KfW Development Bank

Ex post evaluation
Climate and Environment in Urban Areas, People's Republic of China

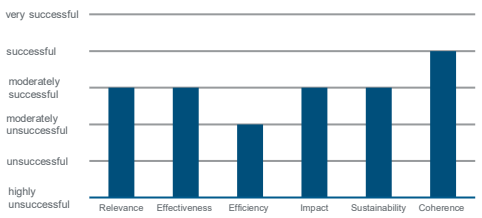
Title	"Infrastructure for Climate and Environment in Urban Areas – Energy Efficient Refurbishment of Residential Buildings in Tangshan" component (EEB Tangshan)		
Sector and CRS code	Biosphere protection / 41020		
Project number	BMZ No. 2008 66 616		
Commissioned by	Federal Ministry for Economic Cooperation and Development (BMZ)		
Recipient/Project-executing agency	Government of the PRC, represented by the Ministry of Finance/Tangshan Affordable Housing Project Investment & Construction Co. Ltd.		
Project volume/ Financing instrument	*EUR 23.0 million, loan under Financial Cooperation (* concessional loan)		
Project duration	*11 December 2012 to 26 November 2018*		
Year of report	2023	**Year of random sample**	2020

Objectives and project outline

The programme's objective at outcome level was the sustainable use of energy-efficient and climate-friendly infrastructure in China's urban area. At impact level, the aim was to contribute to combating global climate change.

The programme consisted of two modules. One module was completely rescinded in the course of implementation for compliance reasons in agreement with all parties involved. The second module had to be adjusted several times due to internal and external factors with regard to the project, and implementation was significantly delayed.

Overall rating:
moderately successful



Key findings

The project was of particular political relevance and had a high degree of internal coherence, while its development effectiveness remained below expectations. The project was rated as being "moderately successful" for the following reasons:

- The relevance of the project was successful thanks to the open programme approach and the resulting greater focus on the partner's policies and priorities, as well as the project's ability to adapt, but the poor involvement of the homeowners proved to be a serious problem.
- The project's internal coherence was extremely successful thanks to the use of synergies from the German DC instruments, while external synergies with other donors were limited by the open programme approach.
- Efficiency was moderately unsuccessful in spite of the expected high macroeconomic and social effects due to the moderate implementation efficiency and the three-year delay of completion.
- The developmental impact was only moderately successful, as rebound effects still bring the actual achievement of the calculated target value into question, at least at the time of the project completion report.
- Partners and project-executing agencies are able and willing to maintain the results, but the risks of inadequate maintenance are also rated as fairly high due to the nature of ownership, which is why sustainability is rated as moderately successful.

Conclusions

- The complementary integration of FC and TC through development policy departmental research refines the design and favours the scaling effects of FC measures.
- Involving apartment owners at an early stage of project implementation is a critical element for the success of energy-efficient housing refurbishment projects.
- The higher German energy efficiency standard was not able to fully convince the Chinese side, primarily for cost reasons.

Ex post evaluation – rating according to OECD-DAC criteria

General conditions and classification of the project

The evaluated FC programme was still implemented and completed as part of bilateral development cooperation (DC) between China and Germany. Bilateral DC between the two countries has now come to an end as a result of China's rapid growth. In the "BMZ 2030" reform concept, China is classified as a global partner with whom the German Federal Ministry for Economic Cooperation and Development (BMZ) is now working strategically.

The FC programme was set up as an "open" programme. Since 2021, the Federal Ministry for Economic Cooperation and Development (BMZ) has no longer referred to FC programmes, but to intended topics with the following two variants: (a) criteria-based *with* additional KfW-internal appraisal and (b) criteria-based *without* KfW-internal appraisal. The latter are comparable to the previous "open" programmes, such as the present project in China, i.e. similar measures with a common target system, which are bundled in a criteria-based module proposal. These are many small, homogeneous measures with one executing agency (or a constellation of several executing agencies for the entire project) and similar risks. The evaluated project is similar to today's intended topics, i.e. a "project to reduce emissions by financing urban infrastructure services in China", in which several small, largely identical measures are carried out in different cities in China.

The evaluated FC programme consisted of two modules. Module II was terminated in the course of implementation due to suspected cases of compliance violations on the part of the Chinese project-executing agency, and the loan was fully rescinded in agreement with all parties involved. For reasons of transparency and accountability, the evaluation refers to the overall programme, but the cancelled module is evaluated exclusively under the relevance criterion for the evaluation questions of the (i) alignment with policies and priorities; (ii) appropriateness of the design and (iii) adaptability or "relevance of termination". The evaluation of the cancelled module is not included in the overall rating of the criterion relevance or the overall rating of the FC programme, on the grounds that neither developmental impacts nor material damage can be attributed to Module II as a result of the mutually agreed rescission.

Timeline: EPE China, climate and environmental protection in urban areas

* Program Climate & Environmental Infrastructure in Urban Areas | * Module I: EEB Tangshan | * Module II: EEB Tonghua and replacement project DH Jinzhong

November 9, 2009
Program Proposal Project "**Climate and Environmental Infrastructure in Urban Areas**". Designed as an open program to support model and demonstration projects for solutions in the fields of energy, transport, waste and wastewater management.

October 20, 2011
Identification of 2 components with Chinese partners (reporting 2011)
- Module I: Energy efficient building refurbishment **Tangshan** (planned: 23.6 million EUR)
- Module II: Energy efficient building refurbishment **Tonghua** (planned: 36.3 million EUR)

November, 2012
EEB Tonghua: On-site progress monitoring reveals inconsistencies regarding scope and quality of rehabilitation measures carried out.

February 15, 2013
EEB Tonghua: Audit of use of funds by external auditors (reporting 2012-13).

March 31, 2014
EEB Tonghua: KfW submits final BMZ reporting for the project (reporting 2014).

August 29, 2014
DH Jinzhong: Project appraisal "District heating".

December 12, 2014
EEB Tonghua: EEB Tonghua: Amendment of loan agreement. With BMZ approval, agreement with Chinese MoF to fully repatriate disbursed funds of EUR 32.3m to KfW and leave loan to MoF in place for an alternative project.

April, 2015
EEB Tangshan: Second reduction of project volume due to sharp fall in exchange rate and thus significantly reduced RMB equivalent of German funding, and temporary suspension of the project with MoF support due to lack of residents' own contributions (reporting 2015).

March, 2016
EEB Tangshan: Third reduction of the project volume (on 120 apartments in 4 districts) due to deletion of Xiangfuli district and due to difficulties and compromises with several residents regarding the replacement of windows (reporting 2015).

April 6, 2017
***replacement project* DH Jinzhong**: KfW submits the final reporting for the project. For compliance reasons, it recommends terminating the project (reporting 2017).

June 30, 2017
***replacement project* DH Jinzhong:** Termination agreement

2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018

September 10, 2010
Concrete definition of possible locations and single components with Chinese partners (reporting 2010).

April 8, 2012
EEB Tonghua: Project review "Energy Efficient Refurbishment of Residential Buildings in Tonghua": 294 residential buildings in 10 districts of Tonghua; 43,000 residents; total estimated cost EUR 36.3 million; loan agreement, April 9, 2012.

10. December, 2012
EEB Tangshan: Project review "Energy Efficient Refurbishment of Residential Buildings in Tangshan": 198 residential buildings in 7 districts of Tangshan; 34,000 residents; estimated total cost EUR 23.0 million (approx. RMB 377.5 million); Loan agreement (DV), December 10, 2012.

September, 2013
EEB Tangshan: Progress review leads to the first reduction of the project scope (from 198 to 175 buildings, Caochangjie district cancelled).

March, 2014 *(according to reporting 2014)*
EEB Tangshan: Draft of the tender documents has deficiencies. The executing agency is requested to make improvements and is supported in this by the consultant.

2014
replacement project DH Jinzhong: Loan agreement "Jinzhong District Heating": supply of district heating to two city districts; 231,000 inhabitants.

March 31, 2015
EEB Tangshan: Since March 3, 2015, offers for supplies & services are available, which are reviewed by the project executing agency and implementation consultant (reporting 2015).

January, 2016
replacement project DH Jinzhong: Delayed publication of the invitation to tender for supplies & services and expected delay in completed construction work of around one year to the fourth quarter of 2017 (reporting 2016).

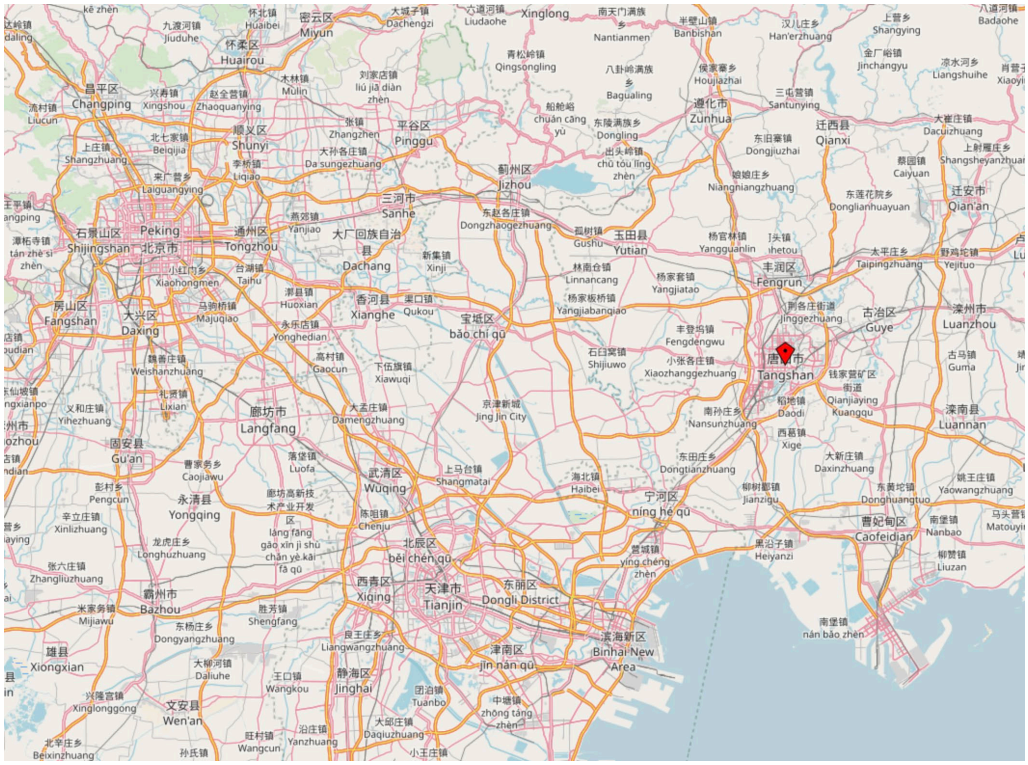
August, 2016
***replacement project* DH Jinzhong**: KfW first receives information about repeated compliance case in July 2016, which the implementation consultant investigates on site and confirms in his audit report dated August 19, 2016 (reporting 2017).

