but in the fine print of the proposal, it is clear that they are supported by international technical assistance to create a tailored IWM strategy for each pilot city.

<u>The original causal pathways</u>

The ELE has adopted the five causal pathways from the elaborated ToC for the China IWM NSP. Each causal pathway sustains one of the five outputs and outcomes in Figure 3, as shown in Figure 4.

Figure 4. Original Causal Pathways of the Theory of Change of the CHINA IWM NSP



In order to progress from the abovementioned weaknesses in the enabling environment, towards the successful delivery of the outputs presented, the NSP ToC foresees 5 causal pathways, which are illustrated in Figure 4 and explained in the relevant sub-sections of Section 4.1.

The ELE has identified the following causal pathways sustaining each of the five outputs of the NSP:

- **Causal pathway supporting Output 1:** If pilot municipalities join the NSP they can have support for a CO_2 and IWM baseline, learn from the knowledge of European experts experienced in IWM on how to make an IWM strategy, and implement physical system diversification and improvements, organise segregation of kitchen waste and other parts of municipal solid waste (MSW), and have an IWM system functioning in their cities.
- **Causal pathway supporting Output 2:** If the NSP is in close contact with national policymakers and designs the NSP to be aligned with national policy guidelines for segregation of waste fractions, then pilot city success in implementing these approaches will influence national policymakers to make IWM the standard for Chinese cities. And further, if the NSP supports the pilot cities in building capacity to promote and implement segregation of four waste fractions: kitchen waste, residual waste, hazardous waste and recyclables 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 a WeChat platform, then cities will have the capacity to implement national policy guidelines and their success will also create upwards policy linkages towards national policies.
- **Causal pathway supporting Output 3:** If PCs have support from international experts to produce a CO_2 baseline, then they are better able to understand the need for more rigorous monitoring, and ready to learn from international experts who introduce MRV "technologies" (approaches to monitoring, reporting, and verification). 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, verify emissions, which will allow them to mobilise climate finance through proven emissions reductions, a key milestone to gain access to climate finance. And if the business and

financial sectors see pilot cities using MRV to monitor the positive impacts of implementing IWM, then the availability of climate finance via the CCER system will attract business and financial stakeholders to bring private capital into investing in low-carbon development in the waste sector.

- **Causal pathway supporting Output 4:** If the NSP invests in structurally increasing capacity of waste management professionals and businesses in the public sector (specifically in the pilot cities and national ministries and PC staff), as well as in the private sector, and shares the NSP experience on including citizens in waste segregation efforts, and mobilising the private sector in IWM, then segregation will be a large-scale success and treatment plant operators will come to understand that it improves waste management efficiency and show convincingly that segregation works. And if the NSP and cities share their positive experiences with designing systems around waste segregation, then the success will strengthen national policies for segregation, as well as raise the level of attention for the pilot cities, and strengthen the interest of other cities to participate (and businesses to work with them). This will raise the profile of IWM in China, and create a virtuous circle where more cities want to join the project and national policies create more demand for implementation of IWM and international best practice throughout China.
- **Causal pathway supporting Output 5:** If there is enough promotion, education, publications, study visits, WeChat forum communication, training, capacity development, and assistance to businesses on IWM as a climate-friendly development strategy and a new investment opportunity, and if this activity makes good use of digital media when personal contact is restricted due to the COVID-19 pandemic, it will attract business and financial sector investors to work with the cities to mobilise financing from the CCER, and if the CCER system is functioning, the pilot cities will become a magnet for private sector (share-holder-owned) investment in IWM and climate finance.

4 Key Findings

In this section, the ELE Team presents the main findings of the ELE. These are structured according to the ELE Questions in Table 1[3]. The beginning of each section contains a summary of the findings related to the relevant ELEQ with a RAG rating of the strength of the NSP's contribution story to the ToC. The OECD DAC criteria are also presented following the scale: Good / Very good = Green; Problems = Amber; Serious deficiencies = Red.

4.1 Relevance of the NSP

Table 2. Evaluation Question 1

Evaluation Questions	1. To what extent does the NSP address an identified need (by national policy institutions, city government, citizens, and the private sector)?
Summary	• The project was formulated in consultation with the national government and the planners, and it reflects the priority to modernise the management of municipal solid waste, and increase the emphasis and investment on waste classification. • For example, the strategy to select pilot cities in different regions, and to support them to set up professional waste sorting and provide training, education and projects, serves the national government priority to spread these practices throughout all Chinese cities in China. In fact, the large and mega-cities were already starting to work on segregation, but NSP pilot medium-sized cities were only in the starting stage when the proposal was written. • The NSP is relevant to the private sector wanting to learn about technology from Europe and get technical assistance to understand how to apply it and what the earning models in China are. • The NSP helps cities understand how to implement 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.

In order to assess the relevance, the ELE team asked NSP Team Members and NSP Stakeholders from the PCs, about the connections between the NSP and national policies. In general, the answer was that the NSP was opportunity-driven, and was created in response to national priorities as expressed in the 13th Five Year Plan (FYP). The proposal itself was prepared in close consultation with both policymakers and planners at a national level. Moreover, the strategy of the NSP to recruit and work with (early-adopter) medium-sized pilot cities, distributed geographically in some regions in China, was deliberately designed to complement the national guidelines for implementing source segregation and spread practical know-how on this as widely as possible.

Chinese national policy also aims to open more spaces for private and financial sector participation in low-carbon waste management. To respond to that, the NSP used the implementation of robust MRV practices that would allow obtaining China Certified Emissions Reduction (CCER) credits as an additional revenue option to attract new finance and business sector stakeholders to the solid waste

[3] In order to maintain a fluid narrative between the achievement of the NSP outputs, outcomes and the long-term impact, the findings about ELEQ 4 (Impact) are presented right after those of ELEQ 2 (Effectiveness).

sector. The reliance on IWM as the key NSP framework also supports the priorities of national and city officials to intensify the zero harm profile of waste management, by matching a supply of diversified treatment options that rely on separate management of kitchen and garden waste, to the available supply of national subsidies and investment funds.

The RAG rating for this question is green because of the large number of interviewees who answered that the priorities and programmes of the NSP are highly relevant to national policies, and especially, that the NSP work in the PCs has made it clear to Chinese cities that it is possible to implement national policies, and has provided lots of support for doing this.

4.1.1 How external factors impacted the NSP's relevance

The primary external circumstance in terms of relevance relates to the transfer of the competent authority for the China Certified Emission Reductions (CCER) programme from NDRC to the MEE. This delay affected the relevance of climate finance for Chinese private and financial sector stakeholders because CCERs weren't available for much of the project period. But the Chinese committee on carbon neutral in 2060 provides strong support on further development and especially for the dissemination of the NSP concept and outputs.

4.2 Effectiveness: Achievement of the NSP Outputs

Because this is a mid-term ELE, the focus of the ELE has been on progress in achieving the **outputs**, and the RAG causal pathways analysis looks primarily at outputs. However, in two of the five results, although the outputs have been achieved, at mid-term there have been breaks in the causal chain that risk compromising the achievement of the outcomes and impacts. These instances have been highlighted in the impact section (Section 4) and in the conclusions. It is especially important to signal these at mid-term so that the NSP has the opportunity to take specific actions to ensure that the outcomes and impacts are reached.

The ELE team analysis of the interviews, as well as the field visit to Suzhou, the "most advanced" of the PCs, provides strong indications that all of the outputs have been achieved to some degree, already at mid-term. Several of the outcomes have also been achieved, or there is evidence that the project is on the path to deliver these outcomes. The main issue here is the ambiguity in the proposal, as to how the NSP is interpreting IWM.

Table 3. Evaluation Question 2

Evaluation Question	2. To what extent has the implementation of the NSP been achieving intended outputs?
Summary	• **Output 1**: Significant progress has been made towards the project goal of climate-friendly integrated waste management systems in the five PCs. The cities have been strategically selected so that they serve as regional demonstrations of new approaches and technologies. The introduction of IWM approaches to the physical system of waste management has been well-received by the pilot cities, implemented, and has led to new insights on the collection and management of various materials streams. The introduction of IWM governance ideas that stimulate institutional and financial reforms is on the project agenda for the coming years but has been delayed by the travel restrictions for

	international consultants as a consequence of the COVID-19 pandemic.
	• **Output 2**: Close coordination between the NSP team, national policy-makers, and the Chinese Association of Urban Environmental Services (CAUES) has resulted in upwards 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.
	• **Output 3**: The NSP has provided TA in the pilot cities to produce a CO_2 baseline and introduce MRV methodologies for calculating CO_2 and CH_4 reduction and other GHG monitoring (also N_2O is discussed). All five pilot cities have had an introduction to MRV which has improved their regular reporting on emissions reductions. Third parties are interested in MRV and its potential for enabling carbon emissions reduction trading as a business model. But the limitations in the availability of the CCER (the ETS at China national level) mean that climate finance business models are not yet visible nor available to business and financial sector stakeholders, and remain challenges for the remaining years of the NSP.
	• **Output 4**: Capacities of key stakeholders (such as businesses and citizens) concerning international best practice for IWM have increased, through training and awareness activities supporting municipal staff and trainers to work with citizens, schools, NGOs, and associations, as well as specific capacity development activities engaging and involving business and financial sector stakeholders in meetings and digital events. A rich variety of stakeholders have been reached by project activities, and are positive about the possibilities of IWM in their own activities and spheres of influence. Study visits and regional activities are attracting interest and visitors from other cities.
	• **Output 5:** NSP activities have reached the business and financial sectors through a very active WeChat platform with Q&A to answer business questions, combined with other social media and physical events, including visits to the PCs. Potential Public-Private Partnerships (PPP) and Build-Operate-Transfer (BOT) partners from shareholder-owned companies have been supported to analyse the current business environment and market potential of the Chinese waste sector. Stimulated by the NSP, the private sector has taken a leadership role in building anaerobic digestion projects, using mixed or kitchen waste to produce fertilizer and soil amendments, and generating electricity from their biogas, and their fertilizers for soil remediation.

4.2.1 Output 1: IWM systems established in 5 pilot municipalities

The proposed impacts and outcomes of the NSP are quite clear in Figure 3, as are the activities and outputs. There is, however, a qualification needed for Output 1, introduction of IWM in the five PCs. The original project proposal and design called for the International Technical Assistance Team 2 (TA 2) to visit each of the PCs and to support the cities to formulate, in the early years of the project, a specific IWM strategy tailored to the baseline conditions, circumstances, and needs of that city.

The NSP was in the final phases of contracting TA Team 2 when COVID-19 made international travel to China impossible, and when China reopened the European members couldn't travel. That means that at the time of the ELE, these strategies for the PCs had not yet been written, even though the Chinese team members of TA2 had visited all of the cities and conferred with the international members by email and in online meetings. Therefore the output was partially achieved.

The result is that the five PCs are working on IWM supported by the NSP team, and have made many IWM-related adjustments to operations and to diversifying their physical systems. But without the strategy document, the PCs have not yet started activities nor achieved outputs related to the governance aspects of IWM. This appears to be a direct consequence of the fact that the IWM City-

specific strategy document has not been produced, and is, according to the NSP team, both a priority for 2021 and a major reason to extend the project period for one to two extra years (see recommendations below).

Significant progress has been made towards the project output of establishing climate-friendly integrated waste management systems in the five PCs. The cities have been strategically selected so that they serve as regional demonstrations of new approaches and technologies. The introduction of IWM approaches has brought improvements to the physical system of waste management and has been well-received by the pilot cities, implemented, and -- in combination with Output 3, the availability of MRV systems -- has led to new insights on the GHG reductions associated with IWM collection and treatment of segregated materials streams. The part of IWM that relates to modernising physical operations and documenting climate benefits in the five PCs is thus well advanced and this output is documented and appreciated in the interviews.

The five PCs have endorsed the physical system aspects of IWM and have moved decisively and rapidly to change collection and treatment practices. Many interviewees talked about how the PCs are working on measuring, monitoring, and improving the efficiency of facilities, and optimising interactions between facilities. All PCs started with a situation analysis and gap assessment between Chinese and European understanding of IWM. The monitoring systems of the cities have been assessed by TA2 and the MRV system has been introduced by TA1 and more specific training is planned for 2021 and 2022.

There is abundant evidence of funds mobilisation, as cities have been able to draw on national subsidies and funds to build treatment facilities, which diversify the waste stream beyond the "zero harm[4]" or best environmental practice model of sanitary landfills and incinerators. The RAG rating is green *at mid-term* because the NSP has broadly disseminated the idea that an integrated solid waste system is more than a landfill and an incinerator, and because the IWM idea has been accepted that segregation and materials recovery can be as or even more important than energy recovery, in having an efficient system. We can call this *breaking of the disposal monopoly* a key IWM result, and one that in Europe and the Americas triggered several second-level governance reforms that affect institutional coherence, finance, and inclusivity. If the NSP now moves to work with these cities on the governance aspects, the RAG rating is expected to remain green. However, if the implementation of IWM stops with the physical system, then the term “international best practice” would not be appropriate, and in a final ELE, the RAG score for associated outcomes and impacts is likely to colour amber or even red.

The introduction of IWM governance ideas that stimulate institutional and financial reforms is a high priority to achieve outcomes and impacts. NSP team members state clearly that it is on the project agenda for the coming years, and in the Validation Workshop, the team stated that this is a high priority and that they are looking at ways to move it forward. In other words, we cannot yet say that PCs and other stakeholders understand what IWM means in terms of a system approach, financial and institutional integration, and policy, but there are movements in that direction. Communication

[4] “Zero Harm” represents a problematic translation issue, it has been explained by the Chinese ELE team that this is “Chinglish”. The term in Chinese is sometimes translated as “sound environmental practice” but since the NSP staff repeatedly used the words "no harm" or “zero harm” or "100% harmless" the ELE team maintains this formulation.

from the NSP team and TA Team 2 suggest that the governance aspects of IWM are planned for introduction in 2021 and 2022 and that the desired outcome will likely be achieved, also because all of the pilot cities, in their own ways and according to their own priorities, are gradually changing their way of planning and looking at waste management systems.

4.2.2 Output 2: Policy recommendations and/or technical standards are considered by national and local political decision-makers

Output 2 is part of the outcome and impact on upwards policy linkages and influence. The mechanism for this was difficult to understand in the proposal and largely absent in the reporting, so the interviews and especially the discussion in the Validation Workshop were critical to understanding the state of the art and how this has worked. According to the NSP team interviews, Output 2 has been fully achieved and there are strong signals that the results chain going forward to outcomes and impact is not only probable but already being achieved. Mechanisms to achieve this were already clear during the proposal preparation, and are quite seriously under-reported in the Semi-Annual Reports and Annual Reports and not present at all in the M&E documents. Specifically, when the NSP team was preparing the project, they did it in close consultation with national policy-makers and they specifically mentioned their frequent engagement with the staff and consultants who are writing the 14th FYP.

Moreover, communication and interplay between the NSP, the cities, and national stakeholders are very active and successful, with the NSP conducting roundtable workshops for political decision-makers at the provincial level, working with national government on policy recommendations for the waste sector, and influencing the ideas on solid waste management that are being worked into the 14th FYP. This was explained by the NSP team and confirmed in the PC group interviews, as well as being mentioned by some third parties. Some of these communication channels are informal, as for example it emerged that the NSP project leader and other members of the project team are functioning as informal advisors to the national offices making plans and laws.

Close coordination between the NSP team, national policy-makers, and the CAUES has resulted in upwards 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. An additional channel is that CAUES is involved in writing various types of standards for the solid waste sector, but also for the Ministry.

The institutional structure of the NSP implementation is centred on a Steering Committee consisting of the responsible national ministry, MOHURD, the Delivery Organisation, GIZ, and the implementing partner, CAUES. Additional stakeholders, such as the municipal entities of MOHURD, are included in the overall steering structure of the NSP to ensure transparent communication between the different entities involved and a smooth implementation process. This institutional structure ensures that the policymakers at MOHURD are constantly observing the gains made by the NSP and incorporating ideas into national policy.

PCs and other NSP stakeholders strongly support the project, and through the TA to the PCs (even without the strategies), they are learning that improved management of organic waste can reduce GHGs and that the MRVs can demonstrate that. In response to questions about this, the evidence

states that “the NSP and the TA Team 2 is guiding the cities on CO_2 reduction, on the definition of IWM as well as how to implement it and supporting them in reaching and training citizens” (see Annex C).

More evidence from the interviews states: "IWM Policy guidelines [produced by the NSP] supported PCs to learn about IWM and CO_2 reduction and how to engage stakeholders, including citizens and businesses" (see Annex C). Active informal and formal exchanges and consultations between national, regional, and local government stakeholders and the NSP are facilitating upwards and downwards policy linkages and creating a virtuous circle of mutually reinforcing activities and leveraging new standards and policy innovations.

PCs are enlarging treatment capacity for kitchen waste to actively reduce GHG emissions. Most activities in the PCs, up to now, involve diversification and optimisation of waste management operations in and between the facilities in those cities. Concrete steps for IWM at the policy level, in terms of integration of physical, financial, institutional and governance aspects, are not yet operational in the PCs. However, during the validation workshop, the NSP team stated that addressing the IWM financial and governance aspects of IWM are already planned for the coming years of the NSP. To give time for these important aspects to create associated impacts, the ELE team strongly believes that **the NSP requires an extension of the project timeline for two years,** with more detail in the section on recommendations.

Output 2 is coloured green due to multiple statements of NSP stakeholders and third parties that the project is closely aligned with national government policies and that the 14th FYP is reflecting the experiences of the project to strengthen government policies, and to work with CAUES to create a standard for IWM in cities.

4.2.3 Output 3: Experiences with the application of Chinese MRV methodology for the waste sector are available

Output 3 is the most technical output and also the one that is most directly related to climate change. It relates to supporting the PCs to move to MRV approaches to measuring the impact of IWM on GHGs from the PCs.

At the output level, the NSP has conducted training in the PCs about internationally-recognised MRV methodologies for calculating CO_2 and CH_4 reduction and monitoring of other GHG emissions, such as N_2O. All five PCs have received MRV training (so it is "available") and are starting to use MRV for regular reporting on the progressing emissions reduction made through the NSP. In the interviews, all three types of interview sources expressed their appreciation that the NSP has brought information on MRV of IWM to China, and confirmed that it was new to them, and helpful.

The Annual Report 2019 indicates that "the monitoring consortium developed a monitoring plan and provided guidance to the demonstration cities in the application of the MRV methodology, indicating the data needed and equipment that can be applied to collect the data. The challenges associated with GHG emissions monitoring were discussed during the monitoring tours in May-June and November 2019. Given that the comprehensive understanding of the MRV model and a carbon market by the demonstration municipalities is still lacking, the NSP foresees special training activities on the topics in 2020” (see Annex C).

At mid-term, there are some questions about whether the impact that is associated with Output 3 in the ToC in Figure 3 can be achieved, that is, whether MRV will stimulate the business and financial sector to seek to earn models in waste management based on climate finance. The main risk here is that the CCER programme will not re-start nor take applications within the period of the project. This is, unfortunately, an external circumstance that is outside the direct influence of the NSP, but the reach of the NSP team to central policy-makers suggests that indirect influence and a sufficient extension of time for the project will bring this impact into NSP reach. Also, the broader implications of the use of MRV for the "software" and governance aspects of IWM, is an interesting topic for the next phases of the NSP, and this has already been started as mentioned in the Semi-Annual Report 2020: "On April 17, 2020, the NSP organised a capacity-building event on the topic of GHG emissions monitoring in the waste sector with a focus on the staff of the PCs" (see Annex C).

Output 3 is coloured green because the M&E and annual and semi-annual reports confirm that field visits, orientation and some training have taken place so that "experiences with the application of Chinese MRV methodology for the waste sector are available". Moreover, many of the business sector third parties interviewed were very positive about the NSP's training and dissemination activities.

4.2.4 Output 4: Capacities of key stakeholders, including citizens, on international best practice for IWM has increased

Output 4 is the broadest output because it focuses on the capacities of all types of stakeholders. Therefore it overlaps with capacities of PC operational and management staff and trainers, who are the main focus of Output 1, of citizens, who are the end-users of the solid waste systems in the PCs, and also business and private-sector third parties, who are the direct focus of Output 5. Annual and Semi-Annual Reports list numbers of attendees, and many interviews included a mention of the highly visible social media campaigns and especially the WeChat platform of the NSP. Beyond the output level, questions remain about whether IWM, as it is currently being interpreted by the PCs and in the absence of city-specific IWM strategies -- represents the full dimensions of "international best practice" as this output intends.

ELE identified overwhelming evidence of the many training and awareness activities supporting and training municipal staff and trainers to work with citizens, schools, NGOs, and associations. It is clear that the business stakeholders who have been interviewed greatly appreciated the capacity development opportunities offered by the NSP for them to become acquainted with the system approach of IWM, an overlap also with Output 5.

Some examples: The NSP can take credit for the success of source segregation of waste streams, first in PCs, where Training of Trainers (ToT) activities took place to teach municipal staff how to communicate with citizens about waste, citizen activities in schools and NGOs, brochures, booklets, and posters produced by the NSP, and tours for citizens of solid waste and kitchen waste facilities in their cities. The PCs in their interviews, as well as TPs, reported that other Chinese city stakeholders have participated in study visits to PCs and other activities organised by the NSP.