November 26, 2018
EEB Tangshan: Report of the final inspection

Brief description of the project

The project was designed as an open programme. The individual components were to lead to the reduction of specific greenhouse gas emissions by promoting pilot and demonstration projects and thus contribute to combating climate change globally. Under the open programme, urban infrastructure investments in the areas of energy, wastewater disposal and transport, which make a substantial contribution to reducing climate-damaging emissions, should be eligible. In addition to the benefits at global level, the population living in the catchment area of the respective component was to benefit as the direct target group. Sites and components were specified in accordance with the Chinese administrative requirements and German specifications in the course of implementation. As is customary for open programmes of this type, the individual components were examined by KfW in accordance with the usual criteria and, in the event of a favourable review result, loan agreements were concluded as tranches of the total loan. The total costs in the programme proposal amounted to up to EUR 120 million with an anticipated Chinese counterpart contribution of 50%. To this end, EUR 60 million in FC funds were to be provided as a reduced-interest loan.

Figure 1: Project location City of Tangshan, China



Source: https://openstreetmap.de

Breakdown of total costs

EUR million	Inv. (planned)	Inv. (actual)	Module I (planned)	Module I (actual)	Module II (planned)	Module II (actual)
Investment costs (total)	**120**	**21.31**	**46**	**21.31**	**74**	**--**
Counterpart contribution	58	1.69	23	1.69	35	--
Debt financing	62	19.69	23	19.62	39	--
Of which budget funds	*10 (RIL)*	*0.115*	*0.469*	*0.115*	*0.469*	--

Rating according to OECD-DAC criteria

Relevance

Policy and priority focus

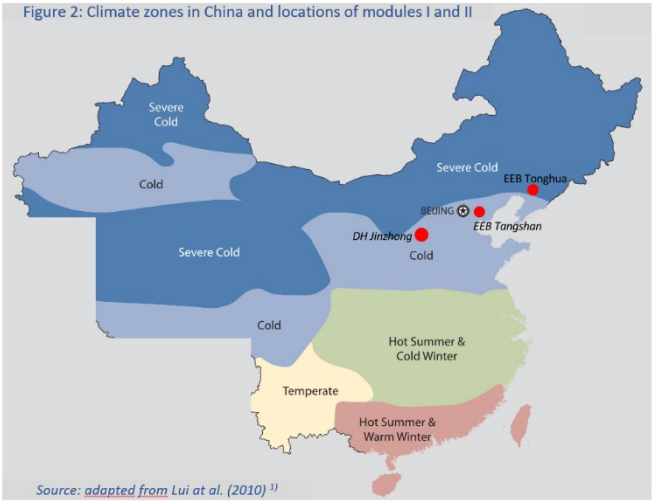
At the time of the programme appraisal (PA) in 2009, China had already achieved some of the Millennium Development Goals (MDGs). The “Climate and Environment in Urban Areas” programme took particular account of MDG 7 “Ensure environmental sustainability” by reducing CO_2 emissions (an indicator of MDG 7). The programme was consistent with the priorities of the Chinese government’s 11th five-year plan (2006–2010). This emphasised the resource-efficient and environmentally friendly development of the energy sector with the aim of reducing energy intensity by 20% during this period.

China’s government sought to position the country as a responsible climate actor in the run-up to the UN Climate Change Conference in Copenhagen in December 2009. In previous years, extensive government programmes were launched to increase energy efficiency and the share of renewable energies in the energy supply. Increasing energy efficiency in the area of urban infrastructure was an essential element of this strategy.

The programme was in line with the objectives of the Tangshan and Tonghua municipal authorities in the area of energy-efficient refurbishment of buildings as well as the Jinzhong municipality with regard to the energy-efficient supply of district heating. The promotion of the energy-efficient refurbishment of existing buildings as well as the development and implementation of heating reforms are among the main tasks of the municipal authorities in the northern provinces in which the three project locations are found (cf. Figure 2, below). Local governments are responsible for implementing the political requirements and enforcing the regulations. To meet these challenges, the programme worked with the local governments of Tangshan, Tonghua and Jinzhong.

In China, the energy efficiency of buildings and the reform of the district heating sector are essential elements of a low-carbon development strategy in the 16 provinces with cold climates (cf. Figure 2: climate zones in China). Heating is a legal requirement in these provinces. Energy efficiency of buildings and the reform of the heating sector go hand in hand. The design as an open programme for climate-relevant measures in urban areas has opened up the opportunity to help China reduce its CO_2 emissions in a multi-sectoral and flexible approach. The programme was also not regionally limited. This took into account the fact that climate action is a national task in China and is equally on the agenda in all provinces. The partner side (planning and specialist institutions or communities) submitted applications for individual modules in the programme in accordance with the relevant procedures established on the Chinese side.

Figure 2: Climate zones in China and locations of modules I and II



Source: adapted from Lui et al. (2010) [1]

In order to reduce energy intensity in the housing sector, the government of China introduced measures to promote heat metering and energy retrofitting (HMEER) in northern regions in 2007. The programme was jointly led and monitored by the Ministry of Housing and Urban-Rural Development (MOHURD) and the Ministry of Finance (MoF). MOHURD adopted a directive in October 2000 for retrofitting existing buildings with and without central heating located in the extremely cold and cold zones. In 2008, MOHURD published a document stating that the heating intensity after refurbishment should be reduced by 50% (as observed in the

target systems of the EEB measures) compared to the heating intensity of buildings in the 1980s.[1] The objectives of the FC programme took particular account of the relevant political and legal framework conditions.

The central government's willingness to develop programmes for the thermal refurbishment of residential buildings was high. At the same time, it did not have sufficient resources to fund all the provincial initiatives.

The FC programme was in line with the climate and environmental protection efforts agreed in the Joint declaration from the German-Chinese intergovernmental consultations. It was embedded in the Federal Ministry for Economic Cooperation and Development (BMZ) priority area of "Environmental policy, protection and sustainable use of natural resources" and the political advice of technical cooperation (TC). Within the priority area, a number of action areas (energy and climate protection, urban development, environmentally friendly transport systems) were relevant, with the action area of energy and climate protection standing out due to the explicit connection to climate action. The programme directly linked to other FC projects for climate action (in particular the Climate and Energy Programme China, BMZ No. 2008 66 608), but focused on financing urban infrastructure services.

The need for action for an Environmental Impact Assessment (EIA) was checked for each component. An EIA was carried out for the DH Jinzhong project, which was approved by the Chinese Ministry of Ecology and Environment on 29 May 2014. For the EEB projects in Tangshan and Tonghua, there was no need to perform an EIA during the project appraisal in 2012. In 2018, safety risks were criticised in several buildings in the EEB Tangshan project, which KfW Development Bank insisted on eliminating with reference to the ESIA criteria introduced in the meantime. KfW's reliable control mechanisms were able to detect suspected compliance violations on the part of the project-executing agencies in Module II. In close coordination with the Federal Ministry for Economic Cooperation and Development (BMZ) and the Chinese Ministry of Finance, an amicable solution for reducing corruption in DC projects was found with the loan being rescinded in line with the Federal Ministry for Economic Cooperation and Development's (BMZ) new "Anti-corruption and integrity" quality criterion.

Focus on needs and capacities of participants and stakeholders

Table 1. Direct target groups of the measures in Modules I and II

Module I	Module II	
EEB Tangshan	EEB Tonghua	DH Jinzhong replacement project
34,000 residents in 198 residential buildings in seven residential areas	43,000 residents in 294 residential buildings in ten residential areas	231,000 residents or 57,750 households in two districts

The residents of the selected cities and residential buildings benefited as a direct target group from the FC programme (see Table 1). The two EEB measures in Tangshan and Tonghua were geared towards the needs of the direct target group via the goal of increasing the level of comfort for residents. Insulated buildings provide better protection against cold outdoor temperatures, reduce indoor air pollution and reduce health risks from mould. The objectives of the district heating project in Jinzhong were aimed at the residents of the two districts supplied with district heating. The FC measure was intended to benefit the entire population in the broader sense thanks to the improved air quality in the Jinzhong metropolitan area and, at a global level, all due to the positive climate and environmental impacts.

The introduction of energy efficiency measures in refurbishment projects, especially in existing centrally heated residential buildings, is a particularly challenging task and an area where technical activities and results (outputs) alone do not lead to positive changes at the level of the direct target group (outcomes). The core problems are technical and institutional in nature. When renovating existing residential buildings to improve energy efficiency, apartment owners must be actively involved at an early stage. This was only taken into account to a limited extent in the objectives of the FC measures in Tangshan and Tonghua. The interventions of the two FC projects

[1] Filippini, M., & Zhang, L. 2019. Impacts of heat metering and efficiency retrofit policy on residential energy consumption in China. *Environmental Economics and Policy Studies*, 21(2): 203–216; Lang, S. 2004. Progress in energy-efficiency standards for residential buildings in China. *Energy and Buildings*, 36(12): 1191–1196.
[2] Liu, F., Meyer, A. S., & Hogan, J. F. 2010. Mainstreaming Building Energy Efficiency Codes in Developing Countries. *World Bank Working Papers*.

were aimed in particular at the needs and capacities of the municipal project-executing agencies, i.e. the transfer of technical *know-how* and quality assurance in the construction of the energy efficiency measures.

Appropriateness of design

The design of the FC programme was appropriate and coherent. A balance was found between cost, rigour and complexity to ensure verification of the target system. A fundamental challenge in energy efficiency projects is that project complexity, degree of uncertainty, existing energy management systems and the risk allocation for savings achieved have an effect on the costs of the monitoring and evaluation system. The programme had ensured due precision in this regard, while ensuring reasonable costs for measuring target achievement.