One concrete example of this is that some of the PCs have changed their waste classification systems in response to NSP training and the first experiences with MRV: while, in the past, there

were two types of classification, i.e. dry and wet garbage, currently in all five of the PCs, Bengbu, LanZhou, Xian, Tai'an, and SuZhou, city staff have been teaching citizens to classify waste into four categories: hazardous, kitchen waste, recyclables, and other wastes.

The shift - typical for the IWM experience -from looking at waste as a mass of mixed materials to looking at it as specific streams that can be treated based on their properties, has been intensified by PCs' advocacy to their citizens to use recycling opportunities provided by the private sector. Also, there has been strong support from the NSP to schools, NGOs, and citizens with direct awareness-raising activities, training of trainers, speaking to schools and organising trips for students and teachers, the publication of guidelines and pamphlets, and organising events and visits to facilities. Finally, the NSP has contributed to strengthening the policy and scientific literature about IWM in China by working with CAUES on standards and working with experts to publish guidelines for cities on AD.

Output 4 is coloured green because the outputs are robust, and due to the very large number of interviewees mentioning and appreciating the communication, awareness, training and information activities of the NSP, including training of trainers in the municipalities and the active WeChat and social media activities. There is a risk that it could turn amber in terms of outcomes, in case, at the end of the project, the PCs still have no strategies nor are engaged with IWM-driven governance reforms. So the continuance of green depends on the next years and the activities focused on IWM governance aspects, which will bring in the full measure of "best international practice".

4.2.5 Output 5: Awareness of stakeholders from private and financial sectors for IWM business prospects has increased

Output 5 is about awareness in the specific stakeholders from private (shareholder-owned) companies and the private financial sector, interpreted to mean investors. The relationship between output, which involves direct activities, and outcome and impact is indirect and therefore the evaluation at output level may not be a very good predictor of the outcomes or impacts. In this sense, it could be said that its relevance is weaker than its efficiency.

There is strong evidence of the contribution of NSP activities to the increased awareness and interest of the private and financial sector to waste management. For instance, these activities involved organising digital and physical training, seminars, conferences, a WeChat platform to answer business questions, other social media exposure, networking workshops and study visits to PCs for businesses and other cities (including the next 11 potential cities mentioned in the proposal, such as Kunming).

Many interviews included appreciation for the Output 5 activities about awareness, capacity development, and the relatively new phenomenon of horizontal exchange of information between cities and stakeholders, including site visits. Also, NSP stakeholders (especially those from the PCs) confirmed that participating in the NSP changed the way budgeting and reporting on solid waste activities. The first point of entry for this is reported as meaning that the NSP has broadened the horizon, NSP stakeholders in Suzhou communicated with German and European experts in related fields, which brought new input.

Six NSP stakeholders and third parties have confirmed that the NSP has high visibility with broad activities in PCs with many kinds of stakeholders, and has successfully stimulated the segregation of waste streams, which is getting better and better. The project is reaching business and financial stakeholders are inspiring their interest, but the NSP ability to leverage actual investment will depend on the rapid opening of the CCER application process.

The inclusivity aspects of the project and the focus on involving private companies were mentioned in six interviews, and has stimulated the local government to intensify the involvement of private companies to carry out waste management activities.

Also in the interviews, it was clear that when NSP stakeholders mention capacity building, this is conceived at many levels, such as in terms of substance, process, approaches, and methods. Support from the NSP has helped pilot cities to constantly adjust the communication methods with residents. For example, they pay more attention to the organisation of communication and training. There are also new forms of capacity interventions in terms of support to policies, laws and regulations. While these relate to the fact that the treatment methods are more diversified, they also move beyond that into governance.

Moreover, we think the change of waste classification is actually a measurable indicator of the governance aspects of IWM, since it changes the ways that professionals work. In relation to this, one of the PCs reported that there is now an office of waste segregation, a new node in the organogram. And certainly, the decision to use anaerobic digestion as a treatment for organic waste represents a new kind of approach. PCs now understand that their work will include optimisation, management, and budgeting of collection and transportation; and for this their reliance on innovation by private enterprises is important.

Communication interventions are robust, and this part of the NSP has touched many stakeholders. Private sector wants to learn about technology from Europe and get technical assistance to understand how to apply it and what are the earning models in China. But the business sector third parties have flagged the problem that they have nowhere to go with their interest, because of the delays in re-starting the CCER system. Interestingly, there is an exception in terms of LanZhou, which has a Clean Development Mechanism (CDM) project and can demonstrate that there is a real interest in climate finance.

To conclude, at mid-term, Output 5 has been achieved. Many NSP stakeholders and Third parties confirmed that the NSP has strengthened the interest of entrepreneurs and businesses in the existing service market of the Chinese waste sector - that is, in activities where the government is the payer and private shareholder-owned businesses can take more active roles in the traditional models of PPP and BOT. Therefore private businesses are on track to help local governments shift their budgets to be able to cover waste sorting and support energy recovery from food waste via anaerobic digestion, with two types of sources mentioning that the project has given cities the idea that there are climate and operational gains to be made by separate management of kitchen waste. Particularly a third party representing a private company located in the area of Bengbu was very enthusiastic about the new opportunities to build anaerobic digestion projects, use restaurant or kitchen waste to produce fertilizer and soil amendments, and generate electricity from their biogas, as well as their fertilizers for soil remediation. He indicated that in his part of the country there is not

so much innovation and that therefore the opportunity to learn from nearby Bengbu, the "least advanced" pilot city, provides extra value for him as an entrepreneur.

But no evidence emerged that businesses have taken steps to engage in climate finance, nor that the private financial sector has been reached by the project activities nor engaged in the NSP up to this point. The interview results gave the idea that this was related to the delays in re-opening the CCER, but there is also a possibility that it is simply too early in the project or that the delays related to the financial aspects of IWM have played a role.

The looming risk looking towards the ability of Output 5 to translate into Intermediate Outcome 5 in Figure 3, is that, without a functioning CCER regime in the China Emission Trading System (CN ETS), there will be not enough buy-in by the private financial sector to invest in IWM (see more details in Section 4). If the NSP can be extended, there are strong indications that intermediate outcomes and impacts in this area will be achieved.

Output 5 is coloured green at the output level because the activities promised in the project have been reported as completed and from the interviews, but whether it is green at the end of the project is completely dependent on the CCER system under MEE becoming operational. And while it appears that the NSP team has important influence at MOHURD, the decisions of MEE and what happens with the CCER have to be considered to be outside of the control of the NSP, which could turn the outcomes and impacts to red.

4.2.6 How external factors affected the NSP's effectiveness to achieve its outputs at Mid-term

Two main external factors have negatively affected the NSP's effectiveness in achieving outputs at mid-term. These are:

- COVID-19-related restrictions on international travel **to China** for the European members of the TA teams and **from China** for study visits in Europe, and
- The institutional shift in the early years of the NSP, of the CCER program from NDRC to MEE, which resulted in the programme not being open for applications for most of the period that the NSP has operated.

Negative impacts of COVID-19

The first impact of COVID-19 has been a **restriction of international travel to China.** This has caused a delay in the international TA Team 2 being able to deliver city-specific IWM strategies for the five PCs. This means that their transition to IWM has been vigorous but partial. This affected all aspects of the NSP, including strategy for bringing European ideas and technology to Chinese cities and experts and Technical Assistance to pilot cities. International experts of Consortium 2 could not visit demonstration cities. Restrictions related to COVID-19 delayed the NSP implementation schedule in relation to the specific role of the international experts, and especially the TA Team 2 (TA2).

COVID-19 travel restrictions in Europe meant that the International TA2 experts could neither directly visit cities nor deliver technical assistance in the way it was foreseen in the proposal. The main consequence of this is that the five PCs have been developing IWM based on an incomplete understanding of the governance impacts and the importance of an IWM strategy. Currently, this

activity is being planned for 2021, but it is still to some extent dependent on the potential for international experts to travel. In the Validation Workshop, the NSP Team indicated that they are on track to adjust the strategy for completing the IWM experience in the PCs.

COVID-19 also resulted in Chinese national policies that prevent Chinese nationals from travelling abroad. National government policy at the current time -and for most of 2020- has forbidden public officials, academics, or other Chinese experts to go abroad, and even for private companies, permission to travel is still quite difficult. The NSP team is reconsidering their strategy for exposing Chinese stakeholders to leading examples of European implementation of IWM systems. Outside of the issue with TA2, physical events, and the study visits to Europe, the negative impacts of the COVID-19 pandemic have remained limited.

The NSP team was able to compensate for other COVID-19 related factors, as staff become more fluent with online meetings and events. Now that there are no internal restrictions in China, physical events are again possible and the NSP team is rapidly making up for the lost time.

Positive impact of COVID-19

Digital dexterity and reliance on social media associated with the COVID-19 pandemic had a positive impact on the ability of the NSP to get the messages out and attract interest in the project, especially in the business sector.

Unavailability of the CCER system

The third external factor that is projected to affect the outputs at a later stage in the project, as well as the likelihood to achieve the intended NSP outcomes and impacts, is the postponement of the launch of the nationwide China ETS and, with it, the opening of the CCER market, which has not taken applications since it moved from NDRC to MEE in 2018. As a result, neither PCs nor private companies could apply for or test the mechanism of CCERs. The projected success of both **end of project** Output 3 (MRV system) and **end of project** Output 5 (engagement of the private sector) may turn out to have been affected by this factor *even though the outputs at mid-term have clearly been achieved*. Particularly, the ELE team signals the risk that at the end of the NSP, Output and Outcome 5 may turn out (in retrospect) not to have been achieved. For this reason, Figure 6 in Section 5.1 shows, for Outputs 3 and 5, that looking forward from mid-term, there are risks that the interest of private business and financial stakeholders to invest in climate financing for IWM have not yet been proven, and thus remain to be tested.

4.3 Impact: Likelihood to achieve outcomes and impacts

Table 4. Evaluation Question 3: Likely Impact of the NSP Assessed at Mid-term

Evaluation Question	3. What evidence is there that the NSP is likely to contribute to the intended impact in the ToC (incl. transformational change), as well as any unintended or unexpected ones?
Summary	• The NSP is on track to contribute to transformational change in the solid waste sector, especially outputs and outcomes 1, 2, and 4, which focus on the IWM impacts of the physical waste management system, which will ultimately contribute to

	transformational changes in the GHG footprint of the sector, especially in terms of CO_2 and CH_4, the GHGs most closely associated with solid waste actions.
	• Even without the planned IWM strategies for the pilot cities, the NSP is on track but needs more time for the transformational change to work its way through the more complex and politically sensitive governance aspects of IWM, especially those of sound institutions 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
	• Transformational change concerning the solid waste system as a landscape in which reliable and predictable introduction of IWM as a stepping-stone to securing climate financing is less certain, as these depend on cross-sectoral and cross-landscape influences and effects which have not yet been shown to be robust. The likelihood that the NSP will succeed to make contributions that lead to outcomes 3 and 5, and impact 1, is, therefore, less likely.

The current ELE is occurring at mid-term in a situation where, as indicated in Section 4.2, some parts of the China IWM NSP are occurring in a timely way, and others are delayed due to COVID-19 restrictions and the unavailability for most of the project period of the CCER system of the CN ETS.

At the policy level, the NSP, the PCs, and the national policy-makers and planners are in a kind of virtuous circle, where their actions reinforce each other and support transformational modernisation via the IWM path to transform the facilities-based understanding of waste management to IWM. The most transformational aspects appear to be NSP-inspired changes in the way PCs understand, procure, finance, manage, measure, and report low-carbon solid waste performance, as the physical part of an IWM system.

The next project years are critical to whether these changes “reach and touch” pilot city solid waste institutions, budgeting, system auditing, reporting, and planning, that is, become a fully mature IWM system. The differences in the pilot cities -- including location, degree of experience with modern waste management, and the fact that LanZhou already has a CDM project operating -- will provide a rich variety of evidence on this point. There is evidence that all of the pilot cities are on a path to achieve the intended impact and benefits of fully functional IWM systems in Chinese cities, including financial, institutional, and governance benefits. Whether they reach their destination depends on what happens in the remaining years of the project.

The achievement of transformational change as proposed in the NSP ToC will be greatly increased by the granting of a two-year budget-neutral extension to the China IWM NSP team; such an extension is expected to transform the RAG score of amber at mid-term, to green at project completion. **The NSP is on a path to create transformational change in both the solid waste and the climate change landscapes, that can deeply affect the impact on GHG emissions of processes of modernisation of the Chinese waste sector.** The ELE team sees evidence that the realisation of the potential for transformational change towards a low-carbon waste sector is within reach. The evidence for this comes from the interviews with the PCs, who are very enthusiastic about the NSP and about the positive changes it has made.

The NSP has leveraged an impressive number of physical system changes in the five pilot cities, many involving private investment and new technical approaches. Even with delays in the governance system, the presence and contribution of these facilities will anchor the diversification

of the waste sector and its move to more inclusive and diverse approaches, many of which rely on citizen participation. The amount of public investments attributable to the technical support by the NSP in 2019 (direct GHG emission reductions) is calculated based on the following facilities:

- newly-built agricultural market waste treatment stations (Suzhou) – approx. EUR 3.9 million per year (25 stations; CNY 1 million to 1,5 million per station of public investments under PPP model; 1-3 years contracts including service and treatment);
- Qizishan landfill power generation plant (Suzhou) – to be further clarified;
- WTE facility (Taian) – approx. EUR 13.7 million per year (PPP; private partner covered the whole cost of the facility; the government pays waste treatment subsidy (60 CNY per ton of waste) and buys electricity (ca. CNY 180-200 per ton of waste));
- Organic waste treatment station in Anning district (Lanzhou) – approx. EUR 2.3 million per year (PPP; 3 years contract; payment by the government covers waste collection service (smart bins) and waste treatment).

By city, the facilities directly attributable to the project that were launched and reported upon in the Annual Report 2019 include:

Suzhou

- Restaurant Waste Treatment Plant in Industrial Park (400 t/d)
- Restaurant Waste Treatment Plant in Gaoxin District - pilot phase (300 t/d)
- Qizishan landfill power generation plant (6MW; direct technical support by the NSP)
- Small-scale biological waste treatment facilities at agricultural farmer markets (direct technical support by the NSP)

Lanzhou

- Organic waste treatment station in Anning district (20 t/d; direct technical support by the NSP)
- Emergency landfill - under construction

Xi'an

- Restaurant Waste Treatment Plant (220 t/d)
- WTE plant in Gaoling district – pilot phase (2250 t/d)
- WTE plant in Lantian district – pilot phase (2250 t/d)

Taian

- Phase II of the WTE facility (direct technical support by the NSP)

Bengbu

- WTE plant (1210 t/d)
- Large MSW transfer centre in Bengshan district

These investments (and the management and monitoring improvements that operating them imply) convincingly predict the achievement of Intermediate Outcomes 1, 2, and 4, as well as the overall Project Outcome, and Impact 2 as shown in the ToC in Figure 3, that is, the outcomes and impacts that relate to improving the functioning and performance of solid waste systems through

implementation of the IWM approach. In this sense, the lack of strategies has not reduced the direct project results.

At the same time, whether the NSP can achieve its ambitions depends on the next phases of implementation of IWM in the five current PCs, as well as in the project's success in the expansion to 11 more cities, and via policy and standards, to all Chinese cities. Specifically, there is an urgency for the NSP to expand the understanding of IWM and to take on the challenges of waste governance, institutional coherence, and financial modernisation of the waste sector. Ideas such as activity-based budgeting, full-cost accounting, inclusivity, sound institutions and risk analysis are critical. Following is a short explanation of how these concepts are used in IWM in the solid waste sector, again following the experience of the two international ELE team members.

- **Full-cost accounting** falls under the financial sustainability (governance) aspects of IWM, and has not yet been mentioned by any stakeholder interviewed. The "full" "in full-cost" means that in addition to reporting on both direct and indirect costs, a city (or company) accounts for and reports upon the *financial* value of negative and positive externalities of all parts of the solid waste system . A key element of full-cost accounting is *the costs of inaction*, a concept that is well-explained in the 2015 document *Global Waste Management Outlook* (also a good source for ISWM and the WasteAware Indicators used in the NSP proposal). Full-cost accounting was neither encountered nor mentioned in the interviews with any of the pilot cities. Nor is it specifically mentioned in the NSP proposal or as a subject of training and capacity activities in the NSP. When asked, NSP staff did indicate that this is the type of intervention that they are expecting to do in the coming years, with support of TA Team 2.
- **The inclusivity aspects of ISWM** are split into user inclusivity and provider inclusivity. **Including users** means that the citizens and businesses using the system are invited to participate in planning and decision-making processes so that they have a say in what it does and how much they can afford to pay for it -- and also that they have access to information and training (as the NSP is providing). **Provider inclusivity** means the same for the shareholder-owned and state-owned companies who provide the facilities and the services. And it also means bringing the private recycling sector -- operating in all Chinese cities but considered to be commercial parties, and not part of the solid waste system -- into the institutional landscape of waste management in a formal way.
- **Activity-based costing** is another part of financial sustainability and is closely related to **institutional consolidation**. At its most simple, it means that a municipality budgets at a high level of detail with separate accounting, for example, for the costs of vehicles, personnel and fuel for other waste collection routes, for amortised capital costs of facilities or vehicles, for separate collection of kitchen waste or recyclables, etc. This allows for shifting of budgets to adjust performance, for example, when kitchen waste is diverted away from an incinerator to an anaerobic digestion (AD) facility, there should be a change in the budget for collection, but there will also be a change in the cost of operations of both the incinerator and the AD, and there may also be a good reason to shut one down or decide to take extra waste from somewhere else.
- **Sound institutions** and the term **institutional consolidation** is both a prescription and a description of a common IWM process, which creates a focused and clearly labelled solid waste and recycling, or materials management, division or department instead of a more dispersed collection of activities falling under different departments and different nodes in the

organigram. Activity-based costing, for example, is very complex across institutions when the people are in the Department of Human Resources and the vehicles in the Department of Transportation and the facilities in the Department of Infrastructure. It becomes much easier and more effective when the personnel, vehicles, infrastructure, planners, legal experts, and finance are all included in a single solid waste institution.

- **Risk analysis or risk-based decision-making** is often contrasted with **harm-based decision-making.** The decision in a risk analysis setting is based on an assessment of risk that says: *yes, we do this and calculate the risk that it will go wrong, and if that risk is small enough, we go ahead and deal with the risk if it occurs.* Harm-based decision-making says: the negative effects are so certain that we have to assume that they will occur, and compensate for the consequences. In the information that we have received about the China waste sector, the harm-based impact of landfilling is that it is certain to take a large amount of land area, nearby cities, and bring a large exposure of waste with it, so it has to be minimised. The preference for incineration is because incineration has a risk of air pollution and hazardous residues but there are measures to mitigate the risks and their impacts, making incineration preferable to landfilling in Chinese policy.

Attention is also needed to accommodate the project to the developments in the next years in terms of CCER and the availability of real climate finance options for the business and financial sectors.

NSP has certainly developed both the capacity, experience, network, reputation and policy reach to achieve these, but there is a need for more time. **For the NSP to succeed, it needs more time, particularly as we see, in the winter of 2020, that COVID-19 infection rates in China and Europe are rising, so that the possibility of travel remains uncertain.**

However**, anticipating intermediate outcome 5, there is a looming threat of a break in the causal chain especially concerning the financial sector, because the business models related to climate finance via the CCER system are not** yet available and so direct investment of private capital in IWM systems and the waste sector remains a likely but unconfirmed and unproven activity for the coming years.

4.4 Efficiency

Table 5. Evaluation Question 3: Efficiency of the NSP

Evaluation Question	3. To what extent is the relationship between inputs and outputs timely and to expected quality standards?
Summary	• Most inputs are occurring on time and completely in line with the proposal and the planning, but two of the critical outputs, related to climate financing on the one hand, and MRV measurement of climate impact changes in cities on the other, are delayed. • Since these delays are largely attributable to external circumstances, it seems fair to say that the NSP is doing its work efficiently, and in a timely way. • The high-quality standards are not proven at output level and depend on the expanded implementation of IWM beyond the physical system.

All of the evidence suggests that the efficiency of the NSP has been high and that delays in delivering two of the critical outputs, related to climate financing, on the one hand, access to the CCER system, are based on external circumstances beyond the control of the NSP team.

There is recognition for and understanding of the fact that "software" of IWM is lagging behind the changes in the physical system: the project has not yet touched the governance issues of financial or institutional consolidation, which indicates a need for intensifying the TA and consultation in the PCs. However, the NSP team and many NSP stakeholders noted that the coming years will have a focus on the governance aspects, including IWM budgeting and institutions and policies.

It appears that the COVID-related impacts have been minimised by a rapid shift to digitalised communications. Indeed, the effectiveness and high-quality standards of project communication, training, information sharing, and site visits have been broadly reported in interviews in all categories, reports, and presentations. However, the NSP still has not fully replaced its strategy based on international seminars and study tours for capacity building. This could be an issue as COVID-19 cases are raising and there is an increasing likelihood of longer-term travel restrictions between Europe and China.

The green score here is dependent on the success of the NSP to secure permission for a substantial extension of time to overcome the associated delays and to achieve the expected level of quality of the two outputs most affected by external circumstances. Many interviewees and reports confirmed that more time is needed for various parts of the NSP that are not yet complete, activities have had to be postponed, and more time is needed. Also, third-parties reiterated their support for having the project period extended. When asked, the NSP staff indicated that they believe that such an extension would be possible without asking for additional budget, since COVID-related delays have meant that they are behind in planned spending.

4.5 Sustainability

Table 6. Evaluation Question 5: Sustainability of NSP Outcomes

ELE question	5. What is the likelihood that the outcomes will be sustained after the end of the NSP funding period?
Summary	• The main conditions for the NSP to be sustainable rest with the ability to access CCER financing, involve the private and financial sectors and complete the IWM-related governance system modernisation that is just starting. • For three of the five outputs, the likelihood of being achieved at the outcome level, and of sustained beyond the NSP period is extremely high. • Key sustainability risks lie, to some extent, in the NSP success in terms of physical system efficiency at the output level. First, there is a risk that cities seeking to replicate the experiences of the five PCs will only focus on the "narrow" physical system gains. Secondly, without clear examples of monitoring, 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 will be stifled by an over-investment and resulting over-capacity for incinerators.

IWM has proved to be robust and sustainable in virtually all high-income countries since it emerged as a dominant modernisation model in the period between 1985 and 1995, and there is every reason to think that this will also be the case in China. The project benefits from strong and significant tailwinds and has already achieved a great deal, that stakeholders - and especially the cities -see to be helpful. The involvement of CAUES in the project follows also the experiences of Germany, the

Netherlands, the UK, and key Scandinavian and North American countries, in creating a community of practice and a knowledge base to develop and disseminate IWM.

For three of the five outcomes, the likelihood of being sustained beyond the NSP period is extremely high. A range of reasons given by the stakeholders interviewed support this conclusion, including the high level of co-ordination with policymaking and the preparation of the 14th FYP at the national level, the work of CAUES on standards for IWM and its new physical system, the involvement of share-holder-owned private companies in PPP and BOT relationships with Chinese cities, and the strong and successful outreach via a range of events, training and training of trainers (ToTs), meetings, and social media activities. The fact that the project has given "hands and feet" to the national targets for source separation means that it is anchored in policy and practice.

Some key sustainability risks lie, to some extent, in the NSP success in terms of physical system efficiency. First, there is a risk that cities seeking to replicate the experiences of the five PCs will only focus on the "narrow" physical system gains, rather than the overall IWM strategies and governance aspects, which have been delayed in the project activities and outputs. The second danger is that without clear examples of monitoring, 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 will be stifled by an over-investment and resulting over-capacity for incinerators that have been designed and dimensioned before the gains of the project in *breaking the disposal monopoly.*

For this reason, the sustainability is - at mid-term - coloured amber, with the expectation that, if the NSP is able to reintegrate the strategic planning process in the cities, and get the financial and governance components of IWM working, this would turn to a "green" at project end.

4.6 Learnings

The main learnings relate to the importance of a systems approach to solid waste modernisation, a lesson that is transferable to other domains and so also to other NSPs. The specific transferability is at this moment limited, because the China IWM NSP is, to date, one of only two operational NSP's (and one in the pipeline) looking specifically at the waste sector. It is to be hoped that the learning here will stimulate other projects as well.

An important lesson is that working on climate finance and climate-friendly development in other sectors than directly in energy, is possible but complex. Such "dual-landscape" NSP support projects require coordinated action from governmental agencies who may not be accountable to each other, and this can complicate and delay coordination and threaten outcomes that depend on cross-sectoral coordination.

Moreover, in a project like the NSP, where changes in the waste landscape should produce a measurable change in emissions that qualify for climate financing that must attract new business interest, there are multiple types of relations and causality, and the causal paths are not easy to identify or follow and prediction is problematic. In such complex projects, the value of case-based working is high, because work across landscapes is possible in a much more direct way at the city level than at the national level. And we can see this in the NSP, where major progress of the NSP up to now has been in the pilot cities in the waste sector itself. The outcomes which are threatened are those which depend on multi-sectoral co-ordination: achieving climate finance for IWM-based waste

modernisation and thereby attracting financial sector stakeholders. It is quite amazing that so much of this NSP is functioning well despite its complexity.

Another lesson is that using a project to leverage structural change within a sector requires different tools than changing technologies or introducing BAT or BEP physical systems. This lesson suggests that it is not only due to COVID that cities were able to make rapid changes in technological and in their physical systems based on the project design and some contact with European TA teams, but that addressing the governance aspects has taken longer and has required (and not yet received) the extra intervention of a city plan and strategy. Institutional change is more difficult and less likely to occur in the short or even middle term. But it is precisely this institutional strengthening and reform that are the vehicles for institutionalising and anchoring physical system change.

To summarise, leveraging structural reduction of emissions in the waste sector is really transformational, and transformational change is more than a question of better and more diverse facilities, and also attracting new private sector entrants as operators or financiers. The transformational change that has been made at the output level can be described as breaking the disposal monopoly, showing cities, CAUES, NSP team members and national policymakers that there is a deeper version of zero harm waste management that reduces CO_2 emissions and improves efficiency. The NSP team needs more time to be able to do justice to the institutionalisation process that can anchor the learning, and support the young, tender, but clearly present virtuous circle of mutually reinforcing learning between national and city government, between state-owned and shareholder-owned companies, and between the NSP team and ministries, and even between public officials and citizens.

5 Conclusions

This section goes back to the NSP Theory of Change to assess the extent to which the project has achieved the outputs predicted and designed into the project, based on the original causal pathways and assumptions.

5.1 RAG analysis of causal pathways

Figure 5. Overview of NSP causal pathways assessment with RAG colour rating

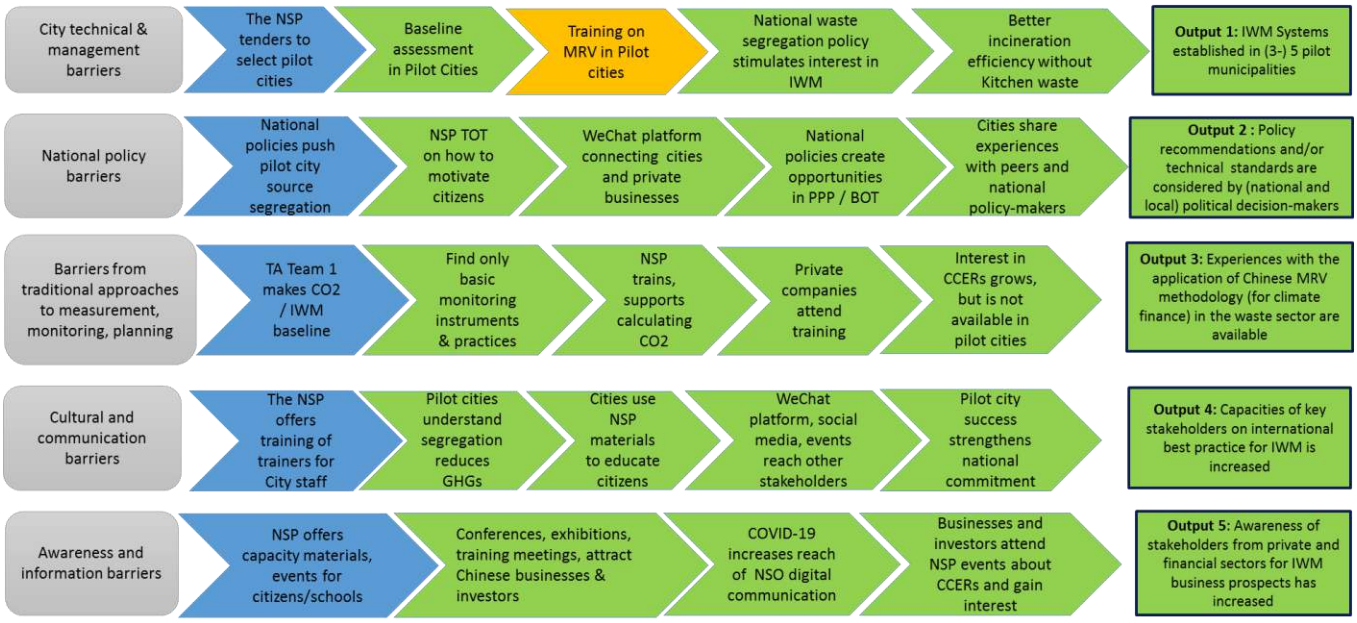
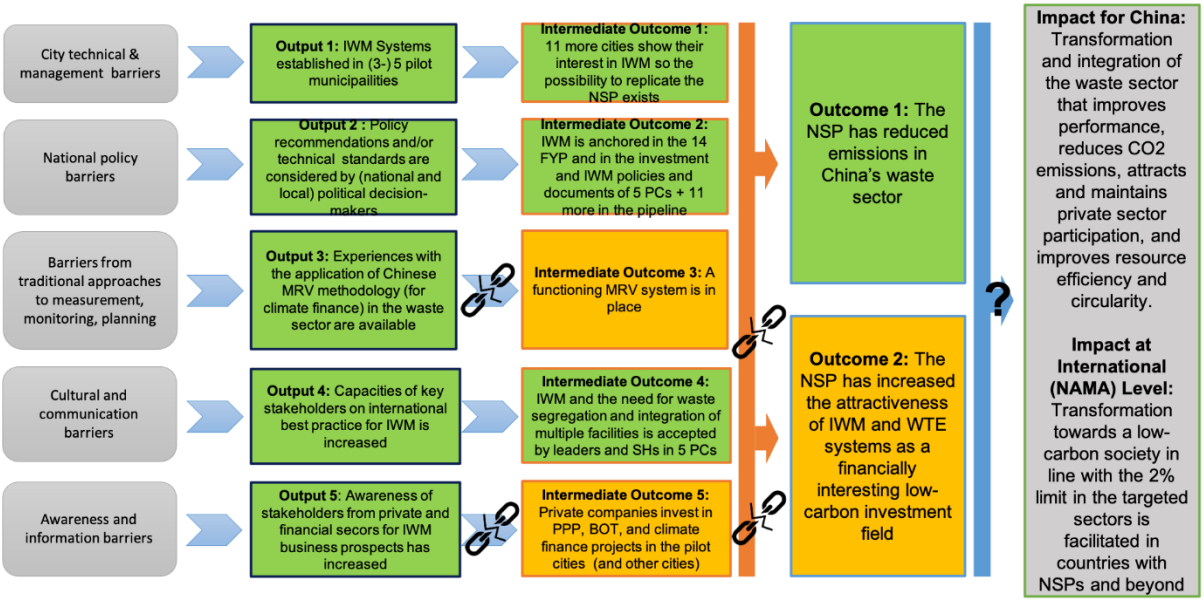


Figure 5 presents an overview of the progress of the NSP along its ToC causal pathways towards its planned outputs, because at mid-term - and with delays due to COVID-19 and to the availability of the CCER system - it is too early to assess outcomes or impacts.

The RAG rating uses the same scale as the previous section (i.e. Good / Very Good = Green; Delays or risks = Amber; Outcomes at risk = Red) and the colours of the shapes are the same colours used in Section 4.1 to rate the NSP's achievements for each output. This is to be read as an assessment of the NSP's situation at mid-term.

Figure 6. Results chain RAG looking forward to Outcomes and Impacts



Although the ELE Team's assessment of the ToC causal chain at the output level is overall green, there are indications that intermediate Outcomes 3 and 5 are threatened by external circumstances. For this reason, the ELE team has included an additional RAG diagram, shown in Figure 6, that projects forward potential risks to the NSP causal chain towards the outcomes and impact.

Output 3 was achieved and is shown in green in Figure 5 because the experiences of MRV are available in all five PCs. However, as Figure 6 shows, the causal chain is at risk to be broken beyond it -at the impact level - because the MRV related outputs are only a stepping-stone on the way to documenting emissions reductions, which is necessary so that the cities can apply for CCERs, which in turn depend upon the CCER system working. Specifically, the PCs have oriented to the MRV methodology and are aware of it, but this has not had the intended outcome of producing business and financial sector interest in or applications to the CCER programme, simply because the programme is not open for applications yet. There is evidence that they could become interested, in terms of the fact that Lanzhou has a Clean Development Mechanism (CDM) project still operating.

Output 5 is similarly positioned in that the output level has been achieved, but there is a probable broken causal link moving towards intermediate outcome, outcome and impact in terms of private and financial sector actions to invest in climate finance. This is again due to the fact that the CCER programme is not open.

There is a second problem with the probability that a green Output 5 will lead to its intended outcomes. The PCs have been learning about and implementing a reduced version of IWM, which focuses only on the physical system. Outcome 5 and the project impacts depend upon the willingness and interest of the private financial and business sectors to invest in and participate in new climate finance models, and the specific climate finance facility that the NSP has specified is the CCER. But the functioning of the CCER is delayed at National level.

It is important to note that there is a question mark in Figure 6, indicating uncertainty as to whether the impacts are within reach based on current indications. The two most important contributions to

this uncertainty are first, whether the CCER programme will be open to projects in the waste sector, and secondly, whether the NSP can get an extension of time.

Moreover as mentioned earlier, IWM implementation has been focused on diversifying facilities and *breaking the disposal monopoly*, and the associated governance system reforms and innovations in financial systems, inclusivity and institutional coherence, that characterise the IWM experience in Europe and North America, are delayed. And when the NSP team talks about financial reforms, they are restricting their framing to the category of interventions called *user-pay systems,* and specifically an approach called *Pay as you Throw* (PAYT) which was pioneered in the USA and is popular outside Europe. PAYT is a "small" version of IWM financial sustainability, and the NSP would do better to look at more fundamental reforms in the financing, budgeting, procurement, planning, and institutional landscapes are precisely the changes that would be most likely to result in significant mobilisation of private capital over the longer term, and they are also the main ingredients of long-term transformational change.

The risks shown in Figure 6 represent a very strong justification for extending the NSP project for two additional years, to allow time for the NSP team to work with the cities to re-adjust planning for the TA2 to deliver IWM strategies for the cities, and to allow more time for the CCER system to be open and to potentially consider applications from the NSP.

5.2 Formal Tests of Process Tracing

As of last in the analysis of the evidence, the ELE team used the formal tool of process tracing as an additional test to check the validity of the NSP ToC and assess the strength of the evidence collected by the ELE. Process tracing is an evaluation method that applies formal tests to the evidence to assess the causality between the initial hypotheses and what is actually observed. Annex D illustrates the results of applying the process tracing formal tests to the causal pathways of the NSP ToC.

The overall conclusion of the process tracing is that the process causality in the NSP is highly complex; the hypotheses of the NSP have been well-designed but have multiple conditionalities and causalities, which make the project vulnerable, as well as making it quite difficult to trace the processes formally.

All key outputs have been achieved but the complexity of the causality means that outcomes and impacts may be at risk, in part due to external circumstances. The risk and external circumstance of the COVID-19 pandemic -- and the nearly complete cessation of international travel that has resulted from it -- could hardly have been anticipated as a risk, and the NSP is doing the best they can in an unprecedented time, and achieving important results.

In contrast, the risk that the CCER system would not function falls more clearly within the project-related circumstances. It suggests that the NSP proposal may have taken too narrow a definition of "national policy-makers" and did not look sufficiently at institutional risks at the national level.

5.3 Conclusion

The overall conclusion is that the NSP is reaching the outputs in all areas under its direct control, but that the ability to achieve outcomes and impacts is under pressure from two sets of external circumstances: COVID-19 travel restrictions, completely external to the NSP, and the uncertainty about the CCER scheme, external to the solid waste landscape, but part of the energy and climate finance landscape. The work with the cities is robust and the NSP is working on adjusting their approach to ensure that the city strategies are produced and IWM governance aspects are introduced and supported. The issues of availability of climate financing in the way that the NSP proposal have envisioned require more attention and quite a lot of "managing up" to remove barriers at the national level. The coming years will be critical to achieving the goals.

6 Lessons and recommendations

6.1 Lessons on the introduction of IWM in China

The evidence gathered during the ELE, along with the key findings presented in Section 4 and the conclusions in Section 5, has been used by the ELE Team to elaborate the lessons below. These are presented here:

1. **Expanding the idea of "zero harm" (Chinese re-translation to English of the Chinese term "sound environmental management") to include materials recovery and low-carbon development is crucial to break the disposal monopoly and shift to IWM.** Before the NSP, policies for good solid waste practice focused on environmentally sound final treatment, or "zero harm" waste management. But this concept of "harm" was narrow and related to observable physical consequences. It did not include the idea that waste-related GHG emissions or the loss of resources through the combustion of organic waste and recyclables were also forms of "harm". So a main consequence of the NSP is that the idea of "harm" has been expanded, and the idea of "zero-harm" is now based (at least in the five PCs) on IWM concepts, including the criteria of segregation of waste, management of separate streams in different ways, and low-carbon development. In summary, the NSP has shown the PCs and Chinese policymakers that *disposal with or without energy recovery is not enough for zero-harm waste management. Materials recovery and low-carbon development are also critical aspects of a modern IWM system.* In this sense, one key lesson of the NSP -- perhaps the most significant one -- is that *it is necessary to break the disposal monopoly,* and the NSP has contributed to doing this in the pilot cities.
2. **Policies on waste segregation and diversification of treatment by material streams are key precursors of IWM systems, but they do not represent an IWM strategy.** In advancing towards diversifying the waste treatment mix, and proving the feasibility of segregation and optimisation, the NSP has supported the pilot cities (and city staff, contractors, institutions, citizens and businesses) to advance along the path to IWM. In this, the NSP has helped cities and businesses (and citizens) to understand that segregation is more than a personal environmental action, it is a technical necessity in the new IWM system and essential to its success in managing waste and reducing GHG emissions. They have done this in alignment with national policies for waste segregation to achieve no-harm, low-carbon, efficient, and environmentally responsible waste management systems. Yet, both the NSP and the PCs have, at mid-term, only a partial understanding of the importance and benefits of implementing IWM, and this is because they are responding to alternative policy drivers, such as the availability of climate financing and a national priority to involve new stakeholders from the private and financial sectors in the solid waste sector.
3. **At the output level, this approach to IWM as policy-driven and donor-financed has been producing important results, but it will probably not be sufficient to achieve intermediate or final outcomes, nor to have long-term impacts and sustainability.** Pilot cities are diversifying their waste infrastructure, managing by type and characteristic of different waste streams, and investing in more targeted collection and treatment, especially for kitchen waste. They have also

learned to use the MRV approach to measure GHG emissions associated with the waste system, and to consider the GHG impacts of waste management to be an important addition to the criteria of "no harm" waste management. This has produced insights that redirecting kitchen waste and other organics to specific treatment facilities also increases the efficiency and energy production of incinerators, while at the same time reducing the need for incinerator capacity. These types of cross-facility impacts are key to realising the system benefits of IWM, as well as to understanding that IWM is a system, and not limited to the construction of facilities. As the idea of waste is changing, Chinese waste managers in the pilot cities start to appreciate the complexity and value of the many materials in waste. This is gradually introducing the idea, at management level, of the importance of a more complete understanding of IWM, one that would include multiple management, governance, and institutional levels, in addition to the diversification of waste treatment facilities. Indeed, reforms in management, governance, and finance are necessary for the transformational change in the waste sector that the project has as its ambition. The early evidence for this is to be found in the ways that cities are starting to analyse their incineration capacity, given that kitchen waste is being diverted to special facilities as well as some of the questions that stakeholders are asking.

4. **A more complete understanding of IWM, represented by city-specific IWM strategies linking governance, finance, procurement, institutional coherence, and inclusivity is necessary to move from project outputs to outcomes and impacts.** For example, as pilot cities receive training and learn to analyse the performance of their institutions, shift budget lines and activities, and procure new types of services, they are likely to gain an expanded understanding of the benefits to be gained by working more closely with the private sector, in new relationships, including with the private recycling sector. The city-specific strategies, therefore, look quite essential to achieving outputs and impacts.
5. **Although it is possible to advance to a certain extent on the path towards IWM physical system changes without a clear IWM strategy, long-term success requires more**. Going through the planning and participatory effort of developing an IWM strategy with clear goals, targets and a set of actions would substantially increase the likelihood that the shift towards IWM is complete in all its forms. And this completeness would enhance the enabling conditions for institutionalisation and anchoring of IWM and full adoption of IWM Governance, which in turn is critical for the long-term success of climate-friendly integrated waste management
6. **Putting an IWM system - even an incomplete one - into place in Chinese cities begins to create similar dynamics to those in high-income countries inventing IWM in the 1980s.** For example, an additional development that can be attributed to the NSP is that it has socialised the idea of waste prevention. Stakeholders and policymakers in China begin to consider waste prevention, re-use, repair, and second-hand trade (shown in the hierarchy as being part of the "no harm" concept of good environmental management) and are learning that waste prevention and minimisation can have even more positive impacts than improving waste treatment. But while this is very interesting, it is not clear how this would be measured, and at the moment climate financing does not reward these policy goals because they are not measurable.