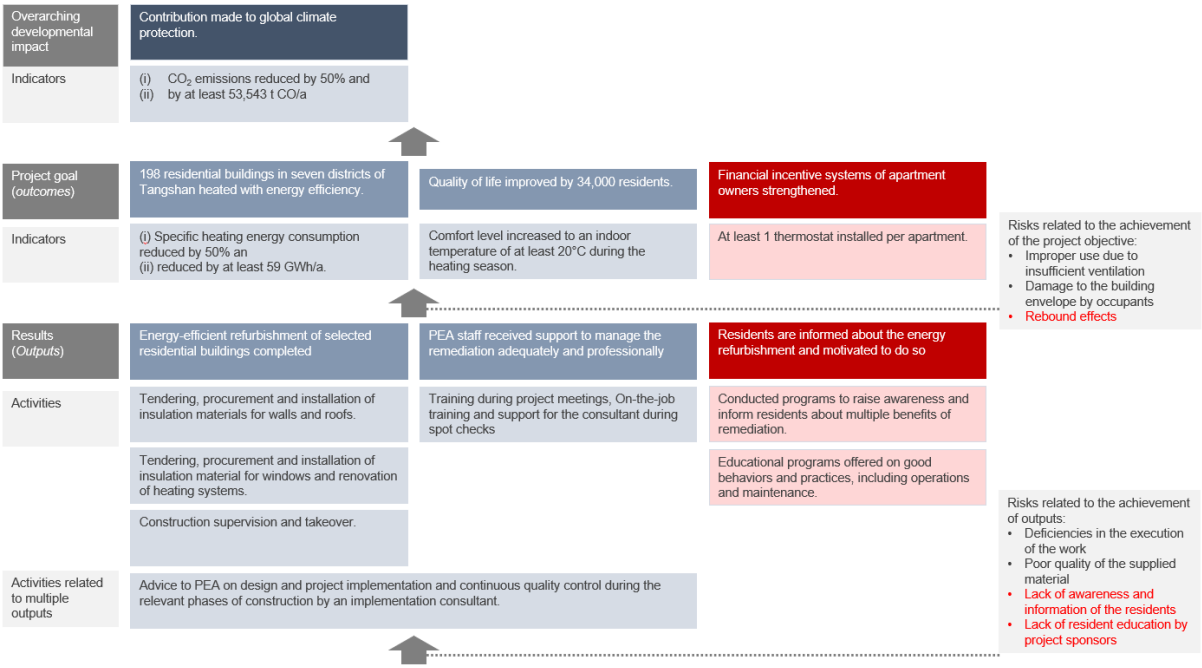
Reproducible pilot and demonstration projects in the area of urban infrastructure were financed with the aid of the FC programme. Sustainable use of the energy-efficient and climate-friendly infrastructure provided (outcome) was intended to reduce the specific emissions of CO_2 and other greenhouse gases. The programme intended to contribute to combating climate change (impact) in this way. Reducing the emissions increase was also expected to reduce air, water and soil pollution as well as the resulting health hazards.

The impact chains of Modules I and II were streamlined and practical with 1 to 2 outcomes and 2 to 5 outputs per measure. Together, all three measures had the overarching developmental objective (*impact*) of the overall programme “to make a contribution to global climate change mitigation”:

- **Module I, EEB Tangshan**: The project purpose (*outcome*) was to heat 198 residential buildings in seven residential areas of Tangshan in an energy-efficient manner and improve the living conditions of the 34,000 residents.
- **Module II, EEB Tonghua**: The project purpose (*outcome*) was to heat 294 residential buildings in ten residential areas of Tonghua in an energy-efficient manner.
- **Module II, DH Jinzhong** (replacement measure): the project purpose (*outcome*) was to supply two districts of the city of Jinzhong with energy-efficient and environmentally friendly district heating.

For all three FC measures, the executing agencies received support from international implementation consultants during implementation in order to ensure quality control and the transfer of *know-how*. This is logical, common international practice and proven.

From today’s perspective and for the relevance of the target group, it seems reasonable to take into account an expansion of the assessment criteria for the target group’s inclusion, including potential risks during implementation (cf. additions in red in Figure 3). Effective awareness campaigns among residents are essential to complement the technical construction measures. A corresponding reconstruction of the *Theory of Change* is illustrated in Figure 3 using only the example of the EEB Tangshan project, as the other two EEB Tonghua and DH Jinzhong projects were terminated.



Response to changes/adaptability

The FC programme strategy did not have to be adjusted during implementation. However, changed framework conditions and various risk situations required several adjustments to the sub-components of the programme. KfW's regular progress reviews and accompanying quality assurance by international implementation consultants ensured that risks for the FC modules were quickly identified and solutions were promptly developed. KfW and the Chinese Ministry of Finance (MoF) were particularly responsive and adaptable, and risk management in the FC programme was fully effective.

Originally, the FC programme was fully allocated with the two projects EEB Tangshan (Module I) and EEB Tonghua (Module II), with the exception of residual funds of EUR 0.635 million. As part of an on-site progress review in November 2013, KfW found discrepancies in the scope and quality of the refurbishment measures carried out in Module II, e.g. with regard to the number of windows replaced, the thickness of the insulation materials installed and with regard to the location and number of the renovated buildings, which was confirmed by external auditors as part of an audit of the use of funds initiated by KfW. Due to the misappropriation of funds by the project-executing agency, this FC measure was terminated on 31 March 2014 and the FC funds disbursed up to that point were returned. It has been agreed with the Chinese government that the total loan funds of this module amounting to EUR 36.365 million will be invested in an alternative measure.

The EEB Tangshan project was adjusted and reduced three times (see Table 2). The first adjustment was carried out in September 2013 because the apartment owners were not willing to make their own financial contributions for the building refurbishment, contrary to what was anticipated at the start of the project. Due to the strong devaluation of the euro, the project scope had to be adjusted a second time in April 2015. In March 2016, sufficient consent of the apartment owners to parts of the refurbishment measures led to the fact that neither the windows (in around 70% of the buildings), nor the heating systems (in around 50% of the buildings) could be replaced or renovated to the agreed extent. The project scope was reduced a third time.

Table 2: Adjustments to the EEB Tangshan project

	Adjustment 1	Adjustment 2	Adjustment 3
Year	September 2013	April 2015	March 2016
Result	Reduction of energy-efficient refurbishment to 175 buildings in six districts	Reduction of energy-efficient refurbishment to 158 buildings in five districts	Reduction of energy-efficient refurbishment to 119 buildings in four districts

In view of the discrepancies arising in Module II in Tonghua, KfW also intensified its risk management for Module I in Tangshan. It strengthened the local presence of the contracted international consulting companies and ensured even closer follow-up with regular local progress reviews by KfW's Beijing office and KfW headquarters. In coordination with the Chinese Ministry of Finance, the DH Jinzhong project was identified as a replacement project for EEB Tonghua and subjected to an assessment by KfW (internal report dated 29 August 2014). The project-executing agency in Jinzhong entered into the existing loan agreement for the EEB Tonghua project, which was reassigned accordingly on 12 December 2014 by means of an amendment. Other compliance-relevant anomalies suggested that the project-executing agency wanted to refinance measures already implemented in a national programme via the FC loan and ultimately led to the end of cooperation on Module II. The underlying loan agreement was terminated by mutual agreement with the Chinese Ministry of Finance on 30 July 2017. The relevance of the loan agreement reversal was convincingly declared and documented in the "Termination Agreement", in-house reporting and to the Federal Ministry for Economic Cooperation and Development (BMZ).

Summary of the rating:

The objectives of the measure are highly relevant, taking into account the policies and priorities of the Chinese partner government and the German Federal Government. This also applies to the exceptionally high adaptability and consistently appropriate response to changes in the framework conditions, some of which were severe. The concept was solid and comprehensible, but, according to the current state of affairs, it was only suitable to a very limited extent to effectively involve the direct target group of residents. The relevance is rated as moderately successful overall.

Relevance: 3

Coherence

Internal coherence

The programme directly linked to other FC projects for climate action (in particular the Climate and Energy Programme China, BMZ No. 2008 66 608), but focused on financing urban infrastructure services. At the time of the project appraisal, the city of Tangshan in the Hebei province 200 kilometres east of Beijing was a well-known pilot city for energy-efficient refurbishment by German DC and other donors.

During the period between 2005–2008, three residential buildings in Tangshan were renovated as a pilot project with the support of the then German Agency for Technical Cooperation (GTZ). The experience gained in this process was incorporated directly into the significantly more extensive EEB Tangshan FC project with 198 planned residential buildings, as the implementation consultant had already advised the TC project in the FC project. Furthermore, a study was published in 2008 by the German Development Institute (DIE) on China's energy efficiency policy for buildings under the co-authorship of employees from the German Development Institute, KfW, German Agency for Technical Cooperation (GTZ) and the Friedrich Ebert Foundation (FES).[3] The instruments of Germany's DC interacted in a particularly meaningful way, both conceptually and in terms of personnel in implementation and quality assurance. The open FC programme and its pilot and demonstration project EEB Tangshan was a very suitable scaling of the TC pilot project, regardless of the adjustments made to the project scope.

[3] Richerzhagen, C., Frieling, T. von, Hansen, N., Minnaert, A., Netzer, N., et al. 2008. *Energy efficiency in buildings in China: Policies, barriers and opportunities (DIE Studies, 41)*. Bonn: Deutsches Institut für Entwicklungspolitik (German Development Institute).

External coherence

Due to the open programme approach, the possibility of external synergies with other donors was restricted or explicitly focused on complementarity with the partner's own efforts.

The FC measure fully utilised the existing systems and structures of the partner side. The interventions were fully complementary and consistent with the Chinese partners' own efforts at national and municipal level. The EEB Tangshan FC project was prepared by the responsible planning and specialist institutions and supported in its implementation. The project application was submitted via the usual procedural channels established by China. The borrower was the Chinese Ministry of Finance (MoF) representing the People's Republic of China. The FC funds were forwarded to the project-executing agency in the city of Tangshan via an on-lending bank, the *Export-Import Bank of China (Exim Bank*). The executing agency, *Tangshan Affordable Housing Project Investment & Construction Co. Ltd*. is a wholly state-owned company, which was founded in 2010 specifically for the refurbishment of Tangshan municipal residential buildings and is subject to the supervision of the municipal building authority, *the Tangshan Municipal Bureau of Housing & Urban-Rural Development.*

The supplies and services financed by FC (insulation materials for roofs and exterior walls, thermal insulation windows, room thermostat valves, etc.) were tendered internationally. The project-executing agency assigned the implementation of the tender to what is known as a *window company, Instrimpex International Tendering Company.* The project-executing agency itself was responsible for ensuring project monitoring. Construction supervision was carried out by local inspectors in accordance with Chinese regulations. The basic data for the evaluation and repeated adjustment of the target indicators were compiled by a Chinese research institute on behalf of the project-executing agency.

The FC programme was not classified as a programme-based approach in the design phase. As a result, there was no standardised comprehensive programme and budget framework and no formalised process of donor coordination and harmonisation. Rather, the project supported the Chinese partners' own efforts (subsidiarity) in particular. The approach of the open programme explicitly provided that the components derive from the plans of the respective ministries and other government bodies and that they assume leadership during implementation.

Summary of the rating:

The synergies between the German DC instruments were used well beyond FC and TC. Due to the open programme approach, the possibility of external synergies with other donors was restricted or explicitly focused on complementarity with the partner's own efforts. The FC project extensively used all the relevant systems and structures of the partner country at national and municipal level. Coherence is rated as successful overall.

Coherence: 2

Effectiveness

Achievement of (intended) targets

The adapted target was the energy-efficient heating of 119 residential buildings in four districts of Tangshan with a total of 22,000 residents. The target level of absolute heating energy savings has been updated according to the adjustment of the project scope.

The target achievement at outcome level is summarised in the table below:

Indicator	Status during PA	Target according to EPE	Actual value at final inspection	Actual value at EPE
(1) Reduction of specific heating energy consumption and absolute heating energy savings	N/A	50% and at least 37.6 GWh/a	62% and at least 51.74 GWh/a	Value achieved
(2) Increase in the comfort level of residents	Baseline 2012: significantly below 18^0C	Internal temperature of at least 20^0C during the heating period	Above 25^0C	Value achieved

The FC project objectives were achieved well beyond the expected target level.

The indicators were determined based on a heat demand calculation for the refurbished buildings carried out by a Chinese research institute for building technology and energy efficiency. However, the actual heat consumption of the refurbished buildings had hardly decreased or not decreased at all during the final inspection. While the apartments had an interior temperature well below 18°C before the energy-efficient refurbishment, the residents now heated their apartments to over 25°C at the time of the final review with the same heat input. It must be taken into account that at this point, the possible consumption-based billing with the new heating valves was not applied directly and corresponding financial incentives to reduce the energy consumption of heating energy had not yet taken effect.

Contribution to achieving targets

Implemented all refurbishment measures agreed at the time of the appraisal, which were based on the requirements of the German Energy Saving Ordinance (ENeV 2009):

- Insulation of the outer walls (12cm [2]; λ: 0.042 W/m*K3) with a 12cm thick exterior insulation finishing system to reduce transmission losses.
- Insulation and complete refurbishment of the roofs (14cm; λ: 0.033 W/m*K) with high-quality insulation material (extruded polystyrene hard foam, XPS) in a thickness of 14cm to significantly reduce the transmission losses of the roofs. In addition, all roofs are sealed with appropriate foils to prevent building damage due to moisture penetration from the roofs.
- Installation of heat-insulated glass windows (k-value: 2.0 W/m [2] K; g: 0.65[4]). The single-glazed steel, aluminium or framed windows were replaced with thermal insulation glazing, and frames made of materials with a good insulating effect were used (e.g. plastic frames).
- Rehabilitating the heating system: As a prerequisite for a later introduction of consumption-dependent heat tariffs, the residential buildings were equipped with room thermostat valves and devices for recording consumption. In addition, the connecting lines of the existing district heating distribution system in the affected districts were insulated.

Furthermore, the old house doors of the refurbished residential buildings were replaced with new, heat-insulated doors, and the cellar ceilings of the buildings were insulated. The residents of the refurbished residential buildings in Tangshan benefited from the FC measure as a direct target group. Their living comfort has been increased by the measure. Despite the problems with facade and window refurbishment, the rehabilitation of the heating systems went very well. According to the implementation consultant's report, the residents were very satisfied with the new technology and with the good instructions from the heating company. As part of the EPE, the project-executing agency expressed they were pleased that most residents supported the project. Positive feedback from residents to the project-executing agency mainly refers to the higher temperature in the apartments in winter, but also to the reduced noise.

The services provided by the international implementation consultant (quality control for the implemented measures and transfer of *know-how)* were used extensively and valued by the project-executing agency. The project-executing agency rated the support as excellent, efficient and helpful.

Measures such as a target group analysis or separate gender analysis were not taken into account in the FC project. From today's perspective, taking into account gender-specific issues that could have been relevant to the FC project and providing gender-disaggregated data on the impacts of the energy efficiency measures and the assessment of gender mainstreaming opportunities as part of the project implementation could have additionally supported significant gender impact potential of the FC project.[4]

Quality of implementation

Implementation of the FC measure with regard to target achievement was successful overall, but could only be achieved with enormous additional effort on the part of KfW project management and the implementation consultant. In 2015, a change in management at the project-executing agency led to inability to act for several weeks. The executing agency intended to renegotiate previous agreements and technical specifications.

On the advice of KfW and the subsequent instruction from the Chinese Ministry of Finance (MoF), the project-executing agency had to provisionally suspend the implementation due to non-compliance with the agreed project concept and instead had to develop a proposal for how the project could still be successfully completed. In the meantime, KfW had considerable doubts that the project could be successfully implemented. Until then, KfW had stopped disbursement of the supply contract. It was discussed with the Chinese side that the advance payment of the supply contract cannot be settled for the time being due to the significant deviation from the agreed project concept. Accordingly, the Chinese side had not submitted the down payment request to KfW.

The Chinese Ministry of Finance's degree of commitment was high throughout the implementation and was always solution- and result-oriented in critical project situations. The successful continuation and completion of the project were primarily attributed to KfW's close and effective communication with the Chinese Ministry of Finance and the proactive commitment of KfW project management and the international implementation consultant.

Unintended consequences (positive or negative)

Unintentional side effects for the direct target group of residents repeatedly presented the FC project with serious problems. It turned out that, by July 2015, the majority of the direct target group had not been informed at all about the upcoming refurbishment measures and, above all, not about their counterpart contribution of RMB 110/m. According to the implementation consultant, there were a maximum of eight out of 158 buildings in which all residents would agree to the refurbishment work. On KfW's side, this was surprising in view of the project preparation that had been underway for several years and the statement made by the project-executing agency in 2014 that 80% of the residents had already agreed to the renovation measures, as well as the supply and service contract for the project already concluded at the time.

A recently published study[5] focused on the main risks associated with energy refurbishment of residential buildings in China. A questionnaire survey was carried out to obtain the opinion of experts in government departments, property developers and architectural firms and to investigate the significance of various known risks. The study found that most of the risks are associated with owners on the one hand, and public-sector executing agencies on the other, with these risks predominantly arising on site during the construction phase. The study took into account various risks, some of which were already anticipated during the project appraisal of the FC project, such as deficiencies in the execution of the work or inadequate quality of the delivered material.

These risks were also verified in the empirical study, but were classified as less significant in the statistical evaluation. Risks associated with the owners were much more significant. The implementation of energy refurbishment projects requires the consent of most (more than 2/3) owners in an apartment building in China. It is common for them to lack knowledge and information about renovation measures and their benefits. On the side of the public

[4] Cf. GCF. 2015. Gender Assessment. FP010: De-Risking and Scaling-up Investment in Energy Efficient Building Retrofits. Armenia: UNDP

[5] Jia, L. et al. 2021. Exploring key risks of energy retrofit of residential buildings in China with transaction cost considerations, in: Journal of Cleaner Production, Issue 239.

project-executing agencies, insufficient communication and support services are mentioned. In combination, this leads to a lack of cooperation and opportunistic renegotiations between owners and project-executing agencies, from the perspective of the interviewees with the most significant key risks.

In connection with the *safeguards*, the FC project had successfully learned lessons from risks arising in the context of the FC programme. Appropriate compensatory measures were taken with the early intensification of KfW's follow-up and on-site supervision by the implementation consultant. The risk mitigation mechanisms of the FC measure were generally suitable and always functioned. As early as 2012, the call for tenders from the international implementation consultant called for an increased local presence and an agreement was reached with the project-executing agency on a time schedule that provided for the refurbishment measures to be extended over a period of at least two years (2013 and 2014) in order to prevent potential quality deficiencies due to time pressure. In addition, the follow-up was intensified with regular on-site progress reviews.

The financing plan agreed upon with the Chinese side during the appraisal provided that around 25% of the total costs of the FC measure (around RMB 95 million, equivalent to approx. EUR 11.5 million) be provided from the residents' own funds. The intended use of the funds was to finance thermal insulation windows and refurbish heating systems. In the course of obtaining the residents' written consent to the cost sharing, it was found that a large proportion of the residents had already exchanged existing windows for (single-glazed) insulated glass windows at their own expense and were not prepared to make the required capital available in full. Since energy-efficient renovation can only be guaranteed with simultaneous insulation of the exterior walls and the installation of high-quality heat-insulated glass windows, it was decided, in view of the pilot nature of the project, to dispense with all residents' contribution to the window replacement. In subsequent negotiations between the executing agency and the provincial government, the number of buildings to be refurbished was reduced accordingly from 198 to 175 buildings. As a result of the cost savings, the residents' contributions were reduced by RMB 25 million. The implementation concept and financing model were adapted accordingly.

Summary of the rating:

The project objectives were fully achieved. The FC measure consistently drew effective lessons from experience and always developed appropriate strategies to respond to internal and external risks. However, temporary unintended negative effects occurred, and the impacts of the project only materialised after a three-year delay. The effectiveness is rated as moderately successful overall.

Effectiveness: 3

Efficiency

Production efficiency

At the project appraisal (PA), the microeconomic internal interest rate, i.e. the *financial rate of return* (FIRR) of the project, was calculated to assess microeconomic profitability. As a result of the heavily subsidised heating cost tariffs in China, there was a negative financial rate of return of -3%. However, the measure focused on contributing to climate action and improving the residents' quality of life. It was also stated that the building structures were significantly upgraded. Due to the high macroeconomic and social effects as well as the high energy subsidies, a macroeconomic view was rated as more expedient.

The efficiency of project implementation in the FC project was only moderate. The majority of outputs were not created within the planned period. The project was assessed on site in September 2012 and the loan agreement was signed in December 2012. At the time of the project appraisal, a total term of 22 months (March 2013 to December 2014) was assumed for the project. Due to numerous problems and delays and a temporary suspension of implementation, the implementation period was extended to 58 months (March 2013 to December 2017). The total delay of three years was long.

Due to delays in the course of the project, the consulting contract had to be increased a total of four times. The significant rise in the share of total costs for consulting services was appropriate in view of the long-term delay and several project adjustments.

Despite delays in implementation and currency fluctuations, the project achieved its overarching developmental goal and its adjusted project purpose. The extent to which the low implementation efficiency is comparable with other EEB projects for KfW's residential buildings and other institutions in China and in the sector could not be determined as part of the evaluation due to a lack of comparative evaluations.