6.2 Lessons on Complex Dual-Landscape Climate Finance Projects

The main learnings relate to the importance of a systems approach to solid waste modernisation, a lesson that is transferable to other domains and so also to other NSPs. This is highly relevant for two other NSPs that look at climate impacts of the waste sector: the NSP in India which entered implementation last year, and NSP in Mozambique which is still in the Detailed Preparation Phase. It is to be hoped that the learning here will stimulate other projects as well.

An important lesson is that working on climate finance and climate-friendly development in other sectors than directly in energy, is possible but complex. Such "dual-landscape" NSP support projects require coordinated action from governmental agencies who may not be accountable to each other, and this can complicate and delay coordination and threaten outcomes that depend on cross-sectoral coordination.

Moreover, in a project like the NSP, where changes in the waste landscape should produce a measurable change in emissions that qualify for climate financing that must attract new business interest, there are multiple types of relations and causality, and the causal paths are not easy to identify or follow and prediction is problematic. In such complex projects, the value of case-based working is high, because work across landscapes is possible in a much more direct way at the city level than at the national level. And we can see this in the NSP, where major progress of the NSP up to now has been in the pilot cities in the waste sector itself. The outcomes which are threatened are those which depend on multi-sectoral co-ordination: achieving climate finance for IWM-based waste modernisation and thereby attracting financial sector stakeholders. It is quite amazing that so much of this NSP is functioning well despite its complexity.

Another lesson is that using a project to leverage structural change within a sector requires different tools than changing technologies or introducing BAT or BEP physical systems. This lesson suggests that it is not only due to COVID that cities were able to make rapid changes in technological and in their physical systems based on the project design and some contact with European TA teams, but that addressing the governance aspects has taken longer and has required (and not yet received) the extra intervention of a city plan and strategy. Institutional change is more difficult and less likely to occur in the short or even middle term. But it is precisely this institutional strengthening and reform that are the vehicles for institutionalising and anchoring physical system change.

To summarise, an additional lesson is that leveraging structural reduction of emissions in the waste sector is really transformational, and transformational change is more than a question of better and more diverse facilities, and also attracting new private sector entrants as operators or financiers. The transformational change that has been made at the output level can be described as breaking the disposal monopoly, showing cities and CAUES and NSP team members and national policymakers that there is a deeper version of zero harm waste management that reduces CO_2 emissions and improves efficiency. The NSP team needs more time to be able to do justice to the institutionalisation process that can anchor the learning, and support the young, tender, but clearly present virtuous circle of mutually reinforcing learning between national and city government, between state-owned and shareholder-owned companies, and between the NSP team and ministries, and even between public officials and citizens.

6.3 Recommendations

The recommendations that flow from the lessons were discussed in the Validation Workshop and have been refined in additional discussions within the ELE and NSP teams.

Table 7. Recommendations

Lessons	Recommendations
RELEVANCE	• Put maximum effort into re-thinking and restoring TA assistance team to develop full IWM strategies, including governance, finance and institutional aspects and 20-year projections of quantity, composition, and GHG impacts. • Put more focus on developing publications for Chinese cities (outside of the PCs) on the broad interpretation of IWM, including references to existing articles and books in the international solid waste literature on planning, scientific research on emissions and solid waste system performance and governance. • Commission or agree to co-finance translation to Chinese of key articles and books on IWM in European languages. This provides a deeper level of information to anchor the NSP experience. • Stimulate virtual city twinning and horizontal information exchange between Chinese cities and European cities, at least as long as COVID travel restrictions are in place. CAUES is the Chinese national member of the International Solid Waste Association, which has a project on circular and low carbon cities, that could be interesting for Chinese Zero Waste cities and also for the PCs. • Share the results of MRV monitoring of GHG emissions in the solid waste sector in the PCs more broadly with other Chinese cities, building on the positive experiences with horizontal information exchange in the NSP. • Put more emphasis on the links between waste management and climate change and bring the discussion and dissemination forward in conferences, training, and publications, because the cities have needs and motivation about climate action and are looking for information. • Strengthen lines of communication between the NSP and MOHURD and MEE, so that the CCER scheme and the NSP are coherent with each other.
EFFICIENCY	• Develop training and support materials for cities and potential new private and financial sector partners (also internationals investing in China) that could make use of a variety of climate and green finance funds, not only CCER. For example, some climate finance may be possible from other MEE initiatives, with a focus on reducing methane by improving landfills and implementation of AD and GHG sinks. • Fast-track the activity of preparing IWM strategies in the 5 PCs and at the same time include additional cities in an activity to prepare IWM strategies. One approach would be to shift this activity from the international TA team to CAUES and support it from the International Solid Waste Association, of which CAUES is the Chinese national member. • Explore the use of compost to sequester CO_2 in soils and work with MEE to include this in the CCER system. • In the coming private and financial sector IWM activities, intensify those to organise business demo tours to pilot cities, and develop data for investment and operations – the tool has proven to be useful to policymaker and private sector.
EFFECTIVENESS	• Stimulate research and publications about the improvements in and climate benefits of diverting kitchen waste and organics away from incinerators to AD and composting. • Stimulate research in China and the translation of international research results on the benefits of sequestration of CO_2 in soils enriched with compost and fertilizer from AD sludges. • Move on the intention to pilot Pay as You Throw (PAYT) in the PCs, as the "edge of the wedge" of discussing IWM sustainable financing in cities. • Develop more activities monitoring the specific impacts of diversification, including scientific articles about its impacts. For example, the IWM approach raises questions on

	the place of incineration in an IWM system, and research on its impacts on efficiency and energy generation of existing incinerators could be useful.
IMPACT	• Research and establish a GHG emissions reduction model for the recycling sector and private enterprises to be included in CCER. • Research the efficiency, effectiveness and impact of the private recycling sector in the PCs (and in general), and model potential gains from formalising and integrating the informal recycling activities and monitoring them with MRV. • Work more closely with recycling enterprises, as part of inclusive IWM governance that makes space for private sector participation in several ways. • Ask for an extension of the NSP for two years (see Section 6.3.1)
SUSTAINABILITY	• Strengthen the institutional position of CAUES as the long-term institutional home for capacity building, training, and IWM strategy preparation. • Link with 11 next stage cities in time for the TA2 to do a series of training on how to make an IWM Strategy and focus on Zero Waste/Zero Harm including CO_2 and other GHG aspects. • Talk to the 15 Chinese Zero Waste cities and link them to the project. • Expand the role of CAUES on producing standards for IWM.
LEARNINGS	• Work with CAUES to create an IWM Planning Guide tailored and adapted to Chinese circumstances – with some sections newly written and some translated from English and/or German. • Develop a line of shorter publications or internet-based training modules focusing not on substance, but methods: e.g. full-cost analysis, lifecycle assessment (LCA), activity-based costing, PAYT, waste characterisation and composition, UNFCCC-compliant MRV guidelines for the waste sector.

6.3.1 Recommendation for a two-year extension

The ELE results lead to one very important recommendation for the NSP, and several subsidiary ones, i.e. the need for a two-year budget-neutral extension.

The ELE team strongly recommends to the TSU to give this project substantially more time to achieve its significant and very useful ambitions. A two-year period appears necessary (and adequate) because there are still activities that have not been possible to conduct. These include producing targeted IWM strategies for each PC, which were limited by the COVID-19 pandemic restrictions. The development of the city-level IWM strategies will be crucial to shaping the PCs' IWM systems over evidence-based assumptions for the medium- and longer-term. In fact, the work of the TA2 is due to include the comparison of the current waste quantity and composition projected 20 years into the future, and the appropriate configuration of the "hardware of IWM", i.e. the WM facilities, the selected options based on BAT and BEP, and then look at what kind of elaboration is needed for the financial and legal aspects, inclusivity, institutional coherence, and long-term sustainability.

Furthermore, allowing for these analytical steps underpinning the PC IWM strategies to be fully completed, will mean that the replication and scale-up of the NSP outcomes can happen based on full pilot experiments, rather than partial ones.

Annex A Theory of Change of China IWM NSP and Underlying Assumptions

This ToC has represented an interpretation of the ToC in the proposal, created by the ELE team and presented at the Validation Workshop. After the workshop, it has been corrected by the ELE team in response to comments of the NSP Team as well as re-validated.

Figure 7. China IWM NSP ToC as elaborated by the ELE Team

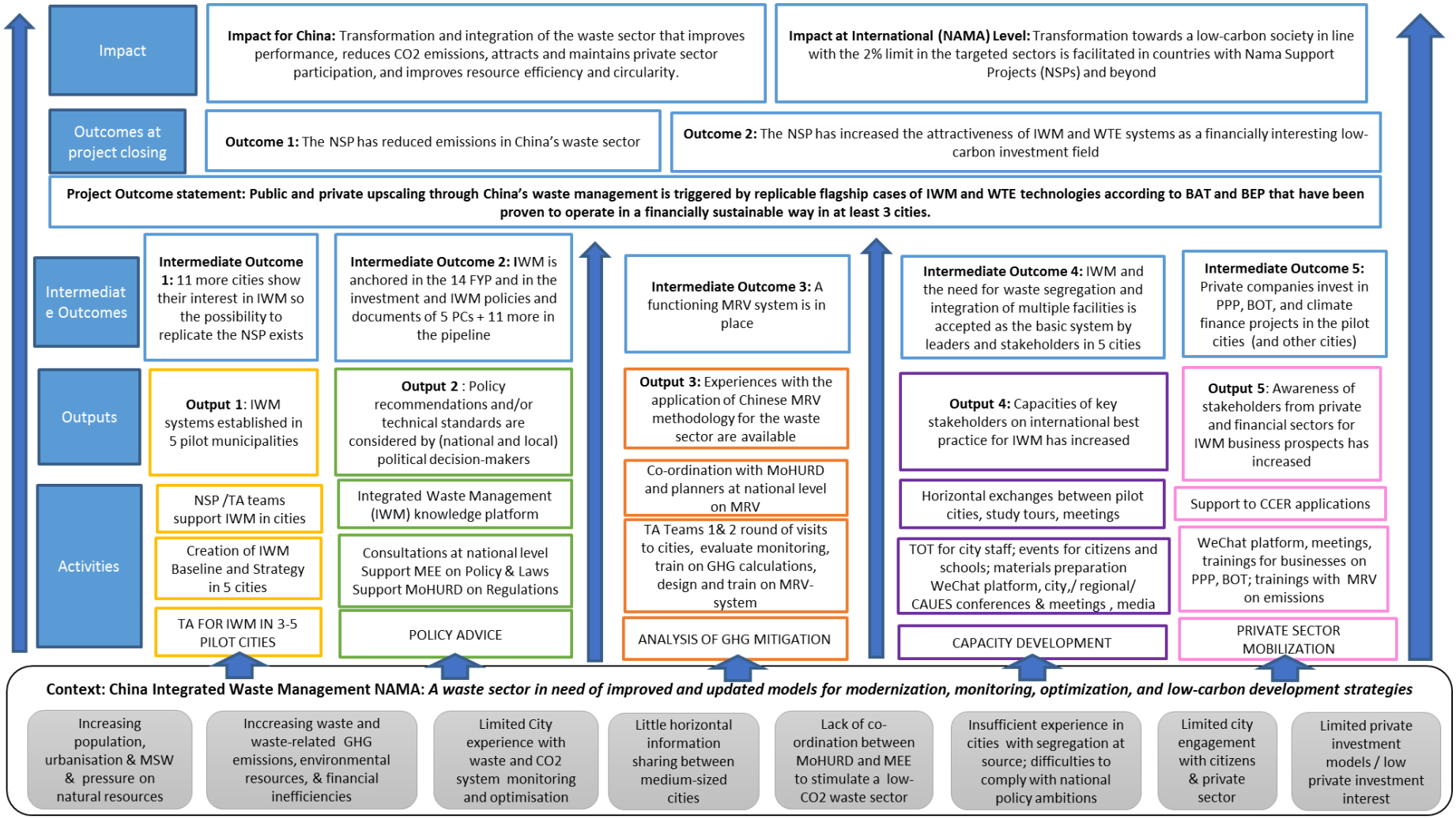


Table 8. Underlying assumptions of the China IWM NSP

ToC element	Underlying assumptions
Impact	• Implementing IWM with support of international technical assistance will lead to a more efficient, optimised, and modern waste sector, which will be responsible for fewer emissions and a lower CO_2 footprint
	• Reductions in CO_2 emissions in the waste sector will be recognised by CCER, the Chinese ETS system, and create a point of entry for climate financing for waste management in the NAMA system
	• Demonstrating this transformation will be so interesting that it will attract significant interest from private (share-holder owned) companies who will invest in the urban waste sector
Outcome	• It is possible to affect policy at the national level by creating replicable experiences of implementing IWM in pilot cities
Intermediate outcomes	• Active communication and training will engage citizens, schools, experts, businesses, and other stakeholders, as well as supporting Pilot Cities to understand how to upgrade their waste systems and implement IWM, including understanding how to implement source separation from households and businesses
Outputs	• Success in the Pilot Cities and with climate financing will bring shareholder-owned (private) investors and private operators into the waste sector (and they will bring new ideas and technologies)

Annex B Evaluation and Learning Exercise Matrix

Table 9. ELE Matrix

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Who can answer this question	Source of information Data gaps
1. RELEVANCE					
1	To what extent does the NSP address an identified need (by national policy institutions, city government, citizens, and the private sector)? Do Chinese citizens qualify as main beneficiaries? Is the project relevant to them?	▪ The NSP design responds to the beneficiaries' needs and strategic priorities at the time of adoption and continues to respond to priorities given the evolving challenges and priorities in the Chinese solid waste sector. ▪ NSP is aligned with the needs of medium-sized Chinese cities, the national government, solid waste stakeholders, the private sector and individuals.	▪ Diversification and integration of waste management will reduce the CO_2 emissions of the waste sector (1,5% of total CO_2 emissions). ▪ The pilot cities will show the government how IWM benefits the waste sector and reduces its CO_2 emissions.	▪ Direct beneficiaries (listed as citizens) and their proxies ▪ City Waste and Urban officials ▪ NSP Team ▪ Independent verifiers (Business and solid waste associations, non-NSP consultants and other donors working on solid waste, NGOs, academics)	▪ Field visit to one pilot city ▪ In-depth interviews ▪ Semi-structured key informant interviews (KIIs) ▪ Context analysis ▪ Document review (Project concepts (logical framework matrix) and progress reports) ▪ National plans, strategies and other policy instruments such as norms, standards, etc.
1.1	How well does the NSP align with government and agency priorities regarding GHG emissions from the solid waste sector?	▪ The project is in line with government targets on solid waste sector development, reduction of emissions from the solid	▪ China IWM responds to climate aspects of national, urban, and solid waste policy and practice.	▪ Stakeholders and officials from the national government, city government, CCER agency	▪ In-depth interviews ▪ Semi-structured key informant interviews (KIIs)

		waste sector including CCER, 13th 5-year Plan.		▪ NSP Team ▪ Academics ▪ Trade associations	▪ Project and city IWM baselines, operating documents.
1.2	What other factors or changes in the NSP-operating context affect the relevance of the project?	▪ The project's goals and specific objectives and needs are still valid. ▪ Several assumptions and causal pathways outlined in the TOC remain valid, after adaptations and refinements.	▪ China IWM is coherent with generalised long-term national 5-year plans and specific city policy priorities that are not affected by short-term context changes (e.g. local and general elections, personnel changes, COVID-19).	▪ Direct beneficiaries ▪ NSP Team ▪ Stakeholders and officials from the national government, city government.	▪ Organogram and budget of Solid Waste Division in pilot cities ▪ In-depth interviews ▪ Semi-structured key informant interviews (KIIs) ▪ Project annual reports ▪ Site visits
2. EFFECTIVENESS					
2	To what extent has the implementation of the NSP been achieving intended outcomes in the short, medium, and long term?	▪ The degree to which there is evidence of the expected results / interim outcomes in the ToC: ▪ IWM implemented in pilot cities in an inclusive way ▪ Existing systems optimised and diversified ▪ Institutional, policy, financial and inclusivity aspects of IWM influenced by the project ▪ CO_2 emissions reduced due to IWM ▪ Gains are measured and documented	▪ Project activities to implement IWM in cities will directly contribute to speeding up the modernisation process making the solid waste systems in Chinese cities more climate-friendly, inclusive, and financially sustainable	▪ Stakeholders and officials from the national government, city government, CCER agency ▪ NSP Team ▪ Academics ▪ Trade associations	▪ Field visits ▪ In-depth interviews ▪ Small stakeholder meetings ▪ Semi-structured key informant interviews (KIIs) ▪ NSP proposal ▪ Baseline documents ▪ City solid waste metrics and reporting ▪ Progress reports ▪ Data from NSP monitoring system / Logframe

		▪ Climate financing is mobilised ▪ CCER credits asked and earned ▪ New stakeholders in the private sector interested in IWM/CCER opportunities ▪ Functioning MRV (Monitoring, Reporting and Verification) system is in place ▪ The strength of the NSP contribution to the realisation of those outcomes (see link between outputs and outcomes) ▪ For each of the outcomes consider the major constraints and opportunities experienced (success and hindering factors)			
2.1	For each output, what were the major constraints and opportunities experienced in implementing the activities? For each output, what were the particular features of the project and	▪ Evidence of the delivery of intended outputs ▪ The strength of the NSP contribution to the delivery of those outcomes ▪ For each of the output consider the major	▪ Implementing the intended activities (as per ToC) will deliver the expected outputs ▪ The NSP is the main factor in the delivery of the outputs	▪ Stakeholders and officials from the national government, city government, CCER agency ▪ NSP Team ▪ Academics	▪ NSP proposal ▪ Baseline documents ▪ City solid waste metrics and reporting ▪ Progress reports

	context that made a difference in achieving these outputs?	constraints and opportunities experienced (success and hindering factors)		▪ Trade associations	
2.2	Are results that are reported for the five mandatory core indicators by the NAMA Facility (M1-M5) in line with the NAMA Facility's M&E framework? Are the activities that are reported for the five mandatory core indicators by the NAMA Facility (M1-M5) on track and producing the anticipated results?	▪ Level of achievement of M1-M5 targets by the project ▪ Circumstances (positive and negative) that influenced the performance on the M1-M5 indicators ▪ Delays in specific activities that are key to the causality chain (such as the Technical Assistance)	▪ The NSP will support the achievement of the NAMA Facility's core indicators ▪ IWM is system change which requires relatively intensive support from an International Technical Assistance Team (ITAT)	▪ City solid waste officials ▪ National policymakers ▪ NSP Team ▪ The International Technical Assistance team ▪ Proxy organisations representing Chinese citizens in the pilot cities. ▪ Business stakeholders and chambers of commerce	▪ NSP proposal ▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Semi-structured KIIs
2.3	Structure & steering: has the NSP been managed, coordinated, and implemented effectively?	▪ The chosen implementation mechanism is conducive to achieving the expected outcomes ▪ The technical component is tailormade for achieving the planned outputs ▪ Communication and visibility are implemented according to an integrated approach	▪ The China IWM NSP team has the right governance structure to effectively coordinate with key stakeholders ▪ Key stakeholders fully own and commit to their role in the NSP ▪ The ITAT is working in all of the cities	▪ Direct beneficiaries ▪ NSP Team ▪ ITAT	▪ Progress reports ▪ In-depth interviews ▪ Semi-structured KIIs

		▪ Stakeholders are invited into the process and are participating and collaborating actively in the intervention.			
2.4	Were there additional outputs and/or outcomes obtained that were not planned in project design (unintended outcomes)?	▪ There is evidence of the NSP's contribution to unintended or unexpected results ▪ If there are positive unintended results, the NSP team has been able to capitalise on them to sustain the intended outcomes ▪ If there are negative unintended results, the NSP team has been able to appropriately identify, address and learn from them.	▪ The NSP management has been appropriately designed to identify, address/capitalise from, and learn from unintended outcomes	▪ Direct beneficiaries ▪ NSP Team ▪ City officials ▪ Environmental NGOs ▪ the Private recycling sector	▪ NSP proposal ▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Semi-structured KIIs
2.5 (Proposed by ELE team)	Given delays in some activities of more than two years, is it still possible for the NSP to make its designed contribution to effective results?	▪ The level of NSP contribution to the achievement of the results compared to exogenous factors. ▪ Several assumptions and causal pathways outlined in the TOC remain valid, after adaptations and refinements	▪ The NSP is the main cause of the achievement of the intended and unintended outcomes ▪ The NSP's positioning in real-time gives it the advantage of "favourable winds" in terms of complementary activities	▪ Direct beneficiaries ▪ NSP Team ▪ City officials ▪ Environmental NGOs and citizen organisations ▪ the private recycling sector	▪ Progress reports ▪ In-depth interviews and meetings ▪ Semi-structured KIIs ▪ News stories from newspapers, radio or internet ▪ Evidence of successful siting and