Allocation efficiency

At the time of the project appraisal, the project's macroeconomic profitability was calculated on the basis of the assumption that the FC measure would achieve cost savings for energy generation by reducing heating energy consumption. It was assumed that the application of the future energy tariff equivalent to EUR 0.02/kWh is far from sufficient to cover the actual costs of energy provision. Due to the lack of availability of reliable data, the conservative assumption of a tariff of EUR 0.04/kWh that covers overall costs was assumed. In addition, the proceeds were used for CO_2 certificates, which, however, had fallen drastically in 2012 to below EUR 1 per certificate since the last round of negotiations in Durban in 2011. Under these conservative assumptions, the macroeconomic rate of return amounted to 2%. This did not take into account other non-monetisable macroeconomic effects that had a positive effect on the measure's eligibility for promotion:

- reducing atmospheric pollutants (sulphur dioxide, nitrogen oxide and dust emissions) and thus improving the air quality and quality of life of residents in the respective districts;
- as a result of the collapse of the market in 2011, an assessment of the CO_2 savings caused by the measures via the price of certificates led to a downward biassed result, which insufficiently reflected the actual benefits;
- improvement of the quality of life of the residents through the significant upgrades to the building structures.

Taking into account the overall effects, sufficient macroeconomic profitability was assumed at the project appraisal (PA).

A *rebound* effect, which was identified in the FC project during the final review, had not yet been taken into account in this forecast. Accordingly, the actual heat consumption of the refurbished buildings had barely fallen, if at all. While the apartments had an interior temperature well below 18°C before the energy refurbishment, the residents now heated their apartments to over 25°C with the same heat input. The *rebound* effect refers to the part of energy savings lost due to consumer reactions as a result of energy efficiency improvements. It is the difference between the actual reduction in energy consumption and the predicted reduction in energy consumption, a forecast that does not take into account the behaviour and reactions of consumers.[6] The *rebound* effect is a complex phenomenon and is difficult to estimate. Given the complexity of the environment and economic model, it was not possible to validate and recalculate these estimates using up-to-date information as part of the evaluation. However, it is assumed that the impacts will be achieved with a permanently appropriate operational and economic outlay and that sufficient macroeconomic profitability will continue to exist.

The positive impacts of the FC project could have been increased with more effective involvement of the direct target group. International experiences show how essential information and awareness-raising campaigns are for the residents of residential buildings in RE projects. In several countries, this task is assumed by private energy service companies (ESCOs) at national or urban level with corresponding technical and communication *expertise.* The number of ESCOs emerging on the Chinese market in the early 2000s grew rapidly.[7] ESCO activities rely on a simple mechanism: financing energy-efficient investment costs with the energy and cost savings achieved through these investments. Prerequisites for this are consumption-dependent heat tariffs and thermostatic valves in the apartments. In the case of the FC project, these prerequisites were only created after the project was completed. It would have to be assessed whether national ESCOs can be involved in FC projects as part of a complementary measure or international implementation consultants with corresponding *expertise*.

In recent years, bilateral and multilateral development banks have increasingly focused on the refurbishment of public buildings in the energy efficiency sector. It is not known whether this is a general trend or whether it is

[6] ESMAP. 2017. Assessing and Measuring the Performance of Energy Efficiency Projects. Washington, DC: World Bank Group.
[7] AFD. 2011. La réhabilitation énergétique des bâtiments Enjeux et méthodes Programme de recherche dans la province du Hubei en Chine. Paris: Agence Française de Développement.

related to the complexity and particular risks of the refurbishment of residential buildings. This approach is based, among other things, on an alternative impact model of what is known as *"leading by doing"*.[8] In many partner countries, governments are setting a good example by investing in the energy-efficient refurbishment of their own buildings. Other public agencies may consider paying more attention to improving the energy efficiency of schools, hospitals, administrative buildings and other institutions under their responsibility. These kinds of programmes could also provide for benefit sharing, where the savings could be divided between the school (for more teaching materials) and the city paying the energy bill, for example.

Summary of the rating:

The only moderate implementation efficiency is significantly below expectations. Despite assumed but not monetisable high macroeconomic and social effects, the efficiency of the project as a whole is rated as moderately unsuccessful.

Efficiency: 4

Impact

Overarching developmental changes (intended)

The overarching development objective was to contribute to global climate change mitigation. The CO_2 reduction target level has been updated in line with the adjustment of the project scope.

Target achievement at the impact level can be summarised as follows:

Indicator	Target value PA	Target value EPE	Actual value at final inspection	Actual value at EPE
(1) The CO_2 emissions are reduced	92,100 t/a	33,818 t/a	approx. 43,000 t/a	Value achieved

The overarching developmental objective was achieved well beyond the anticipated target level. However, the delay of the intended time schedule lasting for several years led to the developmental impacts occurring much later than expected.

The evaluation assumes that the *rebound* effect (heating of the apartments to more than 25°C) determined directly during the final inspection may have decreased in the following years, as, in addition to the technical requirements due to the installation of the heating valves as part of the FC measure, the legal foundations and financial incentives for consumption-based heating billing were also applied as a result. Due to the difficult conditions on site, it was not possible to have a survey carried out among the residents as part of the EPE nor to update the calculation of the target values.

As part of the EPE survey, the implementation consultant pointed out that the Chinese government had sold the apartments to the former tenants at the end of the 90s with an enormous renovation backlog for little money. The buildings were built very quickly and with poor quality after the severe earthquake in 1976, which was estimated to have killed more than 500,000 people. The apartments are extremely small, on average approx. 40 to 45 m^2. The owners belong to the lower income group. It can be assumed that the FC project contributed overall to protecting the interests of low-income, vulnerable groups and to safeguarding social justice.

Several internal project factors led to significant delays and a gradual reduction in the project scope and thus also in the original developmental ambition level of the FC project. These included, among other things, time and qualitative backlogs in the preparation of the tender documents by the project-executing agency, repeated adjustments to the project scope, in each case combined with a structural assessment and calculation as well as

[8] Baeumler, A. et al. 2012. Sustainable Low-Carbon City Development in China. Washington, DC: World Bank Group.

recalculation and adjustment of the target levels, several renewals of the international implementation consultant's contracts and, last but not least, insufficient involvement of the residents in the project implementation and the resulting resistance to individual refurbishment measures. Externally, currency depreciation made it necessary to further reduce the scope of the project.

By designing the FC programme as an "open programme", the intent was to use the individual modules as reproducible pilot and demonstration projects. The energy-efficient refurbishment measures of the FC project were based on the requirements of the Energy Saving Ordinance (ENeV 2009) applicable in Germany at the time and exceeded the Chinese requirements. As part of the project completion report, the executing agency pointed out that the city of Tangshan will continue to apply the lower Chinese energy efficiency standards for self-financed refurbishment projects, as compliance with the standards from the FC module is financially unsustainable according to the executing agency. Despite the pilot and demonstration character of the FC project, the further application and adoption of Germany's standard by the Chinese partners in Tangshan was hoped for and an implicit endeavour, but not a formal objective of the FC measure. The target formulations at impact level were therefore realistically stated with regard to the level of ambition.

Due to the sheer mass of buildings to be refurbished in China, the official maxim was and remains renovating as much and as quickly as possible and at as high a quality as necessary. It can be assumed that both the Chinese Ministry of Finance and the executing agency were aware of the high standard at the time of the project appraisal and wanted to learn from the model for large-scale refurbishment. In Tangshan, 20.4 million m² of buildings were renovated between 2009 and the end of 2011. 16.3 million m² of this refurbishment only concerned the heating systems. Selective problems were solved by replacing the windows in some buildings and replacing the heating in others. The FC project successfully conveyed a holistic approach that incorporated insulation for the outer walls and roofs, window replacement and heating refurbishment. The approach (model) was new and the implementation (demonstration) inspired the partners. This was also associated with the insight that the high German standard according to the Energy Saving Ordinance (ENeV 2009) at the time was not transferable in its entirety to China.

As part of the EPE, the project-executing agency confirmed that it was able to successfully apply several structural procedures and recommendations from the implementation consultant in the FC project and in subsequent projects, which were new to the executing agency at the time. According to the implementation consultant, the Chinese partners included and accepted many technical details and solutions in the EPE interview. For example, the quality and thickness of the insulation materials or the coating of the new windows. Although house doors were planned in the selected buildings, they were not customary. Heat-insulated front doors were therefore also installed. The partner side focused on the high standard in the FC project and developed simple, pragmatic and cost-effective solutions where necessary. Room and radiator thermostats were too expensive locally. Alternatively, valves were installed in the building corridors in front of the apartment doors on the heating pipes. These were used to measure the time period of the heat supply and determine the energy consumption per apartment. The FC project shows great potential for replication of the approaches and results.

Summary of the rating:

The developmental objective was clearly achieved, but significantly later than planned. Furthermore, the hope and implicit aspirations for the Chinese partners to adopt the higher German energy efficiency standard were not fulfilled. Nevertheless, the FC project shows great replication potential for the construction approaches taught and results as the basis for effective, large-scale CO_2 reduction. The positive results dominate, even if the project is below expectations. The developmental impact is rated as moderately successful overall.

Impact: 3

Sustainability

Capacities of participants and stakeholders

With the executing agency, *Tangshan Affordable Housing Project Investment & Construction Co. Ltd.,* a wholly state-owned company was founded in 2010 specifically for the refurbishment of Tangshan's municipal residential buildings. As a municipal special purpose vehicle, the project-executing agency – which still exists today and

maintains contact with the KfW office in China – is subject to supervision by the municipal building authority (*Tangshan Municipal Bureau of Housing & Urban-Rural Development*) and receives sufficient funds from Chinese budget funds (central and provincial government as well as municipal funds) to cover both its investment and operating costs, so that, during project appraisal, it was right to assume that the executing agency had sufficient financing, which is likely to continue to be the case. With a workforce (at the project appraisal in 2012) of 108 employees, of which around 30% were engineers, the personnel requirements were also met to ensure the sustainable operation of the systems.

Contribution to supporting sustainable capacities

The *housing and management* stations, together with the municipal building authority, secured the maintenance of the buildings refurbished using the FC measure and financed them with previously planned municipal budget funds. In addition, instructions were provided for the residents on correct user behaviour. According to statements by the project-executing agency as part of the EPE, scheduled repairs to maintain and ensure upkeep for the energy-efficient refurbishment in the buildings have been carried out since the FC project was completed. More detailed information on the scope, type and frequency of the maintenance measures carried out since the project's final inspection could not be obtained from the executing agency. The empirical study previously cited on various risk factors in energy refurbishment of residential buildings in China[9] classifies the risk of inadequate maintenance as high, but the risk of difficulties with repairs after refurbishment is low.

Durability of impacts over time

At national level, the continued strong commitment of the central government to the promotion of energy efficiency has a positive effect. Energy-efficient renovation of residential buildings is a long-term priority for both China's national government and Tangshan's city government in the current five-year plan (2021–2025) and beyond. According to the Ministry of Housing and Urban-Rural Development (MOHURD), the results of the energy efficiency reform programmes in Chinese pilot cities have helped to maintain the dynamic situation of energy efficiency in China. Some of the pioneering cities, including Chengde and Tianjin in addition to Tangshan, are frequently invited to workshops at national and provincial level to share their experiences with other cities.[10] An advertising video produced by the project-executing agency in the final phase of the measure emphasises the role and cooperation with KfW. It is a clear indication that, in addition to the opportunities for the city, there is also a will to present, follow up and spread the positive results and experiences of the cooperation.

Summary of the rating:

The partner and the project-executing agency are able and willing to maintain the positive effects. Since the risks of inadequate maintenance are nevertheless considered high, sustainability is rated as moderately successful overall.

Sustainability: 3

Overall rating: 3

* *A particular weighting of individual scores is not needed despite the "open programme approach" and the political importance and special role of bilateral relations with China.*

Contributions to the 2030 Agenda

By reducing CO_2 emissions, the FC programme contributes to SDG 13 ("Climate action") in particular. The programme promoted and used cooperation between Chinese institutions at different levels as well as planning and specialist institutions with regard to climate-sensitive sectors. In addition to the ecological contribution to climate

[9] Jia, L. et al. 2021. Exploring key risks of energy retrofit of residential buildings in China with transaction cost considerations, in: Journal of Cleaner Production, Issue 239.
[10] IEG. 2015. Heat Reform and Building Energy Efficiency Project (HRBEE) China. ICR Review. Washington, DC: World Bank Group

action, the focus of the energy efficiency project in the city of Tangshan was also on improving the quality of life of the residents of the residential buildings refurbished to be more energy efficient. Unintended adverse interactions resulted from the inadequate involvement of the target group by the project-executing agency, which led to resistance of the residents to individual renovation measures and a delay in project implementation. The FC project and its target system were consistent with the minimum temperatures recommended by the World Health Organization (WHO) in private buildings to guarantee adequate thermal comfort, which are 18°C for healthy people and 20°C for the sick, disabled, very old or very young people. The owners of the refurbished apartments belong to the lower income group. It can be assumed that the FC project contributed overall to protecting the interests of low-income, vulnerable groups and to safeguarding social justice. The FC project has increased living comfort and prevented the health-endangering risks of mould growth. The social, health and economic resilience of residents has been strengthened for the long term.

Project-specific strengths and weaknesses as well as cross-project conclusions and lessons learned

The project had the following strengths and weaknesses in particular[11]:

- The instruments of Germany's Development Cooperation (DC) have been exceptionally well intertwined, both in terms of timing and overlap, as well as in terms of content-related and strategic synergies. This applies in particular to the GTZ pilot measures with the Ministry of Housing and Urban-Rural Development (MOHURD) in Tangshan and other cities, the overlapping departmental research of the German Development Institute (DIE) in cooperation with the *Chinese Academy of Social Sciences* (CASS) on the political framework conditions for the energy-efficient refurbishment of buildings in China and finally the open programme of KfW with the Ministry of Finance (MoF) with the option of scaling up the energy-efficient refurbishment of residential buildings to a much greater extent via FC.

- The design and implementation of the project had a structural bias, in which the transfer of *know-how* and the quality assurance of the high energy efficiency standard with respect to the project-executing agency were in the foreground, while the transfer of *know-how* and quality assurance for the early and ongoing involvement of the direct target group by the project-executing agency (and the need for its corresponding support by national or international consultants) was underestimated and neglected from the outset.

Conclusions and *lessons learned*:

- In bilateral DC as well as strategic cooperation with global partners, the complementary integration of German FC and TC through development policy departmental research makes a significant contribution to strengthening the appropriateness of the design of FC measures (relevance), using synergies between German DC instruments (coherence) and promoting the scaling and widespread impact via FC measures (overarching developmental changes).

- Involving apartment owners at an early stage of project implementation is a critical element for the success of residential energy refurbishment projects.

- The priority on the Chinese side was to refurbish as many buildings as possible in a short time. The higher but also more expensive German energy efficiency standard inspired individual new approaches and technical solutions, but was not able to sustainably convince the Chinese partners to use this as a model standard.

Evaluation approach and methods

Methodology of the ex-post evaluation

The ex post evaluation follows the methodology of a rapid appraisal, which is a data-supported qualitative contribution analysis and constitutes an expert judgement. This approach ascribes impacts to the project through plausibility considerations which are based on a careful analysis of documents, data, facts and impressions. The possibility of using digital data sources and the use of state-of-the-art technologies (e.g. satellite data, geocoding) was examined, but could not be applied due to a lack of data records at the level of municipal residential areas in Tangshan. Causes for any contradictory information have been investigated. The assessment was based on statements that were confirmed – where possible – by several information sources (triangulation).

Documents: internal project documents, secondary specialist literature, country and sector analyses, comparable evaluations, *systematic reviews,* press releases

Data sources and analysis tools: data collections from international organisations, MAXQDA

Interview partners: International implementation consulting, project-executing agency, German Chamber of Commerce Abroad (AHK), KfW Operational Department, Beijing Office, Technical Expert.

The analysis of impacts is based on assumed causal relationships, documented in the results matrix developed during the project appraisal and updated during the ex post evaluation (see Figure 3). The evaluation report sets out arguments as to why the influencing factors in question were identified for the experienced effects and why the project under investigation was likely to make the contribution that it did (contribution analysis). The context of the development measure and its influence on results was taken into account. The conclusions were reported in relation to the availability and quality of the data. An evaluation concept was the frame of reference for the evaluation.

On average, the methods offer a balanced cost-benefit ratio for project evaluations that maintains a balance between the knowledge gained and the evaluation costs, and allows an assessment of the effectiveness of FC projects across all project evaluations. The individual ex post evaluation therefore does not meet the requirements of a scientific assessment in line with a clear causal analysis.

The following aspects limit the evaluation:

- Remote evaluation: an on-site evaluation was sought, but KfW's office in Beijing and KfW's central security service assessed both the coronavirus situation in China and the corresponding Chinese travel restrictions, resulting in a remote evaluation.
- Insufficient data situation: a survey of individual apartment owners by either the executing agency or an independent institute in China was examined. The executing agency assessed this as unrealistic and, with regard to an external institution, as not having a balanced cost-benefit ratio.

Methods used to evaluate project success

To evaluate the project according to OECD-DAC criteria, a six-step scale is used for all criteria except for the sustainability criterion. The scale is as follows:

Level 1 very successful: result clearly exceeds expectations

Level 2 successful: result is fully in line with expectations and has no significant shortcomings

Level 3 moderately successful: falls short of expectations but the positive results dominate

Level 4 moderately unsuccessful: significantly below expectations, with negative results dominating despite discernible positive results

Level 5 unsuccessful: despite some positive partial results, the negative results clearly dominate

Level 6 highly unsuccessful: the project has no impact or the situation has actually worsened

The overall rating on the six-point scale is compiled from a weighting of all six individual criteria as appropriate to the project in question. Rating levels 1-3 of the overall rating denote a "successful" project while rating levels 4-6 denote an "unsuccessful" project. It should be noted that a project can generally be considered developmentally “successful” only if the achievement of the project objective (“effectiveness”), the impact on the overall objective (“impact”) and the sustainability are rated at least “moderately successful” (level 3).

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ist of annexes:

Annex: Target system and indicators

Annex: Risk analysis

Annex: Recommendations for operation

Annex: Evaluation questions in line with OECD DAC criteria/ex post evaluation matrix

Annex: Target system and indicators

Project objective at outcome level	Rating of appropriateness (former and current view)
During project appraisal: Objective of the FC measure: Sustainable use of energy-efficient and climate-friendly infrastructure Module I: • EEB Tangshan 210 residential buildings in seven districts of Tangshan are heated in an energy-efficient manner and the living conditions of the 34,000 residents are improved Module II: • EEB Tonghua 294 residential buildings in ten districts of Tonghua are heated in an energy-efficient manner and the living conditions of the 43,000 residents are improved DH Jinzhong replacement project: Two districts in the city of Jinzhong are supplied with district heating in an energy-efficient and environmentally friendly manner	From the perspective at the time and in particular because it is an “open programme”, the project objectives are formulated appropriately at outcome level *(state-of-the-art)*. A balance was found between M&E cost, rigour and complexity. From today’s perspective, the project objectives at outcome level are only adequately formulated to a limited extent. • There are generally other non-energy-related benefits for the target groups, jobs and employment, public budgets or local electricity suppliers or the energy sector (see questions on unintended positive or negative impacts under the DAC criterion “Effectiveness”, below). • End users of the EEB projects (residents of the renovated residential buildings) are not/insufficiently differentiated. Low-income households generally benefit more from energy efficiency programmes in terms of health and comfort, as their initial conditions are generally worse than those of average-income households before the improvements • Measures to increase energy efficiency also improve energy security and the current account balance of countries dependent on energy imports. Nevertheless, it should be noted that in order to take into account *multiple or co-benefits* when assessing the benefits of energy efficiency projects, there is often a lack of local data, consensus for quantifying their impacts and monetary values, and resources for carrying out the analysis. An appropriate level of methodological rigour depends on several factors, e.g. the amount of M&E costs should be proportionate to the extent of the energy savings and non-energy-related benefits of the projects and take into account the project-executing agency’s M&E capacities. From the perspective at the time, this was the case in this project.