		▪ Causal pathways that are not credible are eliminated via an amendment process	to modernise the solid waste physical systems		operation of new facilities. ▪ The ways IWM and solid waste are mentioned in the draft of the 14th 5-year Plan.
2.6	Has the NSP M&E framework been able to adequately function?	▪ The proposed NSP M&E framework adequately reflects the challenges, outcomes and impacts of the program ▪ The logical framework is used as a reference tool for monitoring (regularly updated)	▪ The M&E is set up and implemented based on KPI ▪ The Logframe is regularly updated and used as a learning tool	▪ Direct beneficiaries ▪ NSP Team ▪ TSU	▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Semi-structured KIIs
2.7	How has learning been integrated into the project?	▪ The presence and effectiveness of institutionalised learning and adaptation mechanisms within the NSP	▪ The NSP team regularly identify learnings, reflect on them, and accordingly adapt the ToC and implementation of the project	▪ Direct beneficiaries ▪ NSP Team ▪ TSU	▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Semi-structured KIIs
3. EFFICIENCY					
3	To what extent is the relationship between inputs and 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 (project-specific or external factors) and how seriously have they	▪ Technical Component activities run smoothly, on time (and on a budget). ▪ Co-ordination with MOHURD and national policy-makers and City officials is frequent and effective	▪ Direct beneficiaries ▪ NSP Team ▪ MOHURD ▪ National policy-makers ▪ City officials	▪ NSP proposal ▪ Annual and Semi-annual reports ▪ Scan of press and media ▪ Data from NSP monitoring system

		affected the NSP implementation? ▪ The presence and effectiveness of the measures adopted to reduce the delays ▪ The level of satisfaction of the NSP direct beneficiaries or their proxies ▪ The communication from the business sector	▪ National, regional, and local institutions operating in the same landscape (solid waste) are in communication with each other in relation to the NSP ▪ The cooperation with industry association will support efficient information dissemination and stakeholder identification.		▪ Semi-structured interviews
4. IMPACT					
4	What evidence is there that the NSP is likely to contribute to the intended impact in the ToC (incl. transformational change), as well as any unintended or unexpected ones?	▪ The strength of the reasoning behind the chain of results/causal connections ▪ The robustness of the causal links/pathways to the intended impact (namely, increased integration of waste management systems in the pilot cities, benefits to citizens and the private sector, and GHG emissions reduction and CCER financial benefits) ▪ The availability of metrics and a tradition of	▪ Direct: Technical Component activities will be a key to support the determination of a pipeline of potential SSRE projects that will eventually replace fossil fuels when completed. ▪ Indirect: Technical Component initiatives will build mitigative capacity in China and the build-up of institutional capacities to undertake a larger number of projects in the future.	▪ Direct beneficiaries ▪ NSP Team ▪ MOHURD ▪ National policy-makers ▪ Proxies for citizens ▪ NGOs ▪ City officials ▪ Academics	▪ NSP proposal ▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Press and media ▪ Drafts of 14th 5-year Plan

		reporting that can indicate or verify the causal links ▪ The evidence that key outcomes are going to be achieved and the extent of how transformative the NSP is likely to be based on current evidence			
4.1 (Proposed by ELE team)	At mid-term, how plausible is it that the NSP IWM has contributed to the growing interest in source separation, recycling, and composting in the pilot cities? How much evidence do we see/hear that the activities (and preliminary results) of the NSP have worked to socialise the ideas of IWM in institutions, budgeting and management in Chinese cities?	▪ The likelihood the NSP will catalyse the solid waste sector to seek for and find additional, large-scale, sustained GHG savings ▪ The likelihood that the NSP will raise capacity levels in Chinese municipalities to understand IWM as a system and to use system dynamics to leverage results and CI2 impacts ▪ The size of leveraged public and private CO2 reductions by the NSP compared to other NAMA projects or countries ▪ The plausibility of attracting new business partners in solid waste services, recycling, organics valorisation, or emissions reduction	▪ The NSP plays an important role in socialising the idea that solid waste management is a climate-related sector ▪ The NSP leverages systemic change in how local authorities in medium-sized Chinese cities think about waste management, shifting their approach from technical and facility-based to a system approach where institutions, budgets, and governance are equally important ▪ The experience of the NSP pilot cities leverages change at national level ▪ Chinese business representatives	▪ Direct beneficiaries ▪ NSP Team ▪ TSU ▪ Independent verifiers	▪ Progress reports ▪ In-depth interviews ▪ Communications from CAUES ▪ Data from NSP monitoring system ▪ Press and media

			attending NSP training are able to introduce new business models that depend on climate finance		
5. SUSTAINABILITY					
5	What is the likelihood that the outcomes will be sustained after the end of the NSP funding period?	▪ It is possible to see changes in instructions from national to pilot city officials about how to organise, upgrade, and modernise waste management ▪ The changes at the city level are taken up in policy and legal documents at the national level, including recognisably in the 14th 5-year plan ▪ Other cities asking to join as second-tier IWM experimenters	▪ Technical Component activities will help strengthen individual citizen and private sector participation in modernising waste management and connecting solid waste outcomes with climate change ▪ National policymakers adopt the IWM approach of technology diversification, institutional and financial integration	▪ Direct beneficiaries ▪ NSP Team ▪ Other City authorities, especially from the first-level diffusion 11 cities ▪ Academics ▪ CAUES members	▪ NSP proposal ▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Scholarly, journal, and newspaper articles and publications ▪ CAUES conferences and activities outside of the project
5.1	What early evidence can be found of the appropriateness of the NSP strategy to push the replication of the experiences of the demonstration cities during their implementation of IWM?	▪ There is evidence of the appropriateness of the NSP strategy to push the replication of the experiences of the demonstration cities during their implementation of IWM	▪ Through a strategy based on demonstration in key Pilot Cities, the NSP will foster the scaling up of the IWM introduction in other cities throughout China.	▪ Direct beneficiaries ▪ NSP Team ▪ Other City authorities, especially from the first-level diffusion 11 cities ▪ Academics ▪ CAUES members	▪ NSP proposal ▪ Progress reports ▪ In-depth interviews ▪ Data from NSP monitoring system ▪ Scholarly, journal, and newspaper articles and publications

					▪ CAUES conferences and activities outside of the project
6. LEARNING					
6	What key lessons can be learnt to the benefit of this NSP in achieving their results?	▪ The NSP's documentation of important lessons for other NSPs ▪ The uptake in China of the idea of institutional change as a companion to technical and facility-based interventions ▪ The understanding of causal pathways and the plausibility of "diffusing up" from local pilots to national policy	▪ The NSP will generate important lessons for non-NSP non-NAMA modernisation in the IWM frame ▪ The elements of the NSP and particularly the software of IWM are institutionalised at national and city level and in the CCERs ▪ Climate impacts become a required element in planning, financing, and operating solid waste facilities	▪ Direct beneficiaries ▪ NSP Team ▪ Other City authorities, especially from the first-level diffusion 11 cities ▪ Academics ▪ CAUES members ▪ National officials ▪ Other IWM multi-lateral donors (ADB, WB, UNEP)	▪ Progress reports ▪ Semi-structured Interviews ▪ Grey literature ▪ Academic and popular press ▪ Social media
6.1	How will the learning from this NSP be shared with other NSPs that combine waste management or other environmental services and climate finance?	▪ The presence or instances where the IWM lessons from this NSP have changed the approach/results of other NSPs on solid waste in China or elsewhere in the world	• The learning from this NSP is contributing to change the approach and results of other NSPs or other donor-financed IWM projects in China	▪ Direct beneficiaries ▪ NSP Team ▪ Academics ▪ CAUES members ▪ National officials ▪ Chambers of commerce	▪ Progress reports ▪ Semi-structured Interviews ▪ Conference papers ▪ "Hits" to the project web page

		▪ Uptake at the national level of the idea that waste/climate "software" is critical			
6.2	How did the sharing of learning by other NSPs and other projects contribute to the successful implementation of the NSP?	▪ Documentable instances where the lessons from other NSPs or other projects have resulted in the change of approach or results of this NSP ▪ Documentable inclusion of multi-criteria ('integrated") approaches to environmental sectors other than waste which are exploring NAMA projects and climate finance	▪ The sharing of learning by other NSPs and other projects is contributing to the successful implementation of the NSP	▪ Direct beneficiaries ▪ NGO and citizen organisations ▪ NSP Team ▪ Academics ▪ CAUES members ▪ National officials	▪ Progress reports ▪ Semi-structured Interviews ▪ Press, media, social media ▪ Conference papers ▪ Downloads of project documents

Annex C Evidence and answers to the ELE matrix

The following table has been part of the ELE analysis effort to link the answers to the ELEQs with the evidence from the ELE sources that underpins them. The strength of the evidence is assessed following the methodology explained in Section 0 and the legend in Table 13. The codes found in the answers' text are the references to the specific sources (interviews, workshops, documents). Each code refers to a specific source and follows this legend: NT = NSP Team; NS = NSP Stakeholder; TP = Third Party; AR17 = Annual Report 2017, SAR17 = Semi-annual Report 2017, AR18 Annual Report 2018, SAR18 = Semi-annual Report 2018, AR19 = Annual Report 2019; SAR20 = Semi-Annual Report 2020.

Table 10. Evidence and Answers to the ELE Matrix

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
1. RELEVANCE				
1	To what extent does the NSP address an identified need (by national policy institutions, city government, citizens, and the private sector)?	▪ The NSP design responds to the beneficiaries' needs and strategic priorities at the time of adoption and continues to respond to priorities given the evolving challenges and priorities in the Chinese solid waste sector. ▪ NSP is aligned with the needs of medium-sized Chinese cities, the national government, solid waste stakeholders, the private sector and individuals.	▪ Diversification and integration of waste management will reduce the CO_2 emissions of the waste sector (1,5% of total CO_2 emissions). ▪ The Pilot Cities (PCs) will show the government how IWM benefits the waste sector and reduces its CO_2 emissions	▪ The NSP helps cities understand how to implement national policies on source segregation in practice IWM [NT1, NT2, NS1, NS2, NS3, NS4, NS8, NS9, NS10, NS11, TP9]; ▪ NSP helps with 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. [NT2, NS1, NS2, NS3, NS11, NS12, TP1, TP6, AR17]; ▪ Chinese private sector wants to learn about technology from Europe and get technical assistance to understand the implementation and earning models in China [NS1, NS2, NS7, NS9, NS10, NS13, TP1, TP2, TP3, TP7, TP8, TP9];

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
				▪ NSP introduced segregation to citizens and commercial sectors, and this is important to future development [NS9]; ▪ PCs understand that increased segregation improves the functioning of facilities[NS9]; ▪ Longer-term impacts and institutionalization are not clear [TS8]. ▪ Pilot Cities (PCs) have learned from the project about the importance of engaging citizens [NT1, NT2, NS4, NS9, NS10, NS11]; ▪ NSP supported ToT for trainers in PCs to work with citizens on segregation; ▪ We are not only talking about capacity-based awareness but also a course in segregation at source to students 9-11 years, also doing a book on waste [NT2]; ▪ Communicate to the residents in research and mutual exchange activities and encourage them to participate in our waste management business.[NT2, NS1, NS4, NS9, NS10, NS11].
1.1	How well does the NSP align with government and agency priorities regarding GHG emissions from the solid waste sector?	▪ The project is in line with government targets on solid waste sector development, reduction of emissions from the solid waste sector including CCER, 14th 5-year Plan (FYP)	▪ China IWM responds to climate aspects of national, urban, and solid waste policy and practice	▪ The project was formulated in consultation with the National government and the planners [NT1, NT2]; ▪ The project reflects national priority to modernise the management of municipal solid waste and increase the emphasis and investment on waste classification [NT1, NT2, TP6, AR17]; ▪ The NSP Strategy to select PCs in different regions, and to support them to set up

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
				professional waste sorting and provide training, education and projects, serves the national government priority (and MOHURD standards) to spread these practices throughout all Chinese cities in China [TP6].
1.2	What other factors or changes in the NSP-operating context affect the relevance of the project?	▪ The project's goals and specific objectives and needs are still valid. ▪ Several assumptions and causal pathways outlined in the TOC remain valid, after adaptations and refinements	▪ China IWM is coherent with generalised long-term national 5-year plans and specific city policy priorities that are not affected by short-term context changes (e.g. local and general elections, changes in personnel, COVID-19)	▪ The NSP is coherent with national support for the waste segregation and sorting policy in cities, they reinforce each other[NT1]; ▪ Pilot Cities (PCs) have learned from the project about the importance of engaging citizens [NT1, NT2, NS4, NS9, NS10, NS11]; ▪ PCs understand that increased segregation improves the functioning of facilities [NS9].
2 EFFECTIVENESS				

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
2	To what extent has the implementation of the NSP been achieving intended outcomes in the short, medium, and long term? [Note: this is a mid-term evaluation so that the long-term is not relevant]	▪ The degree to which there is evidence of the expected results / interim outcomes in the ToC: ▪ IWM implemented in PCs in an inclusive way ▪ Existing systems optimised and diversified ▪ Institutional, policy, financial and inclusivity aspects of IWM influenced by the project ▪ CO2 emissions reduced due to IWM ▪ Gains are measured and documented ▪ Climate financing is mobilised ▪ CCER credits asked and earned ▪ New stakeholders in the private sector interested in IWM/CCER opportunities ▪ Functioning MRV (Monitoring, Reporting and Verification) system is in place	▪ Project activities to implement IWM in cities will directly contribute to speeding up the modernisation process making the solid waste systems in Chinese cities more climate-friendly, inclusive, and financially sustainable	▪ Five PCs have installed new kinds of collection and treatment facilities. [NS1, NS3, NS12, TP1 TP2, TP6, AR19]; ▪ The idea that an integrated solid waste system is more than a landfill and an incinerator has been accepted in the PCs and by many business stakeholders. [NS3, NS5, NS7, NS9, NS10, NS11, TP1, TP4, TP5, TP6, TP8, AR18, AR19, SAR20, AR19]; ▪ NSP staff works with national government on policy recommendations for the waste sector, also in terms of the 14th 5-year plan. [NT1, NT2, SAR20]; ▪ Policy guidelines support PCs to learn about IWM and CO2 reduction and how to engage stakeholders, including citizens and businesses [NS1, NS9, SAR18, AR19]; ▪ Even though CCER system isn't functioning, Lanzhou is using CDM financing in relation so solid waste [NS3]; ▪ Chinese experts and third parties find that MRV is new to them and helpful to the establishment of carbon trading in the future. [NT1, NT2, NS1, NS3, NS5, TP3, TP4, TP5, TP7, TP9]; ▪ The broader use of MRV for the "software" and governance aspects of IMW, is an interesting topic for the next phases of the NSP [TP7]; ▪ The GHG reduction part of the NSP is not yet working (properly) [TP2, TP6, M&E19];

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
		▪ The strength of the NSP contribution to the realisation of those outcomes (see the link between outputs and outcomes) ▪ For each of the outcomes consider the major constraints and opportunities experienced (success and hindering factors)		▪ The benefits of carbon trading have not yet been obtained [NS1, NP9]; ▪ It is difficult to determine the CO2 reduction directly influenced by NSP activities [NS1, NS4, NS9, NS10]; ▪ The NSP and the TA Team 2 is guiding the cities on CO2 reduction and what IWM means and how to implement it and supporting them in reaching and training citizens [NT1, NT2, NS7 NS8, NS9, NS11, NS12 NS13, TP1, TP2, TP6, TP9, AR18, AR19, SAR20]; ▪ NSP has conducted training in the PCs for MRV methodologies for regular reporting on emissions reduction made through the NSP. and ETS system and CCER [NT1, NT2, NS2, NS4, NS10, TP4, SAR18, AR18]; ▪ The PCs have different results and effects and are gradually changing their way of planning and looking at waste management systems [NS6, NS7, NS8, NS9, NS10, NS11, NS12, TP1, TP2, TP4, TP9, AR19].

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
2.1	For each output, what were the major constraints and opportunities experienced in implementing the activities? For each output, what were the particular features of the project and context that made a difference in achieving these outputs?	▪ Evidence of the delivery of intended outputs ▪ The strength of the NSP contribution to the delivery of those outcomes ▪ For each of the outputs consider the major constraints and opportunities experienced (success and hindering factors)	▪ Implementing the intended activities (as per ToC) will deliver the expected outputs ▪ The NSP is the main factor in the delivery of the outputs	**Particular Features** ▪ NSP has conducted roundtable workshops for political decision-makers at the provincial level [AR19]; ▪ Capacities of key stakeholders concerning international best practice for IWM have increased. [NS1, NS3, NS4, NS5, NS7, NS8, NS12, NS13, TP7]; ▪ NSP has high visibility with broad activities in PCs with many kinds of stakeholders refers to the segregation of waste streams, which is getting better and better. [NS3, NS4, NS5, NS10, TP6, SA20]; ▪ (High visibility, [NS4, TP2, TP3, TP4, TP5, TP6, TP7, TP9, SA20]; ▪ The large and broad audience for training, information sharing, site visits [NT1, NT2, NS1, NS3; NS4, NS7, NS10, TP2, TP3, TP5, TP7, AR18, AR19, SA20]; ▪ The interviewees gained a deeper impression on the system tools of integrated solid waste management, especially source separation [NS1, NS8]; ▪ The project has "broken the disposal monopoly" [ELE team] TP6]; **Constraints** ▪ Visibility is not institutionalised and may drop when there is competing news [TP1];

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
				▪ It's not clear whether the project ambition for European-style IWM is feasible within the project period [SAR19]; ▪ Measurement of performance in IWM requires more precise monitoring equipment and better measurement, especially to calculate emissions reduction [NS6].
2.2 + 2.3	Are results that are reported for the five mandatory core indicators by the NAMA Facility (M1-M5) in line with the NAMA Facility's M&E framework? Are the activities that are reported for the five mandatory core indicators by the NAMA Facility (M1-M5) on track and producing the anticipated results?	▪ Level of achievement of M1-M5 targets by the project ▪ Circumstances (positive and negative) that influenced the performance on the M1-M5 indicators ▪ Delays in specific activities that are key to the causality chain (such as the Technical Assistance)	▪ The NSP will support the achievement of NAMA Facility's core indicators ▪ IWM is system change which requires relatively intensive support from an International Technical Assistance Team (ITAT)	▪ Organised digital and physical training, seminars, conferences, for interested business/stakeholders, including networking workshop and study visits to pilot for businesses and other cities (including "next 11") [NS1, TP6, AR17, SAR20]; ▪ Opened a WeChat platform with Q&A to answer business questions, other social media [NS3, TP2, TP3, AR18]; ▪ The local government involves private companies to carry out waste management activities [NS3, NS5, NS6, TP2, TP3, TP5].
2.4	Structure & steering: Has the NSP been managed, coordinated, and implemented effectively?	▪ The chosen implementation mechanism is conducive to achieving the expected outcomes ▪ The technical component is tailormade for	▪ The China IWM NSP team has the right governance structure to effectively coordinate with key stakeholders	▪ Impacts and effectiveness are reaching central government [NS2, NS7, NS8, NS10, NS11, NS12, NS13, TP2, TP4, TP8, AR19]; ▪ NSP has changed the way national and city officials and institutions understand and relate to the solid waste [NT2, NS1, NS3, NS4, NS5, NS7,

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
		achieving the planned outputs ▪ Communication and visibility are implemented according to an integrated approach ▪ Stakeholders are invited into the process and are participating and collaborating actively in the intervention	▪ Key stakeholders fully own and commit to their role in the NSP ▪ The ITAT is working in all of the cities	NS10, NS12, NS13, TP1, TP2, TP3, TP5, TP7, TP8, TP9]; ▪ City officials have deepened their understanding of solid waste management [TP2]; ▪ IWM climate finance regulations are not clear [NS1. TP1]; ▪ Climate finance and segregation projects are not implemented [NS1, NS9, NS11. NS12, NS13].
2.5	Were there additional outputs and/or outcomes obtained that were not planned in project design (unintended outcomes)?	▪ There is evidence of the NSP's contribution to unintended or unexpected results ▪ If there are positive unintended results, the NSP team has been able to capitalise on them to sustain the intended outcomes ▪ If there are negative unintended results, the NSP team has been able to appropriately identify, address and learn from them.	▪ The NSP management has been appropriately designed to identify, address/capitalise from, and learn from unintended outcomes	No unintended or additional outcomes found.

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
2.6	Given delays in some activities of more than two years, is it still possible for the NSP to make its designed contribution to effective results?	▪ The level of NSP contribution to the achievement of the results compared to exogenous factors. ▪ Several assumptions and causal pathways outlined in the TOC remain valid, after adaptations and refinements ▪ Causal pathways that are not credible are eliminated via an amendment process	▪ The NSP is the main cause of the achievement of the intended and unintended outcomes ▪ The NSP's positioning in real-time gives it the advantage of "favourable winds" in terms of complementary activities to modernise the solid waste physical systems	▪ COVID-19 has delayed the NSP implementation schedule and especially TA Team 2 strategies and work in the Pilot cities [NT1, NT2, TP3, TP4, TP9, SAR20]; ▪ National government policy means no public officials, academics, or other Chinese experts can go abroad, with exception of some companies (but it is quite difficult) [NT1, NT2, TP3, TP4, TP9, SAR20, ELE Team]; ▪ COVID travel restrictions to and from Europe meant that the International TA Team 2 experts could neither directly visit cities nor deliver technical assistance in the way it was foreseen in the proposal [NT1, NT2, TP3, TP4, TP9, SAR20]; ▪ MEE will soon be re-opening the carbon trading market (on pilot basis), but it is not clear whether they will consider the solid waste sector (NT1]; ▪ We see little institutionalization outside of PCs.
2.7	Has the NSP M&E framework been able to adequately function?	▪ The proposed NSP M&E framework adequately reflects the challenges, outcomes and impacts of the program ▪ The logical framework is used as a reference tool for monitoring (regularly updated)	▪ The M&E is set up and implemented based on KPI ▪ The Logframe is regularly updated and used as a learning tool	▪ ▪ ELE team reading of the M&E, AR, and SAR documents, as well as the NSP kick-off presentation, confirm that the NSP M&E Framework have been able to adequately function.
2.8	How has learning been integrated	▪ The presence and effectiveness of	▪ The NSP team regularly identify learnings, reflect	▪ Visibility is not institutionalised and may drop when there is competing news [TP1]

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
	within the project?	institutionalised learning and adaptation mechanisms within the NSP	on them, and accordingly adapt the ToC and implementation of the project	
3. EFFICIENCY				
3	To what extent is the relationship between inputs and 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 (project-specific or external factors) and how seriously have they affected the NSP implementation? ▪ The presence and effectiveness of the measures adopted to reduce the delays ▪ The level of satisfaction of the NSP direct beneficiaries or their proxies ▪ The communication from the business sector	▪ Technical Component activities run smoothly, on time (and on a budget). ▪ Co-ordination with MOHURD and national policy-makers and City officials is frequent and effective ▪ National, regional, and local institutions operating in the same landscape (solid waste) are in communication with each other concerning the NSP ▪ The cooperation with industry association will support efficient information dissemination and stakeholder identification.	▪ COVID-19 impact on the project was not significant [NS1, NS4, NS10, TP9]; ▪ All PCs are working on improving the efficiency of facilities [NS2, NS7, NS8, NS9, NS10, NS11, NS13, TP1, TP2, TP3, TP4, TP9]; ▪ The input and output efficiency of the project is relatively high in terms of timeliness and quality; ▪ All PCs started with a situation analysis and gap assessment between Chinese and European understanding of IWM [NS3, TP5]; ▪ More support/ consultation by the project is required [NS2, NS4, NS5, NS6, NS7, NS8, NS9, NS12, TP2, AR18]; ▪ Activities have to be postponed [AR18, SAR19, SAR20]; ▪ Because of travel restrictions, the strategy of international seminars and study tours for capacity building will be a long-term problem [NS6]; ▪ Project time should be extended [TP3, TP4];
4. IMPACT				

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
4	What evidence is there that the NSP is likely to contribute to the intended impact in the ToC (incl. transformational change), as well as any unintended or unexpected ones?	▪ The strength of the reasoning behind the chain of results/causal connections ▪ The robustness of the causal links/pathways to the intended impact (namely, increased integration of waste management systems in the PCs, benefits to citizens and the private sector, and GHG emissions reduction and CCER financial benefits) ▪ The availability of metrics and a tradition of reporting that can indicate or verify the causal links ▪ The evidence that key outcomes are going to be achieved and the extent of how transformative the NSP is likely to be based on current evidence	▪ Direct: Technical Component activities will be a key to support the determination of a pipeline of potential SSRE projects that will eventually replace fossil fuels when completed. ▪ Indirect: Technical Component initiatives will build mitigative capacity in China and the build-up of institutional capacities to undertake a larger number of projects in the future.	▪ The project has given cities the idea that there are climate and operational gains to be made by separate management of kitchen waste [NT1, TP3]; ▪ "The masses" (users of the waste system) have learned segregation [NT1, Ns1]; ▪ The NSP staff are open, co-operative and transparent, and as a result, promote sharing information and raising the profile of IWM and solid waste in general [TP5]; ▪ The tradition of horizontal exchange and knowledge sharing is stronger[NS1, NS3, NS7, NS12, TP2, TP4, TP5, TP9]; ▪ The involvement of CAUES is strengthening the learning among waste management professionals [NT1, TP2, TP5, TP7, TP9]; ▪ A waste classification office has been set up (example of ISM institutional development) [NS2]

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
4.1 + 4.2	At mid-term, how plausible is it that the NSP IWM has contributed to the growing interest in source separation, recycling, and composting in the PCs? How much evidence do we see/hear that the activities (and preliminary results) of the NSP have worked to socialise the ideas of IWM in institutions, budgeting and management in Chinese cities?	▪ The likelihood the NSP will catalyse the solid waste sector to seek for and find additional, large-scale, sustained GHG savings ▪ The likelihood that the NSP will raise capacity levels in Chinese municipalities to understand IWM as a system and to use system dynamics to leverage results and CO_2 impacts ▪ The size of leveraged public and private CO_2 reductions by the NSP compared to other NAMA projects or countries ▪ The plausibility of attracting new business partners in solid waste services, recycling, organics valorisation, or emissions reduction	▪ The NSP plays an important role in socialising the idea that solid waste management is a climate-related sector ▪ The NSP leverages systemic change in how local authorities in medium-sized Chinese cities think about waste management, shifting their approach from technical and facility-based to a system approach where institutions, budgets, and governance are equally important ▪ The experience of the NSP PCs leverages change at national level ▪ Chinese business representatives attending NSP training are able to introduce new business models that depend on climate finance	▪ Through the NSP influence, more and more private companies are involved in PPP and BOT – also for incineration and biogas, and more are also becoming interested [NS3, NS$, NS9, NS10, TP6]; ▪ The most transformational aspects appear to be project-inspired changes in the way PCs understand, procure, finance, manage, measure, and report low- CO_2 solid waste performance, as the physical part of an IWM system [NS9, NS10, NS11]; ▪ The NSP has changed the conception of solid waste and the reporting on waste management in the PCs [NS1, NS3, NS9, NS10, NS11, NS12, NS13, TP3, TP4, TP6]; ▪ Rates for separation and classification for recycling and composting increasing [NS4, NS8, NS9, NS10, NS11, NS12]; ▪ There is yet not much TA or learning on metrics, measurement, institutions and financing [NS4]; ▪ Compliance and process monitoring tools are not yet available [NS6]; ▪ The delays in operationalising the CCER system mean that pilot city progress in the transformation towards low- CO2 IWM is not yet visible [NT1]; ▪ At the policy level, the NSP, the PCs, and the national policy-makers and planners are in a kind of virtuous circle, where their actions reinforce

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
				each other, and support transformational modernization via IWM [NS3, NS4, NS11, NS12, NS13, TP1, TP2, TP4, TP7]; ▪ NSP support for segregation at source is a key activity in the PCs [NT1, NS10, TP1]; ▪ In the coming years we will focus on IWM budgeting and institutions and policies [NT1, NS2, NS4, NS9, NS10, NS11, NS13] ▪ The "software" of IWM is lagging behind the changes in the physical system: the project has not yet touched the governance issues of financial or institutional consolidation [NT1, NT2, NS4, NS7, TP7].
5. SUSTAINABILITY				
5	What is the likelihood that the outcomes will be sustained after the end of the NSP funding period?	▪ It is possible to see changes in instructions from National to Pilot city officials about how to organise, upgrade, and modernise waste management ▪ The changes at City level are taken up in policy and legal documents at National level, including recognisably in the 14th 5-year plan	▪ Technical Component activities will help strengthen individual citizen and private sector participation in modernising waste management and connecting solid waste outcomes with climate change ▪ National policymakers adopt the IWM approach of technology diversification, institutional and financial integration	▪ Current standards and policies for waste segregation concerning organic waste attract the private sector so sustainability doesn't depend on the project [NT2, TP1, TP3, TP6]; ▪ Site visits, especially to recycling and organic waste facilities, are a way to involve citizens in better understanding integrated waste management, thus creating more and more motivation to increase waste separation at source [NS1, NS2, NS3, NS4, NS5, NS0, NS10]; ▪ IWM is now integrated into the plans at the national level and will be implemented in more cities [NS5];

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
		▪ Other cities asking to join as second-tier IWM experimenters		▪ Suzhou, Lanzhou, Bengbu and Xi'an have a long-term city planning for waste management [NS3, NS4, NS8, NS10]; ▪ Tai'an does not yet have a plan, there is no long-term planning [NS2, NS12]; ▪ Communication is primarily between professionals and economic stakeholders, has not reached into daily life, "the circle of friends" [TP1].
5.1	What early evidence can be found of the appropriateness of the NSP strategy to push the replication of the experiences of the demonstration cities during their implementation of IWM?	▪ There is evidence of the appropriateness of the NSP strategy to push the replication of the experiences of the demonstration cities during their implementation of IWM	▪ Through a strategy based on demonstration in key Pilot Cities, the NSP will foster the scaling up of the IWM introduction in other cities throughout China.	▪ The project has established a link between waste and climate [NT]; ▪ Study visits promote horizontal communication and knowledge sharing [NS4, Ns5, NS9, NS11, TP6]; ▪ New cities want to join [TP1, TP3, TP4, TP9, NS11, AR17]; ▪ The experience is highly transferable [TP1, TP2, TP3, TP4, TP6, TP7, TP8, TP9]; ▪ The pilot city experience reinforces and supports national policies of segregation is seen as positive, has created a lot of interest, and can be expected to be replicated by other cities in different regions of China [NT1, NS7]; ▪ The implementation of IWM takes a long time /we need more time [TP2, TP8]; ▪ Poorer cities are not being reached [TP2]; ▪ Replication of IWM means Replication of "software" or "governance aspects" of IWM [TP6];
6. LEARNING				

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
6	What key lessons can be learnt to the benefit of this NSP in achieving their results?	▪ The NSP's documentation of important lessons for other NSPs ▪ The uptake in China of the idea of institutional change as a companion to technical and facility-based interventions ▪ The understanding of causal pathways and the plausibility of "diffusing up" from local pilots to national policy	▪ The NSP will generate important lessons for non-NSP non-NAMA modernisation in the IWM frame ▪ The elements of the NSP and particularly the software of IWM are institutionalised at national and city level and in the CCERs ▪ Climate impacts become a required element in planning, financing, and operating solid waste facilities	▪ NSP has raised the profile of solid waste, reached stakeholders who previously didn't think much about the sector, and has conceptually and in real demonstrations, it has "broken the disposal monopoly" [NT1, NT2, NS4, NS7, NS8, NS10, NS11, NS12, NS13, TP1, TP2, TP3, TP5, SAR19]; ▪ NSP has broadened the experience and knowledge of Chinese waste management experts and professionals [NT1, NT2, NS4, TP2, TP4, TP8, SAR20]; ▪ The awareness of the importance of good data and good monitoring has been increased [NS4, TP1, TP2, TP3, TP49]; ▪ The project has given cities the idea that there are climate and operational gains to be made by separate management of kitchen waste [NT1, TP3]; ▪ "The masses" (users of the waste system) have learned segregation [NT1, Ns1]; ▪ The NSP staff are open, co-operative and transparent, and as a result, promote sharing information and raising the profile of IWM and solid waste in general [TP5]; ▪ The tradition of horizontal exchange and knowledge sharing is stronger [NS1, NS3, NS7, NS12, TP2, TP4, TP5, TP9]; ▪ The involvement of CAUES is strengthening the learning among waste management professionals [NT1, TP2, TP5, TP7, TP9];

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
				▪ A waste classification office has been set up (example of IWM institutional development) [NS2] ▪ Recycling is not part of the City's nor the mayor's responsibility [NS10]; ▪ It is not so clear if the NSP is reaching companies or stimulating private investment, or if IWM is profitable with or without a working CO_2 emissions trading system. [NS3, NS6, NS12]; ▪ The complete message of IWM is not the main focus of attention; especially for governance aspects of IWM it is still too early to evaluate [NS7]; ▪ More translation is needed for Chinese to be exposed to international experiences [TP8].
6.1	How will the learning from this NSP be shared with other NSPs that combine waste management or other environmental services and climate finance?	▪ The presence or instances where the IWM lessons from this NSP have changed the approach/results of other NSPs on solid waste in China or elsewhere in the world ▪ Uptake at the national level of the idea that waste/climate "software" is critical	▪ The learning from this NSP is contributing to change the approach and results of other NSPs or other donor-financed IWM projects in China	▪ The project has given cities the idea that there are climate and operational gains to be made by separate management of kitchen waste [NT1, TP3]; ▪ "The masses" (users of the waste system) have learned segregation [NT1, NS1]; ▪ The NSP staff are open, co-operative and transparent, and as a result, promote sharing information and raising the profile of IWM and solid waste in general [TP5]; ▪ The tradition of horizontal exchange and knowledge sharing is stronger [NS1, NS3, NS7, NS12, TP2, TP4, TP5, TP9];

ELEQ No.	Evaluation Question	Evaluation criteria	Original hypotheses	Evidence from interview mapping [including interview references]
				▪ The involvement of CAUES is strengthening the learning among waste management professionals. [NT1, TP2, TP5, TP7, TP9]; ▪ A waste classification office has been set up (example of ISM institutional development) [NS2]
6.2	How did the sharing of learning by other NSPs and other projects contribute to the successful implementation of the NSP?	▪ Documentable instances where the lessons from other NSPs or other projects have resulted in the change of approach or results of this NSP ▪ Documentable inclusion of multi-criteria ('integrated") approaches to environmental sectors other than waste which are exploring NAMA projects and climate finance	▪ The sharing of learning by other NSPs and other projects is contributing to the successful implementation of the NSP	▪ no answers, there are no other NSPs with a solid waste and climate focus.

Annex D Validity of the causal pathways using process tracing tests

Major conclusion from process tracing: The causal pathways were well-constructed and well-reasoned, but there was too little risk analysis. The cases where the hypothesis could not be confirmed or had to be rejected were all attributable to external factors that were not (and perhaps could not) have been anticipated when the NSP proposal was first made in 2014, nor when it was re-submitted and finally approved.

Table 11. Process Tracing Tests

Formal test	Test description of assumptions at mid-term (output level only)	Causal pathways of the NSP [one summary of each path distributed to the correct test assessment]	Path failure or success explanation
Smoking gun (confirmatory)	If evidence is observed, the hypothesis is confirmed. If evidence is not observed, the hypothesis is not confirmed, but this is not enough to reject the hypothesis.	▪ [Output 1] If IWM is implemented, pilot cities will be able to organise segregation of organic waste and improve the city solid waste system.	▪ The IWM physical system implementation works in all five PCs (hence the evidence is observed) and especially in the areas of segregation of organic waste and improving the city solid waste system (hence hypothesis is confirmed). However, there is not enough evidence to know whether this would have happened even without the NSP.
Hoop test (disconfirmatory)	If the evidence is not observed, the hypothesis is rejected. If the evidence is observed, the hypothesis is not rejected, but this is not sufficient to confirm the hypothesis.	▪ [Output 1] If pilot municipalities can be provided with TA from European experts experienced in IWM, then they will produce an IWM strategy and implement IWM physical and governance systems.	▪ The TA was provided by the Chinese experts in the TA team, not the international experts (so the evidence is not observed), and the IWM strategy documents were not produced (hence the hypothesis is rejected). However, there is not enough evidence to know whether this would have happened even with the TA.

Formal test	Test description of assumptions at mid-term (output level only)	Causal pathways of the NSP [one summary of each path distributed to the correct test assessment]	Path failure or success explanation
Double decisive	If evidence is observed, the hypothesis is confirmed. If the evidence is not observed, the hypothesis is rejected.	▪ [Output 2] If the NSP can teach the pilot cities how to promote and implement segregation of kitchen waste and recyclables at source, including teaching citizens about segregation of waste fractions and creating high awareness of the waste system in general, then cities will have the capacity to implement national policy guidelines.	▪ The NSP has indeed provided capacity development to the cities to demystify segregation at source (the evidence is observed) and therefore the PCs have learnt how to implement national policy guidelines (the hypothesis is confirmed). There is enough evidence to say that the cities would not have known how to do this without the NSP.
Straw in the wind	If the evidence is observed, this is not sufficient to confirm the hypothesis. If the evidence is not observed, this is not sufficient to reject the hypothesis.	▪ [Output 3] If staff in pilot municipalities are trained in MRV, they will be able to monitor the change in CO_2 emissions attributable to implementing IWM, and cities and the private financial sector will have access to climate finance and will attract business and financial stakeholders to bring private capital into investing in low-carbon development in the waste sector.	▪ The MRV training was only partially delivered (the evidence is not observed), but the information we have is not enough to reject the hypothesis. In fact, the MRV system was introduced, but there is not enough evidence to know if it would have worked with or without the NSP.

Formal test	Test description of assumptions at mid-term (output level only)	Causal pathways of the NSP [one summary of each path distributed to the correct test assessment]	Path failure or success explanation
Double decisive	If evidence is observed, the hypothesis is confirmed. If the evidence is not observed, the hypothesis is rejected.	▪ [Output 4] A high level of activity in social media and capacity development will increase PCs success and raise the level of attention from other stakeholders about the successes of the pilot cities, and strengthen the interest of other cities to participate (and businesses to work with them).	▪ The NSP has been very active and successful in publicising the work with the PCs and, because of that, the PCs are massively experimenting with diversifying their physical systems, taking steps that require high performance in waste segregation that they would not have wanted, dared, or managed to take without the NSP. In addition, other cities and businesses have shown interest in the NSP. Therefore there is enough evidence to say that without the NSP the hypothesis would have been rejected.
Double decisive	If evidence is observed, the hypothesis is confirmed. If the evidence is not observed, the hypothesis is rejected.	▪ [Output 5] If the NSP creates and maintains an active program of communication and capacity development via social media, events, and especially, a WeChat Q&A window for businesses, this will attract private investors and waste facility developers or service providers to invest in IWM in the PCS in the traditional PPP and BOT models.	▪ The NSP has been successful in delivering active communication and capacity to the business sector (the evidence is observed) and the business sector is interested, and quite a lot of private capital has been mobilised for these two traditional private sector participation models (the hypothesis is confirmed). The interviews confirmed that this would likely have not happened or happened at a lower level without the NSP.
Hoop test (disconfirmatory)	If the evidence is not observed, the hypothesis is rejected. If the evidence is observed, the hypothesis is not rejected, but this is not sufficient to confirm the hypothesis.	▪ [Output 5] if the CCER system is functioning, the pilot cities will become a magnet for climate finance investment from the private sector (share-holder-owned) in IWM.	▪ The CCER is not functioning (the evidence is not observed), but there is no reason to expect that the hypothesis will fail once it has re-started.

Annex E NSP achievements against Logframe indicators up to the mid-term ELE

Below are reported the China IWM NSP Logframe Indicators grouped under the relevant elements of the ToC. Target and achieved figures are reported with a Red-Green (i.e. target not met-met) assessment, but since this is a mid-term report, only indicators relevant to the outputs (and outcomes where available) are reported.

E.1 Impact indicators

Impact indicators are not applicable at mid-term, and they have not been reported yet.

Impact:

- For China Transformation and integration of the waste sector that improves performance, reduces CO_2 emissions, attracts, and maintains private sector participation, and improves resource efficiency and circularity.
- At International (NAMA) Level: Transformation towards a low-carbon society in line with the 2% limit in the targeted sectors is facilitated in countries with Nama Support Projects (NSPs) and beyond

#	Indicator	Baseline	Target 2022
M1:	Greenhouse gas emissions reduce Direct GHG emission reductions of 220,000 to 440,000 t CO_{2e}/yr. are realised through integrated waste management systems in the 3 demonstration municipalities.	0	220,000 to 440,000 to CO_{2e}/yr.
M2:	Number of people directly benefiting from the NSP At least 3 million inhabitants of the demonstration municipalities have access to international best practice waste management and treatment via the introduced integrated waste management.	0	3,000,000
M3:	Degree to which the supported activities catalyse impact beyond the NSP Key stakeholders support the introduced low-carbon waste treatment approaches and replicate them	0	2
M 3.1:	200 political decision-makers on the municipal level who participate in up-scaling activities of the NSP to consider integrated waste management feasible into their planning documents (including waste-to-energy).	0	4
M 3.2:	11 additional municipalities (beyond the three demonstration municipalities) have replicated the	0	4

	approaches demonstrated by the NSP for their own waste management systems.		
M4:	Volume of public finance mobilized for low-carbon investment and development 85 to 142 million EUR of earmarked public funds for each of the 3 demonstration municipalities, in total 350 million EUR, is directly invested in low-carbon integrated waste management systems	0	350 million
M5:	Volume of private finance mobilised for low-carbon investment and development EUR 300 million of additional investment from the private sector is used to replicate the demonstrated approaches in the NSP	0	300 million

E.2 Outcome indicators

Outcome indicators are only partially applicable at mid-term. They were last reported in the Annual Report 2019 and the M&E Plan 2019.

Red: No results reported	Amber: results reported up to 49%	Green: 50% or higher results reported

Outcome: Public and private upscaling through China's waste management is triggered by replicable flagship cases of IWM and WTE technologies according to BAT and BEP that have been proven to operate in a financially sustainable way in at least 3 cities.

#	Indicator	Baseline	Target 2022	Achieved*
Sector Indicator 1:	At least 2 policy recommendations developed by the NSP are reflected in political planning documents at the national and/or provincial level [number of policies]	0	2	1
Sector Indicator 2:	Access to best practices knowledge is established for 400 waste sector stakeholders from at least 20 provinces [number of sector stakeholders]	2	400	933
Outcome Indicator A:	The waste management systems of the demonstration municipalities show increased financial sustainability through the application of integrated waste management, energy sales and access to the Chinese ETS [ranking score*]	0	3	4
Outcome Indicator B:	11 additional municipalities (beyond the demonstration municipalities) replicate the proposed solutions of the NSP [numbers of municipalities]	0	11	0

*Note: Figure from AR/M&E plan 2019

E.3 Output indicators

Output indicators were last reported in the Annual Report 2019 and the M&E Plan 2019.

Red: No results reported	Amber: results reported up to 49%	Green: 50% or higher results reported

#	Indicator	Baseline	Target 2022	Achieved*
1.1	KPI on "Environmental control – waste treatment and disposal" (2+2E) has improved in the demonstration municipalities [ranking score*]	0	2	1
1.2	Main KPI on "Resource Value – 3Rs – Reduce, reuse, recycle" (3+3R) has improved in the demonstration municipalities [ranking score*]	0	4	1

*Note: Figure from AR/M&E plan 2019

#	Indicator	Baseline	Target 2022	Achieved*
2.1	Four policy recommendations and/or technical standards, improving the framework conditions of the Chinese waste sector and based on the experience of the NSP in the demonstration municipalities, are recommended to MOHURD and/or MEE	0	4	1

*Note: Figure from AR/M&E plan 2019

#	Indicator	Baseline	Target 2022	Achieved*
3.1	Lessons learned during the application of the national verification methodology are presented in three demonstration municipalities.	0	4	0

*Note: Figure from AR/M&E plan 2019

#	Indicator	Baseline	Target 2022	Achieved*
4.1	A knowledge platform is established and maintained on a national level under CAUES and MOHURD	0	1	1

4.2	A pool of 20 trainers is available for training on integrated waste management (4.2) and access to the Chinese ETS market (4.3).	0	20	0
4.3	400 planners and/or political decision-makers in the waste sector are trained on how to implement integrated waste management systems including waste-to-energy.	0	400	247
4.4	200 waste sector stakeholders are trained on how to access the upcoming Chinese ETS market.	0	200	321
4.5	Building on the needs assessment, 100 designers are trained in best practice design approaches for integrated waste system components.	0	100	26
4.6	Building on the needs assessment, 100 operation and maintenance technicians are trained in best practice O&M approaches for integrated waste system components.	0	100	79
4.7	Local citizens have increased their understanding about the advanced MSW hierarchy and management in 3 demonstration municipalities.	0	6	4

*Note: Figure from AR/M&E plan 2019

#	Indicator	Baseline	Target 2022	Achieved*
5.1	Development and dissemination of a demonstration tool for a BAT business case [number of BAT business cases].	0	1	0
5.2	100 stakeholders take part in the BAT business case workshop which is conducted in a municipality willing to replicate the NSP approach [number of stakeholders]	0	100	0

*Note: Figure from AR/M&E plan 2019

Annex F List of ELE sources

F.1 Internal documents

1. NAMA Facility Monitoring and Evaluation Framework, November 2018
2. Terms of reference (ToR) for NAMA Support Project evaluation and learning exercises for the NAMA Facility
3. Project Proposal to the NAMA Facility: NSP Proposal 318 China Integrated Waste Management
4. NAMA Support Project Evaluation and Learning Exercises (ELEs) for the NAMA Facility, Theoretical Framework (FW), Revised draft, October 2020
5. Baseline Study Report on Waste Management of Demonstration Municipalities, June 29, 2019
6. Implementation Plan Suzhou (Chinese)
7. Implementation Plan Tai'an (Chinese)
8. Implementation Plan Xi'an (Chinese)
9. Implementation plan Lanzhou (Chinese)
10. Implementation Plan Bengbu (Chinese)
11. Application form of pilot cities, seven documents (Chinese language)
12. Baseline Study Report on Greenhouse Gas Emissions of Demonstration Municipalities, 08/2019
13. M&E Report on GHG Emission Reduction Effects of Demonstration Municipalities (1st -monitoring period 01/01/2019-30/04/2019), 2019
14. M&E Report on GHG Emission Reduction Effects of Demonstration Municipalities (2nd - monitoring period 01/05/2019-31/10/2019), 2020
15. China IWM NAMA Support Project (China IWM NSP) - 2017 Annual Report
16. China IWM NAMA Support Project (China IWM NSP) - 2018 Semi-annual Report
17. China IWM NAMA Support Project (China IWM NSP) - 2018 Annual Report
18. China IWM NAMA Support Project (China IWM NSP) - 2019 Semi-annual Report
19. China IWM NAMA Support Project (China IWM NSP) - 2019 Annual Report
20. China IWM NAMA Support Project (China IWM NSP) - 2020 Semi-annual Report
21. Terms of Reference: Baseline monitoring (final/undated)
22. Terms of Reference: Development of "Key performance indicators" to monitor state of integrated waste management systems in demonstration cities and capacity building based on the WasteAware ISWM benchmark indicator system, 04.05.2018
23. Terms of Reference: Life Cycle Assessment (LCA) modelling and analysis of waste management system for two cities (undated)
24. Terms of Reference: Train-the-trainer program for Chinese authorities working in the field of municipal solid waste (MSW) management (undated)
25. Terms of reference: Concept and content development for an Environmental Awareness-Raising Centre / Waste Museum (undated)

26. WasteAware Benchmark Indicators for Integrates Sustainable Waste Management in Chinese Cities Edition 3.0, November 2019 (Chinese)
27. Germanies Waste Management Policy Development, A Focus on Municipal Solid Waste GERMANY'S WASTE MANAGEMENT, 2019
28. German Biowaste Ordinance (BioAbfV), translation (Chinese)
29. Life Cycle Assessment of Waste Management in Suzhou, PR China (Draft, 25th November 2020)

F.2 Public documents

1. Project Brochure | China Integrated Waste Management (IWM) NAMA Project
2. WasteAware Benchmark Indicators for Integrates Sustainable Waste Management in Chinese Cities Edition 3.0, November 2019 (English)

F.3 List of organisations interviewed

Interview in Chinese	Interview in English

Institution or Affiliation	Number persons	Position and name
		NSP Team (NT)
GIZ China	1	Project Director
GIZ China	1	Project Manager
		NSP Stakeholder (NS)
	Suzhou City	
Environment Sanitation Bureau of Suzhou Municipality	3	Local government representatives
Solid Waste Supervision Centre, Environment Sanitation Management Bureau of Suzhou Municipality	2	Waste related professionals in governmental authority
Suzhou SZT Renewable Resources Recycling Co., Ltd	1	Company representative
Suzhou Supply and Marketing Cooperatives	1	Company representative
Suzhou / Qizi mountain Landfill Site	1+1	Company representative, Local government representatives
Suzhou / Sanyuansi Village Community	2	Community representatives
Suzhou / Shuiyun Community	2	Community representatives
Suzhou / Everbright Environmental Energy Co., Ltd	2	Company representatives
Suzhou SZT Renewable Resources Recycling Co., Ltd	2	Company representatives
Suzhou Huayan Environmental Industry Development Co., Ltd	2	Company representatives
	Bengbu City	

Institution or Affiliation	Number persons	Position and name
Bureau of Housing and Urban-Rural Development Bengbu	3	Local government representatives
Environment Sanitation Management Bureau of Bengbu Municipality	2	Waste related professionals in governmental authority
	Tai'an City	
Environment Sanitation Management Bureau of Tai'an Municipality	5	Waste related professionals in governmental authority
Tai'an Beijing Enterprises Environment Energy Development Co., Ltd	1	Company representative
Tai'an CAS Environmental Protection Engineering Co., Ltd	1	Company representative
	Lanzhou City	
Lanzhou Municipal Commission of Urban Management	4	Local government representatives
Lanzhou FengQuan Environmental Protection Group Co., Ltd	1	Company representative
Gansu China Bio Energy System Co., Ltd	1	Company representative
	Xi'an City	
Waste Segregation Service Centre Xi'an	2	Local government representatives
WELLE Environmental Group Co., Ltd	1	Company representative
Municipal Solid Waste Management Office Xi'an	1	Waste related professionals in governmental authority
TA Team 2 (national)	3	Team Leader
TA Team 2 (International)	5	Team Leader
		Third-Party (TP)
IGDP Innovative Green Development	1	Project Manager
Anhui Guoderunwu Env. Co. Ltd	1	Director
China Agricultural University	1	Professor
Torma	1	Director
Tsinghua University	1	Professor
Beijing Sinocarbon Co. Ltd	2	Consultants
China Urban Construction Design & Research Institute	2	Consultants
China Environmental Resources Technology	2	Consultants
TUS-Env Research Centre	1	Vice President

Annex G Minutes of the Kick-Off Meeting

Title：	NSP China Integrated Waste Management NAMA ELE of Technical Component
Date：	11/27/2020, 7:00 - 10:00 pm (CST)
Topic：	ELE Kick-off Workshop
Participants：	Ms. Dr. Anne Scheinberg (ELE) Mr. Matthias Schoenefeldt (ELE) Mr. Luca Petrarulo (ELE) Mr. Nabil Hudda (ELE) Mr. Dr. Li, Jinhui (ELE) Ms. Yang, Shuyan (Dr. Li's Assistant) Ms. Wang, Nannan (Dr. Li's Assistant) Mr. Qian, Mingyu, Project Director (NSP) Ms. Dr. Liu, Xiao, Senior Technical Advisor (NSP) Ms. Hou, Jingyue, Technical Advisor (NSP) Mr. Cai, Songliang, Technical Advisor (NSP) Ms. Liang, Chenyang, Communication Officer (NSP) Ms. Zhou, Yanwen, Junior Project Officer (NSP)

Opening:
Introduction of ELE and NSP team Main goal for this meeting is to align the understanding and key concept of this project between ELE and NSP team and to get a clear understanding of project, deeper knowledge of causality, assumptions and reasons for previous actions Mr. Luca Petrarulo introduced purpose, scope and objectives of ELE: Harmonize evolution and learning among different NSPs Two consulting companies AMBERO Consulting Gesellschaft GmbH (Germany), Oxford Policy Management (U.K.) conduct evaluation and leaning exercises in more than 20 NSPs around the world NAMA proposes transformational not innovative; Changing mind setup, monitor risks, learning by doing, finding best way to achieve results Clarify any lessons from project implementation, how we can use lessons to improve Statement of NSP team: Recognize importance of ELE, keep open mind on discussion and exchange with ELE team's, looking forward to experience learning from other NSPs and to improve the IWM NSP
Introduction of the China IWM NAMA project (PPT):
Dr. Liu Xiao introduced the project background and indicators as well as achievements/tasks accomplished. **Development of MSW management China:** Since 1980 first dumping landfill, started with incineration developing for more than 20 years afterwards, since 2019 waste segregation at source has become mandatory resource management will be the direction in future, but still need to be supported by international knowhow and to improve the whole waste management system in China China achieved basically 100% collection and treatment of MSW in urban area during past 40 years by developing sanitation landfills and incineration plants Aims for future: waste reduction/reuse/recycling, intensive management, from linear to circular economy and development of low carbon MSW management **China IWM NAMA project overview:** Theory of Change: transformation to integrated and low carbon waste management, induce China's mandatory waste segregation at source towards an integrated low-carbon waste management Project duration: Sep. 2017 – Sep. 2022; Budget: 8 M Euro Political partner: Ministry of Housing and Urban-Rural Development (MOHURD) Implementation partner: China Association of Urban Environmental Sanitation (CAUES)

Municipal partners: Suzhou, Xi'an, Taian, Lanzhou, Bengbu

Main project components:
Technical assistance to demonstration cities:
5 demo cities: Suzhou, Xi'an, Lanzhou, Bengbu and Tai'an, with a total population of about 18 million people benefit from NSP
Development and adaptation of the Key Performance Indicators (KPIs) for assessing integration level of the municipal waste management systems
Supports from international and national experts, one domestic monitoring consortium and one Sino-International technical consulting consortium
Prepare annual reports and advice on low carbon development
Technical, political and financial supports to local governmental authorities and decisionmakers (MSW management indicators, biodegradable waste management, PAYT scheme, etc)
Conduct Life Cycle Assessments (LCA) to visualize improvements and compare results to baseline
Show Best Available Technology (BAT) and Best Environmental Practice (BEP) and implementation a replicable financial sustainable business model
Solutions for kitchen waste treatment and financial sustainability

Policy advice:
Annual report to MOHURD, demo cities and other stakeholders
Annual steer committee meeting with all stakeholders, discuss achievements, next steps
Development of standards with CAUES: waste management KPIs, biodegradable waste treatment technology and landfill management guidelines
Involvement of GHG emission density into local standards

Analysis of GHG mitigation effects
Baseline study and semi-annual MRV in each demo cities
Each demo city had different results during baseline study, resulting in different improvement levels of GHG emission density after project implementation

Capacity building
2X annual low carbon IWM conferences in different cities
2X international cooperation sub-forum as side event of CAUES annual conference
Due to COVID-19 physical meeting opportunities were limited this year, online and livestreaming as new media source to reach more than 20k audience
In total, organized and attended in more than 30 workshops and seminars
Awareness raising activities for different stakeholders, supporting Xi'an to build up an education centre, and special handout for waste segregation education
IWM NAMA project website has 6,203 visits, and WeChat Account collected more than 1881 followers.

Private sector mobilization
Currently in China, Public-Private Partnership (PPP) is the normal business model for MSW collection/transportation and treatment, so private sector is quite important
Tailor made courses for private sector focus on low carbon development
Establish connections between investors, banks and leading companies

Next Steps:
Strengthen technical support and influence on demo cities and disseminations of successful business mode
Develop business model based on demo cities' practices
Leverage investment from private sector
Align national 2060 net-zero CO_2 goal to waste sector
Improve waste reduction, reuse and recycling rate, as well as data collection and management
Quantify the influence of waste reduction is challenging, ELE team might support NSP in this part

Discussion on PPT prepared by NSP team

Dr. Anne Scheinberg:
PPT shown by NSP presents activities and scope of work in a much better way as in the annual report
Try to more visualize project in future reports e.g. adding more photos and information

Integration and optimization factor of institutions missing

Annual report based on Theory of Change, demonstration of demo cities as biggest part of the project and how to lead them to the three dimensions of IWM and low carbon development
2 ways to present project: based on current NAMA Facility report template and based on the understanding of IWM and present the gap between BAU and BAT/BEP

Mr. Luca Petrarulo:
Definition and difference between waste management and IWM
Previously only waste disposal to landfill and energy recovery conducted as waste management in China
Improve material value from linear to a circular economy by increasing reduction, reuse and recycling performance, in addition to more awareness
Waste segregation as starting point of IWM, resulting in different kind of material flows and a systematic management system
An international concept of IWM considers three dimensions of waste management
Physical element: different waste fraction, treated by different technology and facilities
Stakeholders: waste management not only issue of government, combining citizen and private sector all together, involving new stakeholders
Strategy aspect: politics, health, education, social, environment etc.

Clarification discussion for specific questions from ELE team (PPT):

During the discussion, the following questions regarding the project and its implementation have been defined by the NSP team:

To what extent do the evaluators have the same understanding of the NSP (differences/ overlaps)? (what is IWM, how is the causality?)
Similar understanding from NSP and ELE team in physical and governance aspect of IWM
With introduction of NSP KPIs, the NSP focus more on the governance part and the further improvement on existing management systems
Before the NSP, the waste sector focused with physical aspects mainly

What is the status of the NSP outputs delivery?
Important activities: various advices to demo cities (TAs from two consortiums on low carbon development and IWM, short-term experts on landfill, biowaste treatment, waste segregation, LCA, financial tool, etc.); annual steer committee meeting gathers all stakeholder and government authorities for policy advice; capacity building and awareness raising activities on low carbon development and IWM for various stakeholders; emphasize the connection with private sector
At beginning the NSP had set a high importance on technology , but for the government the establishment of an integrated solution, including policy instrument like waste charging systems or “pay as you throw” shows same importance now
MBT plant which was proposed in the proposal is not considered by MOHURD and local government because of the waste segregation at source
Due to COVID-19 the activities of this year have been postponed, e.g. the quarantine measures for international experts
Disseminate the experiences to another 11 cities, where the demo cities act as sustainable replicable cases
China’s ETS is still not available for the waste sector, the benefits from low-carbon development is still not accessible for waste sector. But due to the 2060 carbon neutral commitment, the waste sector has already seen the importance of low-carbon development.

Is the NSP considering amendments, changes?
No amendments for the budget
3 international contractors: Sino-International technical consulting consortium, Adelphi, DTU apply innovative actions like online training courses due to COVID-19 restriction
Train the trainer and study tours to Europe will shift to a virtual solution or events in China; for next year it is also planned to combine online- and offline- events
an one year extension of the NSP due to COVID-19

What have been key barriers and opportunities encountered?
Waste segregation law in China positive for project implementation
Local government’s motivation on low carbon development increasing because of 2060 carbon neutral commitment
Keep working on awareness raising to highlight link between low carbon development and IWM
COVID-19 is one barrier for the international activities

How has the NSP been driving change (what worked well/ not so well)?
Baseline and two monitoring reports available
Technical Component of project already contributed much to the demo cities including technical assistance, policy recommendation and capacity building
Future improvements in technical standards, guidelines, private sector mobilization, reliable data collection and sharing

What is the strategy, methodology and roadmap of the implementation of the projects to achieve the result?
Monitoring and Evaluation methodology and report shows the strategy and achievement in the project
Completed a lot of activities on awareness raising of local government regarding low carbon development, but it is hard to monitor and the outputs can only be achieved on a long-term view; ask for suggestions from ELE team
Demo city (Suzhou) considered to include GHG emission reduction into their local waste management standard; in comparison to the local government of demo cities, other non-demo cities do not realize the relationship between waste and CO_2; important knowledge to achieve a transformational change

Discussion on PPT prepared by ELE team

Dr. Anne Scheinberg:
Financial projection related to Annex 8A, talks about financial consequences in demo cities; clarify ROI and consequences for the cities
Simple business model and BAU for projects at proposal time was disposal and incineration subsidized by government
After implementation of IWM, different waste fractions are treated by different technologies – 1st dimension of IWM
Try to induce the government to change towards a new business model
Changes in action: construction of new biogas facilities for kitchen waste around the demo cities
Project aims to modify or relocate subsidies and financing model of government in waste sector; besides energy generation subsidies, waste segregation, separated treatment, data collection and biogas production need to be supported
In demo cities (Suzhou and Xi'an) government partly finances and supports the establishment of whole system: waste collection, segregation, treatment and energy generation

Mr. Luca Petrarulo:
Concept of Green Recovery in China, as a result of COVID-19
No official policy specify the name of "Green Recovery", but some policy with similarities to Green Recovery concept
Government pay more focus and enhance infrastructure of environmental sanitation
Government stablished more healthcare and hazardous waste treatment facilities in demo cities

Dr. Anne Scheinberg:
Seen a baseline document, but not including the detailed data for each demo city e.g. waste quantity, CO_2 amount etc.
Share document with ELE team after the meeting

Mr. Luca Petrarulo:
Financial or technical/management component more important for the government to trigger transformational change
For the local governments, policy and environmental issues are ranked as top priority
Financial part is ranked second as waste management casually sets infrastructure and local governments have the budget to establish and support in this part

Dr. Anne Scheinberg:
Is there a desire for specific recommendations in ELE report?
Opportunities to exchange and learn with other countries' NSPs
IWM NAMA China only has TC and no FC part, get better understanding of both mechanisms by knowing other NSPs
Recommend government of donor countries to show a strong commitment and support to the project, which will help to increase the political support of Chinese government

Next Steps:

By ELE team:
Interview with relevant stakeholders in the next 2 weeks, including final workshop afterwards
Summarize findings and introduce and discuss initial findings to NSP team
Brainstorm potential actions to integrate lessons in project activities

By NSP team:
Update list with all revenant stakeholders and third parties and arrange the Suzhou onsite visit

Annex H Detailed ELE Methodology

H.1 Inception Phase

During the Inception Phase, the ELE Team conducted a review of key NSP documentation, including:

1. The NSP Proposal, Theory of Change (ToC), Logical Framework, definitions, annexes and key deliverables,
2. Annual and Semi-Annual Reports, the NSP M&E Framework,
3. The ELE Theoretical Framework (FW), and
4. Deliverables and templates from the Chile SSRE ELE (the last ELE conducted before this one).

Because the proposal already included a ToC in Annex 1a, this was used as a point of departure. The reading of the proposal, and particularly the Annexes, raised several questions, because of which the ELE team made some additional inquiries to the TSU and contacted the consultant who prepared some of the Annexes, for additional information. For the first weeks, there was some lack of clarity as to the status of the baseline: one baseline on GHG emissions was provided by the NSP with the key documents but the other, the solid waste baseline and IWM strategy for the PCs was not available, and later it became clear that one part of this document had not yet been prepared, due to travel restrictions in connection to the COVID-19 pandemic.

As the methodology called for, the Inception Phase included three other activities:

- the evaluability analysis and production of the ELE matrix,
- customisation and submission of the ELE ToR, and
- preparation of the Kick-off workshop.

H.2 The Kick-Off Workshop

The Field Work Phase began with the ELE Kick-Off Workshop. The workshop was conducted in a hybrid format (i.e. both in-person and remotely), with two groups of NSP staff sitting together in a meeting room, one in the NSP office and one in a hotel in a different city. The Chinese ELE team member, Professor Li Jinhui, attended the meeting in the NSP office with his two project assistants. International ELE team members Dr. Anne Scheinberg and Matthias Schoenfeldt, the NSP ELE Programme Team Leader Luca Petrarulo, and Mr. Nabil Hudda (OPM) participated from their home offices in Europe, with a total participation of 13 persons from the NSP and ELE teams.

The purpose of the kick-off workshop was to:

- review, clarify and validate the purpose, scope and expectations of the ELE,
- clarify and validate the ELE team's interpretation of the ToC in the China IWM proposal, and
- make acquaintance and prepare for scheduling interviews.

The workshop started with an introduction and Q&A session of the ELE purposed, scope and discussion about the NSP Team’s expectations from it, the NSP Team presented their NSP and its

ToC, and provided a great deal of new information which the ELE team had not been able to understand from reading the proposal, reports, and other documents, perhaps because the full dossier is in Chinese, and the ELE team was generally limited to the English official reports.

During the interviews, the NSP ToC was updated and made more precise and detailed, since neither the initial underlying problems, nor the context, nor the activities, were presented in detail in the initial ToC. The ELE team's detailed ToC was validated in the Validation Workshop and is presented in Figure 3, in Section 3. This also became the basis for the Causal Pathways diagram and the Red-Amber-Green (RAG) analysis, respectively in Section 3 and Section 4.

The workshop was followed by questions from the ELE Team on the parts of the NSP that were reported in the NSP presentation and requests for additional clarification. The presentation was very robust and included a great deal of new information that had not been clearly understood from a review of the project documents, so this part of the workshop was very informative. After that, the ELE Team presented their understanding of the NSP and the ToC and there were more questions and answers and discussion. Because it was the source of so much information, the Minutes of the Kick-off workshop is included as Annex G.

H.3 Chinese and English Interviews

The fieldwork was conducted in two parts: English interviews, all of which were digital, and Chinese site visits and interviews, which were split between in-person and digital contacts.

The data from the document review and the ToC served as a reference point to develop a tailored matrix including the ELEQs (ELE Matrix – see Annex B), which the ELE Team then integrated with the initial hypotheses to be tested by the digital and in-person Key Informant Interviews (KIIs) and site visits in Suzhou.

Working with the NSP team, the ELE Team identified three general categories of stakeholders**:**

1. **NSP Team (NT):** individual members of the NSP Delivery Partners and Implementing Partners, the performance of whom is directly assessed by the ELE;
2. **NSP Stakeholders (NS):** individual, government, organisational or company stakeholders and their representatives who have actively participated in one or more NSP activities; and
3. **Third Parties (TP):** individual, government, organisational or company stakeholders and their representatives who are acquainted with the NSP through a passive relationship to one or more NSP activities, and/or are working on similar or relevant issues.

At the same time, the Chinese ELE Team members worked on the organisation and preparation of the field visit to Suzhou and the digital and in-person interviews, dividing them into the ones which could be done in English (about 20%), and the 80% for which the interview would have to be conducted in Chinese.

Table 12 presents the number of interviews and people interviewed (some calls had multiple interviewees) by each sampling category. For a detailed list of the institutions and organisations interviewed, refer to Annex F.

Table 12. Overview of the number of interviews and interviewees by sampling category

	NSP Team	NSP Stakeholders	Third Parties	TOTAL
No. interviews	2	23	9	**34**
No. interviewees	2	47	12	**61**[5]

The fieldwork began with 3 days of pre-testing the ELEQs in six English interviews with the NSP team and English-speaking NSP Stakeholders and Third Parties. During this time the ELEQs were refined and three versions of the questions were tested on the three categories of interviewees.

In the same period, there was also a field visit to Suzhou, one of the PCs, where the Chinese ELE team member, Professor Li, and his assistant, visited facilities, spoke with and interviewed several stakeholders, and conducted a group interview with the Suzhou City officials and facility owners (public and private sectors) involved in the NSP. China ELE Team Leader Dr. Scheinberg participated in this interview for the first hour (of three hours total), with consecutive interpretation, also to test the feasibility of doing interviews with interpretation. Several alternatives, including recording Chinese interviews and translating them later, or having a simultaneous interpreter at remote interpreting to a tape, were considered and rejected as being dependent upon recording, which could also inhibit the free exchange of information between interviewer and interviewee.

As a result of this piloting of the interviews and the Suzhou experiment with translation, the ELE team, in consultation with the ELE Programme Team Leader, concluded that neither interpretation nor recording was advisable, as both seemed likely to interfere with the ability of the Chinese ELE team member to elicit real information in a timely way.

Moreover, the consecutive interpretation would double the amount of time for the interviews, and simultaneous interpretation would be prohibitively expensive. As an alternative, Scheinberg and Li presented AMBERO, the ELE contracting organisation, with a proposal for having each Chinese interview attended by one of Li's two assistants, who would take notes in Chinese and then fill in the ELE matrix in English. Despite the prediction that this would require up to three hours of processing time for each interview in real-time, it appeared to be the best alternative and was adopted.

H.4 Validation of the pre-test interviews and scheduling of all interviews

After the pre-test, there was a pause in scheduling to allow the ELE team to:

- validate the interview approach
- tailor the interviews for NSP staff, NSP stakeholders and third parties
- socialise the methodology of the ELE with the Chinese ELE member and his assistants
- finalise the translation of the ELEQs.

[5] The total number of persons interviewed includes those who attended the group interviews, but actually did not answer the questions. In the six interviews in the pilot cities, only one or two of the managers or leaders answered the questions, and the rest of the team listened. The TA team interview was a combined interview of TA Team 1 (3 persons) and TA Team 2 (5 persons for most of the time, a sixth for a short time). Here also, while a large number of persons were present, only two or three were actually answering the questions.

H.5 Primary data collection: the interview phase

Following the pre-test, there were 12 days of primary data collection, using in-depth interviews with the NSP Team and KIIs with NSP Stakeholders and Third Parties. The semi-structured interview format followed the ELEQs and the general structure was kept consistent among interviewees from the same sampling category. The semi-structured approach was also the basis for the translation of the ELE matrix to Chinese, where the Chinese team focused on the essence of the questions, not on a direct translation.

In all cases, the contents and wording of the questions were tailored to capture key knowledge from specific interviewees, cover knowledge gaps, test hypotheses and/or triangulate specific information. In all interviews, one person asked the questions and a second person wrote down the verbatim answers. Only two of the English interviews in the pre-test period were partially recorded using the Zoom platform, after this, all other interviews were captured by a note-taker.

Three different digital platforms were used for digital interviews:

1. the GIZ "home" Microsoft Teams platform was used for interviews with the NSP Team, as well as for the Kick-off Workshop and the Validation Workshop.
2. the Zoom platform was used for English interviews with NSP Stakeholders and Third Parties, and meetings of the ELE team.
3. The Tencent platform was used for Chinese digital interviews since Chinese citizens are not permitted to have a Zoom subscription and strongly discouraged from using Zoom.

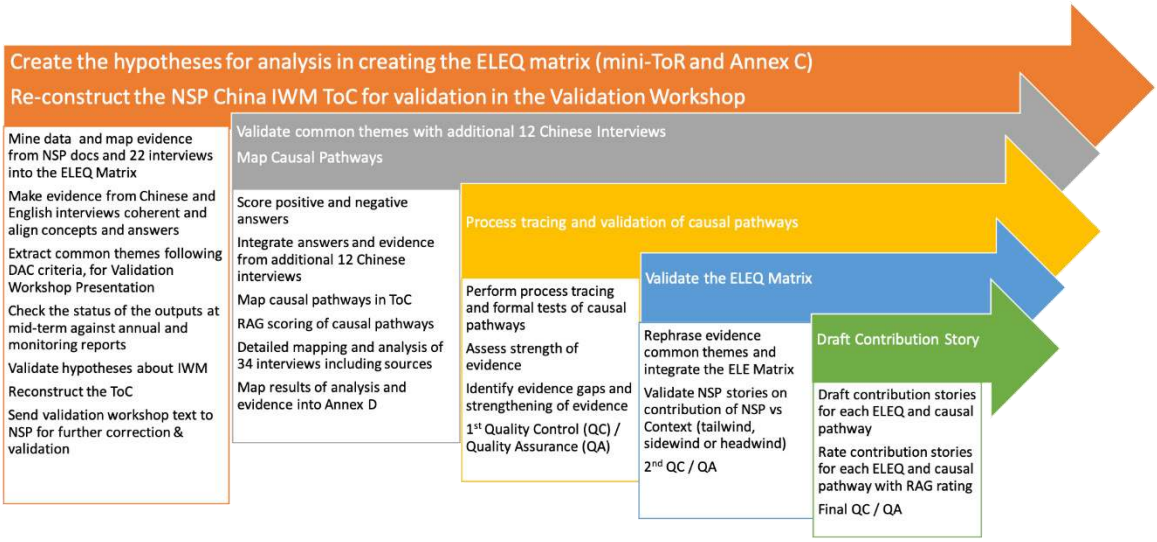
Unlike the previous ELEs, verbatim typing was selected as the method to capture the interview evidence. This is because the recording of in-person (physical) interviews was rejected by the Chinese ELE team member on the grounds that he believed that it would inhibit the free exchange of ideas and the willingness of NSP Stakeholders and Third-Parties to answer the questions in a relaxed and honest way. Moreover, recording of digital interviews is technically impossible with the license of Microsoft Teams held by the NSP team; neither is recording an available function of the authorised Chinese digital platform, Tencent, which was used for all digital interviews in Chinese.

Following the 12 days of interviews, the Chinese ELE assistants translated the Chinese interviews to English, putting answers directly into the ELE matrix. Digital translation was used for the rough translation and re-analysed by the Chinese ELE team member.

H.6 Data analysis and preparation for the Validation Workshop

In this ELE, the integration of primary and secondary data was done in a slightly different way than in previous ELEs, as shown in Figure 8. First, the answers to the first 22 interviews -- combining the English and the first translations of the Chinese -- were put into a Word file and scored generally, as to positive or negative, gaps or unclear, using colour highlighting. In this process, some of the ELEQs, which consistently did not deliver answers, were eliminated. This first discussion and scoring stimulated a number of discussions among the ELE team about some key issues in the interpretation of the core concept of the China IWM NSP, *Integrated Waste Management*, perhaps the most important concept in the ToC, but not necessarily understood by all stakeholders in the same way or on the same level.

Figure 8. Summary of the ELE analysis methodology used in the China IWM NSP ELE



The ELE team then elaborated some common themes, following the DAC criteria and corresponding to the PowerPoint slides in the Validation Workshop template.

Further analysis of the evidence in the interviews took place during the detailed preparation for the validation workshop, that is, before the interview mapping, because the original planning for the ELE had not taken into account the fact that 80% of the interviews required translation. This moved the analysis to an earlier stage in the ELE process than in the three previous ELEs and meant that a great deal of interview mapping took place in several digital meetings where the team applied their direct experience of the questions and answers in the interviews to produce the slides in the validation workshop.

The three members of the ELE team and the two Chinese assistants worked on the slides together, first using interview notes for extracting evidence from the 22 interviews that had already been translated by the time the Validation Workshop took place. Using the DAC criteria as a basis, the team next focused on the answers, identified common themes, and placed these themes and evidence directly into the slides of the draft presentation for the Validation Workshop. In a third step, the Chinese ELE team members checked these themes and evidence against the additional 10 Chinese interviews that had not yet been translated and added additional information and one or two additional slides to the presentation.

In terms of methodology, this meant that the main common themes and evidence were already available "in draft" at the time of the Validation Workshop, giving more weight to the validation process than was perhaps the case in the three previous ELEs. It also meant that the main identification of common themes was already finished before the interview mapping stage started.

The main objectives of the Validation Workshop were to review, discuss and validate the preliminary ELE findings, and identify ways to adapt the NSP based on the lessons identified. The atmosphere was relaxed and there were several fruitful discussions, and some remaining questions were answered: in the Validation Workshop, the NSP team for the first time was clear that their conception of IWM included the governance aspects, but that the activities related to these aspects had been deliberately delayed. After the Validation Workshop, the ELE team converted the

presentation to a Word document; the NSP team put their comments and corrections into that document, and it has been used as part of the evidence base to produce this ELE report.

By doing extensive analysis before the Validation Workshop, the ELE team in effect examined the evidence early, and later in the process returned to interview mapping and gathering of specific evidence, with a focus on *outputs*, since the evidence about outcomes and impacts in a mid-term ELE will be difficult to amass.

H.6.1 Interview Mapping

The ELE Team adapted the Excel interview mapping and analysis tool from a previous ELE and used it to gather evidence for answers the questions in the ELEQ matrix. The answers were coded for the three types of respondents, NSP Team (NT), NSP Stakeholder (NS) and Third Party (TP). The answers were classified by:

1. the OECD DAC criteria, used as organising principle
2. the “connotation” of the evidence (i.e. positive or negative),
3. the ToC themes that had been extracted for the Validation workshop, and
4. the interviews and documents distinguished by each “type of source” (i.e. NSP Team, NSP Stakeholder, Third Party), each identified by a unique reference number for each interview or document.

The answers were then transferred to the ELE matrix that is presented in Annex C. The evidence came from 34 interviews, the Kick-Off and Validation Workshops, and 29 internal and 2 public documents. This evidence was mapped across an ELE matrix with a total of 17 questions and sub-questions, some grouped, each with two "connotations", one for a positive and one for a negative assessment.

In this mid-term evaluation, it was sometimes necessary to ask the same question for DAC criteria relevance as for effectiveness, efficiency, and/or impact. Even though the context and DAC criteria were different, for the interviewees, the question appeared to be the same, and then their answers were the same, and many sources simply refused to answer a question that they (thought that they) had already answered, in an earlier section of the interview. So in the interview mapping, a methodological issue emerged about this. The ELE team, therefore, replicated answers in different places in the ELE matrix where the sources said, literally in the interview, "I already answered that question." This strategy for "gap-filling" was made possible by the fact that the responses to the interviews were typed, not recorded so that the typist was able to indicate when the respondent said they had already answered, but also when a respondent said that they could not answer the question.

H.6.2 Strength of Evidence

No answers were lost or eliminated in the interview mapping, but some answers looked the same. This is because they were replicated during the analysis. This replication gave a new interpretation to the thorough and iterative process of Quality Assurance / Quality Control (QA/QC) that allowed the ELE team to distribute evidence across those emerging themes that were similar or overlapping. The final result can be seen in the “Evidence and Answers to the ELE Matrix” in **Annex C.** In previous ELE's

the evidence was also scored on strength, as shown in Table 13. However, in this double-language ELE, with replicated answers, there was no clear way to tell if the strength of evidence would accurately reflect the circumstances of the answer. Moreover, the ELE team questioned the appropriateness of the translation of a factual and quantitative fact ("1 interview only, 2 interviews, 3+ interviews") to a qualitative scoring system with "Personal opinion, or Weak Evidence ... Very strong evidence". So in this ELE the team has left out any arbitrary conclusion of strength or weakness, and limited the concept of "strength of evidence" to purely refer to the number and type of sources.

Table 13. 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	Personal opinion		
2 interviews	Weak evidence	Medium evidence	
3+ interviews	Medium evidence	Strong evidence	Very strong evidence

H.6.3 Process Tracing and RAG Analysis

An additional method that was used to assess the strength of the evidence sustaining the different causal pathways of the NSP ToC was the application of *process tracing* tests. Process tracing is an evaluation method that applies formal tests to the evidence to assess the causality between the initial hypotheses and what is observed. Annex D presents the results of applying the process tracing formal tests to the causal pathways of the NSP ToC.

Chapter 4 of this report uses the evidence and emerging themes discussed above to present the ELE Team's findings in terms of the performance of the NSP against the OECD DAC criteria (relevance, effectiveness, efficiency, impact and sustainability) and (under the effectiveness criteria) its performance against the ToC outputs. Performance is summarized for each DAC criterion and /or ToC output (for a mid-term ELE), in the form of a Red-Amber-Green (RAG) rating, as follows: Green for good to very good performance; Amber for some progress but problems also identified and/or indicating a break in the causal chain, and; Red signalling serious deficiencies in performance.

H.7 Reporting and presentation phase

The final phase in the ELE methodology is the Reporting and Presentation Phase. During this phase, the ELE Team compiled this report and, after a peer-review internal to the NAMA Facility and the NSP, is now due to present the ELE findings to:

1. the TSU;
2. the NAMA Facility Donors;
3. the NSP Team; and ideally,

4. all the interviewed stakeholders.

H.8 Methodological aspects of working in China

Before concluding the methodological section, a few words need to be said about the fact that this ELE was facing a number of external circumstances that had not emerged in previous ELEs, all of which took place in Latin America. Working in China required creative response of the ELE team and the ELE organisations on some fronts. Therefore, it is worth crystallising the **lessons for future ELEs**, which fall into five topic areas.

1. **Language:** ELE-4 was the first ELE to be conducted in English in a country as geopolitically important as China, and, despite initial indications from the TSU that the ELE would be conducted in English, in reality the number of stakeholders who agreed to be interviewed in English was quite small. The ELE team had only one Chinese speaker, and three English speakers including the Chinese member. And in practice more than 80% of all NSP stakeholders had insufficient English skills level to be interviewed in English, and most of those who could speak English was the NSP Team and Third Parties. This meant that the ELE team had to invent an entirely new approach to scheduling, conducting, registering, and analysing the interviews. A first distinction had to be made between English and Chinese language interviews, and a second one between digital and in-person interviews. Involving an interpreter in an in-person Chinese interview was not only expensive but likely to create an atmosphere too formal for getting a good response. Involving an interpreter in a digital Chinese interview was rejected for a different reason: consecutive translation, the only option in the Chinese Tencent platform, would have doubled the amount of time spent in interviews and pressured both the interviewees and the project timelines. A third strategy of recording the interviews and translating them afterwards would have required every respondent to agree to be recorded, which was risky and also likely to compromise the quality of the interview. The strategy adopted was to ask the Chinese team member to use two English-speaking academic assistants, and ensure that one of them was always present to take the notes in Chinese. This worked well but required one week to translate the first set of 18 Chinese interviews into English to be analysed in time for the Validation Workshop, followed by a second week for the remaining 10 interviews, which served to further validate and refine the evidence and mapping.
2. **Public service culture:** The main impact was that recording was not possible, so all interviews had to be recorded by typing verbatim. This had an unexpected benefit, though, and that was that notes could be directly registered in the ELE matrix, which made the analysis more efficient later.
3. **Digital communication:** Because of the restrictions to digital communication enforced by the Chinese government, the ability to use communication platforms that are common in Europe, and some of which were used in previous ELEs, faced some challenges during this ELE. For example, Zoom, the platform provided by the Ambero / OPM consortium to the ELE Team, is not fully accessible in China: Chinese can attend a Zoom meeting, but they cannot host one. This restricted the ability of the National ELE Expert to organise digital interviews on Zoom. Therefore, the digital platform called Tencent, the most popular in China, was used for all digital Chinese-language interviews. Unfortunately, the current Tencent conference version has a recording feature, but it does not have a simultaneous interpretation feature like Zoom.

Moreover, unlike in previous ELEs in which ELE Team members could communicate effectively via WhatsApp, this was not possible as WhatsApp is blocked in China. In addition, email communications between the ELE Team members in Europe and China were frequently blocked, delivery declined, or simply never appeared to the desired receiver. It was, therefore, necessary for all of the non-Chinese ELE team members to open a WeChat account if they wanted to communicate with the Chinese team smoothly. Finally, the Chinese team member succeeded to open a WeTransfer account to make the file transfers at the end of the project more reliable.

4. **Due diligence of original interview dossiers:** These circumstances combined meant that the evidence base for this ELE was split between English and Chinese ELEQ dossiers and notes so that the team couldn't lay all of the interviews next to each other in their original form. This created the imperative to innovate and resulted in moving the first phase of the analysis forward and doing it largely orally and in preparation for the Validation Workshop. It also means that the raw data from the original 28 Chinese interviews are available only in the original Chinese, some typed and some handwritten, and not in English, and also that there is no archive of recorded interviews.
5. **Working during COVID-19 second and third peaks in Europe:** While there was no restriction on in-person meetings in China at the time of this ELE, communication and translation might have been easier if ELE International team members had been in China, but this was impossible due to travel restrictions resulting from the COVID-19 pandemic *in Europe*. One main limitation resulting from COVID-19 was that of time differences: with a seven-hour time difference, China and Western Europe have only a three-hour overlap during the working day. Despite this, the interviews were completed and analysed in a professional and timely way.