During EPE (if target modified): For the EPE, the goal is modified by the socio-economic benefits for residents					
Indicator	**Rating of appropriateness** (for example, regarding impact level, accuracy of fit, target level, smart criteria)	**PA target level** **Optional: EPE target level**	**PA status (year)**	**Status at final inspection (year)**	**Optional: EPE status (year)**
Indicator 1 (PA-Tangshan): The specific heating energy consumption is reduced	The indicator was and continues to be appropriate *(state-of-the-art).* It is formulated in a SMART and informative manner and can be measured with reasonable effort	50% corresponding to at least 87.4 GWh/y	** After three adjustments to project scope & quality by 2015: 50% corresponding to 37.6 GWh/y*	62% corresponding to 51.74 GWh/y	
Indicator 2 (PA-Tangshan) Increased comfort level of residents	The indicator was appropriate *(state-of-the-art).* From the perspective at the time and from today's perspective, it is also formulated in a SMART and informative manner and measurable with reasonable effort. From today's perspective, further socio-economic benefits of the residents (possibly also of the government, cities and electricity suppliers) would be taken into account	Internal temperature of at least 20^{O}C during the heating period	2012 baseline: significantly below 18^{O}C	Above 25^{O}C	
Indicator 4 (PA-Tonghua) The specific heating energy consumption is reduced	The indicator was and continues to be appropriate (*state-of-the-art*). It is formulated in a SMART and informative manner and can be measured with reasonable effort	50% corresponding to at least 136.7 GWh/y			
Indicator 5 (PA-Tonghua) Increased comfort level of residents	The indicator was appropriate (*state-of-the-art*). From today's perspective, further socio-economic benefits of the residents (possibly also of the government, cities and electricity suppliers) would be taken into account. It was and continues to be formulated in a SMART and informative manner and can be measured with reasonable effort	Internal temperature of at least 20^{O}C during the heating period			
Indicator 5 (PA-Jinzhong) Heat is provided	The indicator was and continues to be appropriate (*state-of-the-art*). It is formulated in a SMART and informative manner and can be measured with reasonable effort	3,685,746 GJ/y			
Indicator 6 (PA-Jinzhong)	The indicator was and continues to be appropriate (*state-of-the-art*). It is formulated in a SMART and informative manner and can be measured with reasonable effort	57,750 households or 231,000 people			

Households or people are supplied with district heating					
Project objective at impact level		**Rating of appropriateness (former and current view)**			
During project appraisal: Contributing to fighting global climate change		The goal of CO_2 reduction (Tangshan) was and still is appropriate from today's perspective, and the target value was updated according to the adjustment of the project scope.			
During EPE (if target modified): --					
Indicator	**Rating of appropriateness** (for example, regarding impact level, accuracy of fit, target level, smart criteria)	**Target level PA / EPE (new)**	**PA status (year)**	**Status at final inspection (year)**	**EPE status (year)**
Indicator 1 (PA-Tangshan) The CO_2 emissions are reduced	The indicator is appropriate *(state-of-the-art)*	50% corresponding to at least 9.21 $MtCO_2/y$	** After three adjustments to project scope & quality by 2015:* min. 33,818t	Around 43,000t	
Indicator 2 (PA-Tonghua) The CO_2 emissions are reduced	The indicator is appropriate (*state-of-the-art*)	50% corresponding to at least 153.8 $MtCO_2/y$			
Indicator 3 (PA-Jinzhong Coal consumption is reduced	The indicator is appropriate (*state-of-the-art*)	114,972 t/y			
Indicator 4 (PA-Jinzhong The emissions are reduced	The indicator is formulated in an appropriate (*state-of-the-art*) and SMART manner	CO_2: 417,245 t/y NO_x: 628 t/y SO_2: 1,256 t/y Dust: 3,794 t/y			

Annex: Risk analysis

Risk	Relevant OECD-DAC criterion
Damage to the building shell by residents (ex-ante)	**Efficiency, effectiveness, impact**
Deficiencies in the execution of the work (ex-ante)	**Efficiency, effectiveness, impact**
(Temporary) rebound effects (ex post)	**Effectiveness, impact**
Lack of awareness and information for residents (ex post)	**Relevance, efficiency, effectiveness, impact**
Inadequate education of residents by project-executing agency (ex post)	**Relevance, efficiency, effectiveness, impact**

Annex: Recommendations for operation

The executing agency was informed of the following need for action as part of the local project completion report:

- Illegal structures (e.g. porches) on the renovated residential buildings cause security risks and must therefore be dismantled
- The executing agency should educate residents about adequate ventilation behaviour and use of the thermostats.
- When maintaining the buildings, the executing agency must pay attention to thermal bridges, as these could potentially cause damage due to mould infestation.

As a result of the coronavirus travel restrictions, it was not possible for the appraiser to get an idea of the situation on site in the apartments as part of the evaluation. However, from the various feedback, it can be deduced that the apartment owners are getting used to how to handle things appropriately under the new general conditions. Since the final inspection, the housing and management stations, together with the municipal building authority, secured the maintenance of the buildings refurbished using the FC measure and financed them with previously planned municipal budget funds. In addition, instructions were provided for the residents on correct user behaviour. According to statements by the project-executing agency as part of the evaluation, scheduled repairs to maintain and ensure upkeep for the energy-efficient refurbishment in the buildings have been carried out since the FC project was completed. More detailed information on the scope, type and frequency of the maintenance measures carried out since the project's final inspection could not be obtained from the executing agency. Similarly, the evaluation did not provide any more detailed information on the current status of the illegal structures mentioned. Due to the nature of ownership, however, it cannot be assumed that the executing agency could prevail and that these could be completely dismantled.

Annex: Evaluation questions in line with OECD-DAC criteria/ex post evaluation matrix

Relevance

Evaluation question	Specification of the question for the present project	Data source (or rationale if the question is not relevant/applicable)	Rating	Weighting (- / o / +)	Reason for weighting
Evaluation dimension: Policy and priority focus			2	o	
Are the objectives of the programme aligned with the (global, regional and country-specific) policies and priorities, in particular those of the (development policy) partners involved and affected and the BMZ?	Were the objectives of the measure aligned with the global climate agreements? Were the objectives of the measure aligned with China's climate and energy priorities at national and local level? Were the objectives of the measure aligned with the Federal Ministry for Economic Cooperation and Development's (BMZ) sectoral and regional priorities/strategies? Was there coordination with the Federal Ministry for Economic Cooperation and Development (BMZ) beyond the project level, e.g. special interests/regulations or adapted procedures for cooperation with China and/or in the energy sector?	Interviews: • Operational Department • Beijing Office • TE • Consulting company • AHK Documents: • UNFCCC, UNEP, IEA reports • Chinese government's five-year plan • Evaluation reports from the World Bank, ADB and bilateral donors in the energy sector in China • Federal Ministry for Economic Cooperation and Development (BMZ) regional/sector strategies			
Do the objectives of the programme take into account the relevant political and institutional framework conditions (e.g. legislation, administrative capacity, actual power structures (including those related to ethnicity, gender, etc.))?	Were there (local) administrative regulations for energy-efficient building renovations at municipal and/or provincial level? If yes, have these been taken into account?	Interviews: • Executing agency • Beijing Office • PM • Consulting company Documents: • Chinese government's five-year plan • Country strategies and evaluation reports from the World Bank, ADB and			

		bilateral donors in the energy sector in China Research/analyses: • Chinese government and administration analysis • Journal article			
Evaluation dimension: Focus on needs and capacities of participants and stakeholders			4	o	
Are the programme objectives focused on the developmental needs and capacities of the target group? Was the core problem identified correctly?	To what extent was the EEB Tangshan project (possibly also EEB Tonghua) relevant for the residents? Were the needs and capacities of the residents sufficiently ascertained during planning or were the residents involved in the planning? Has sufficient consideration been given to and was there sufficient differentiation between tenants and owners? To what extent did the activities and results of the EEB Tangshan project (possibly also EEB Tonghua) correspond to the needs and acceptance of the residents? To what extent are the results of the project still relevant for the residents?	Interviews: • Executing agency • Beijing Office • PM • TE • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Were the needs and capacities of particularly disadvantaged or vulnerable parts of the target group taken into account (possible differentiation according to age, income, gender, ethnicity, etc.)? How was the target group selected?	N/A	Interviews: • PM • Consulting company			

Would the programme (from an ex post perspective) have had other significant gender impact potentials if the concept had been designed differently? (FC-E-specific question)		Documents: • secondary literature • comparable evaluations • EU, EIA, GCF documents			
Evaluation dimension: Appropriateness of design			3	o	
Was the design of the programme appropriate and realistic (technically, organisationally and financially) and in principle suitable for contributing to solving the core problem?		Interviews: • PM • TE • Beijing Office • Executing agency • Consulting company • AHK Documents: • internal project documents • secondary literature • comparable evaluations			
Is the programme design sufficiently precise and plausible (transparency and verifiability of the target system and the underlying impact assumptions)?		Interviews: • PM • TE • Executing agency • Consulting company Documents: • internal project documents			
Please describe the results chain, incl. complementary measures, if necessary in the form of a graphical representation. Is this plausible? As well as specifying the original and, if necessary, adjusted target system, taking into account the impact levels (outcome and impact). The		Documents: • internal project documents			

(adjusted) target system can also be displayed graphically. (FC-E-specific question)					
To what extent is the design of the programme based on a holistic approach to sustainable development (interplay of the social, environmental and economic dimensions of sustainability)?		Interviews: • Operational Department • Partners Documents: • internal project documents • secondary literature • comparable evaluations			
For projects within the scope of DC programmes: is the programme, based on its design, suitable for achieving the objectives of the DC programme? To what extent is the impact level of the FC module meaningfully linked to the DC programme (e.g. outcome impact or output outcome)? (FC-E-specific question)	N/A				
Evaluation dimension: Response to changes/adaptability			2	o	
Has the programme been adapted in the course of its implementation due to changed framework conditions (risks and potential)?	How did you see the project in general, what do you remember about it? Above all, what were the good or challenging issues in the project?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Other evaluation question 1	Were the project terminations relevant and comprehensible?	Interviews: • PM • Beijing Office • Executing agency			

		• Consulting company Documents: • internal project documents

Coherence

Evaluation question	Specification of the question for the present project	Data source (or rationale if the question is not relevant/applicable)	Rating	Weighting (- / o / +)	Reason for weighting
Evaluation dimension: Internal coherence (division of tasks and synergies within German development cooperation):			2	o	
To what extent is the programme designed in a complementary and collaborative manner within the German development cooperation (e.g. integration into DC programme, country/sector strategy)?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • Country and sector analyses • comparable evaluations			
Do the instruments of the German development cooperation dovetail in a conceptually meaningful way, and are synergies put to use?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • Country and sector analyses • comparable evaluations			

Is the programme consistent with international norms and standards to which the German development cooperation is committed (e.g. human rights, Paris Climate Agreement, etc.)?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • Country and sector analyses • comparable evaluations			
Evaluation dimension: External coherence (complementarity and coordination with actors external to German DC):			2	o	"Open programme" explicitly focused on partners (not donors)
To what extent does the programme complement and support the partner's own efforts (subsidiarity principle)?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature			
Is the design of the programme and its implementation coordinated with the activities of other donors?	N/A				
Was the programme designed to use the existing systems and structures (of partners/other donors/international organisations) for the implementation of its activities and to what extent are these used?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature			

Are common systems (of partners/other donors/international organisations) used for monitoring/evaluation, learning and accountability?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents

Effectiveness

Evaluation question	Specification of the question for the present project	Data source (or rationale if the question is not relevant/applicable)	Rating	Weighting (- / o / +)	Reason for weighting
Evaluation dimension: Achievement of (intended) targets			3	o	
Were the (if necessary, adjusted) objectives of the programme (incl. capacity development measures) achieved? Table of indicators: Comparison of actual/target	(Output 1) Was the energy-efficient renovation of selected residential buildings completed as planned? (Output 2) To what extent was the executing agency's staff supported in adequately and professionally managing the energy-efficient refurbishment?	Interviews: • PM • TE • Executing agency • Consulting company Documents: • internal project documents			
Evaluation dimension: Contribution to achieving objectives:			3	o	
To what extent were the outputs of the programme delivered as planned (or adapted to new developments)? *(Learning/help question)*		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			

Are the outputs provided and the capacities created used?	Were the services provided by the implementation consultants (e.g. training during project meetings and on-the-job training) used by the executing agencies?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents
To what extent is equal access to the outputs provided and the capacities created guaranteed (e.g. non-discriminatory, physically accessible, financially affordable, qualitatively, socially and culturally acceptable)?		
To what extent did the programme contribute to achieving the objectives?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents
To what extent did the programme contribute to achieving the objectives at the level of the intended beneficiaries?	Do you have feedback from residents how they rate the refurbishments in retrospect? Have residents mentioned other non-energy-related benefits (for example, health, social, economic, ecological) as a result of the energy-efficient refurbishment of the buildings?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents
Did the programme contribute to the achievement of objectives at the level of the particularly disadvantaged or vulnerable groups		Interviews: • PM • Consulting company Documents:

involved and affected (potential differentiation according to age, income, gender, ethnicity, etc.)?		• internal project documents • secondary literature • comparable evaluations			
Were there measures that specifically addressed gender impact potential (e.g. through the involvement of women in project committees, water committees, use of social workers for women, etc.)? (FC-E-specific question)		Documents: • internal project documents • secondary literature • comparable evaluations			
Which project-internal factors (technical, organisational or financial) were decisive for the achievement or non-achievement of the intended objectives of the programme? *(Learning/help question)*		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Which external factors were decisive for the achievement or non-achievement of the intended objectives of the programme (also taking into account the risks anticipated beforehand)? *(Learning/help question)*		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Evaluation dimension: Quality of implementation			3	o	
How is the quality of the management and implementation of the programme (e.g. project-executing agency, consultant, taking into account ethnicity and gender in decision-making committees) evaluated	How is the quality of management and implementation by the executing agency evaluated (if possible in comparison to other projects by KfW and other donors in which you have been involved during this time and in recent years)?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents:			

with regard to the achievement of objectives?	Has adequate site supervision (M&E/control system) been established? Were the construction supervision/M&E results used by the project-executing agency during implementation as a diagnostic tool to identify problems and take corrective actions and measure project performance?	• internal project documents			
How is the quality of the management, implementation and participation in the programme by the partners/sponsors evaluated?	How did you see the project in general, what do you remember about it? Above all, what were the good or challenging issues in the project? Which Chinese public bodies had to give their approval for which major activities of the project? In your view, were the approval procedures overall rather efficient or did they tend to delay individual implementation steps?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Were gender results and relevant risks in/through the project (gender-based violence, e.g. in the context of infrastructure or empowerment projects) regularly monitored or otherwise taken into account during implementation? Have corresponding measures (e.g. as part of a CM) been implemented in a timely manner? (FC-E-specific question)		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Evaluation dimension: Unintended consequences (positive or negative)			4	o	

Can unintended positive/negative direct impacts (social, economic, ecological and, where applicable, those affecting vulnerable groups) be seen (or are they foreseeable)?	Were unintended positive direct effects identifiable for the electricity suppliers in Tangshan (e.g. increase in grid reliability, postponement of the construction of new infrastructure to meet growing demand)? Were/are the end-user tariffs for energy subsidised in China? If so, can unintended positive direct impacts on the government budget in China be identified (e.g. reduction of tax expenditure on energy subsidies that make it possible to reduce budget deficits or increase expenditure in other priority areas such as health and education)?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • Country and sector analyses • comparable evaluations
What potential/risks arise from the positive/negative unintended effects and how should they be evaluated?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • Country and sector analyses • comparable evaluations
How did the programme respond to the potential/risks of the positive/negative unintended effects?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • Country and sector analyses • comparable evaluations

Efficiency

Evaluation question	Specification of the question for the present project	Data source (or rationale if the question is not relevant/applicable)	Rating	Weighting (- / o / +)	Reason for weighting
Evaluation dimension: Production efficiency			4	o	
How are the inputs (financial and material resources) of the programme distributed (e.g. by instruments, sectors, sub-measures, also taking into account the cost contributions of the partners/executing agency/other participants and affected parties, etc.)? (Learning and help question)		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
To what extent were the inputs of the programme used sparingly in relation to the outputs produced (products, capital goods and services) (if possible in a comparison with data from other evaluations of a region, sector, etc.)? For example, comparison of specific costs.		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
If necessary, as a complementary perspective: To what extent could the outputs of the programme have been increased by an alternative use of inputs (if possible in a comparison with data from other evaluations of a region, sector, etc.)?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Were the outputs produced on time and within the planned period?		Interviews: • PM • Beijing Office			

		• Executing agency • Consulting company Documents: • internal project documents			
Were the coordination and management costs reasonable (e.g. implementation consultant's cost component)? (FC-E-specific question)	Were the coordination and management costs for the implementation consultants and general contractor agreements reasonable?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents			
Evaluation dimension: Allocation efficiency			3	o	
In what other ways and at what costs could the effects achieved (outcome/impact) have been attained? *(Learning/help question)*	Could the achieved reduction of CO_2 emissions and energy consumption have been achieved at a lower or higher cost in another focal area of the open programme?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
To what extent could the effects achieved have been attained in a more cost-effective manner, compared with an alternatively designed programme?	Have different rehabilitation options (e.g. for building envelopes and supply systems) been examined/compared? Has a Maturity Matrix Assessment been carried out for the buildings and the building stock to determine an optimal (most cost-effective) retrofit strategy?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			

If necessary, as a complementary perspective: To what extent could the positive effects have been increased with the resources available, compared to an alternatively designed programme?	Could the beneficial effects of the 'open programme approach' have been enhanced with a DC programme, a programme-based approach (PBA) or a research project (cf. AFD 2012)?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations

Impact

Evaluation question	Specification of the question for the present project	Data source (or rationale if the question is not relevant/applicable)	Rating	Weighting (- / o / +)	Reason for weighting
Evaluation dimension: Overarching developmental changes (intended)			3	o	
Is it possible to identify overarching developmental changes to which the programme should contribute? (Or if foreseeable, please be as specific as possible in terms of time).	Was the measure in Module I able to contribute to global climate protection?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Is it possible to identify overarching developmental changes (social, economic, environmental and their interactions) at the level of the intended beneficiaries? (Or if foreseeable, please be as specific as possible in terms of time).		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			

To what extent can overarching developmental changes be identified at the level of particularly disadvantaged or vulnerable parts of the target group to which the programme should contribute (Or, if foreseeable, please be as specific as possible in terms of time).		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Evaluation dimension: Contribution to overarching developmental changes (intended)			3	o	
To what extent did the programme actually contribute to the identified or foreseeable overarching developmental changes (also taking into account the political stability) to which the programme should contribute?	To what extent did the project have a pilot/model character (e.g. for the partner country China, for the city of Tangshan, for the area of energy-efficient refurbishment of residential buildings in development cooperation)? Were individual consultancy/training services or products particularly appreciated/used by the executing agency and, if possible, replicated? Would individual services or products from your consultancy/training offerings at the time be generally reproducible for the executing agency in follow-up projects and, if so, which ones?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
To what extent did the programme achieve its intended (possibly adjusted) developmental objectives? In other words, are the project impacts sufficiently tangible not only at outcome level, but also at impact level? (E.g. drinking water supply/health effects).	To what extent have the EEB Tangshan measures achieved their adjusted intended development policy objectives?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			

Did the programme contribute to achieving its (possibly adjusted) developmental objectives at the level of the intended beneficiaries?	Do you have feedback from residents how they rate the refurbishments in retrospect? Have residents mentioned other non-energy-related benefits (for example, health, social, economic, ecological) as a result of the energy-efficient refurbishment of the buildings?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations
Has the programme contributed to overarching developmental changes or changes in life situations at the level of particularly disadvantaged or vulnerable parts of the target group (potential differentiation according to age, income, gender, ethnicity, etc.) to which the programme was intended to contribute?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations
Which project-internal factors (technical, organisational or financial) were decisive for the achievement or non-achievement of the intended developmental objectives of the programme? *(Learning/help question)*	Which internal project factors (technical, organisational, financial or legal) were decisive for the (partial) achievement of the intended development policy objectives of the EEB Tangshan programme? What internal project factors (technical, organisational, or financial) were decisive for the achievement or non-achievement of the intended objectives of the project?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations
Which external factors were decisive for the achievement or non-achievement of the intended developmental objectives of the programme? *(Learning/help question)*		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents:

		• internal project documents • secondary literature • comparable evaluations			
Does the project have a broad-based impact? - To what extent has the programme led to structural or institutional changes (e.g.in organisations, systems and regulations)? (Structure formation) - Was the programme exemplary and/or broadly effective and is it reproducible? (Reproducible character)	Have the measures led to structural or institutional changes on the partner or executing agency side (e.g. in the case of regulatory and compliance systems)? What important insights have been gained *(lessons learned)?*	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Evaluation dimension: Contribution to (unintended) overarching developmental changes			3	o	
To what extent can unintended overarching developmental changes (also taking into account political stability) be identified (or, if foreseeable, please be as specific as possible in terms of time)?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Did the programme noticeably or foreseeably contribute to unintended (positive and/or negative) overarching developmental impacts?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents:			

		• internal project documents • secondary literature • comparable evaluations
Did the programme noticeably (or foreseeably) contribute to unintended (positive or negative) overarching developmental changes at the level of particularly disadvantaged or vulnerable groups (within or outside the target group) (do no harm, e.g. no strengthening of inequality (gender/ethnicity))?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations

Sustainability

Evaluation question	Specification of the question for the present project	Data source (or rationale if the question is not relevant/applicable)	Rating	Weighting (- / o / +)	Reason for weighting
Evaluation dimension: Capacities of participants and stakeholders			2	o	
Are the target group, executing agencies and partners institutionally, personally and financially able and willing (ownership) to maintain the positive effects of the programme over time (after the end of the promotion)?	From your personal perspective and from the company perspective of Tangshan Affordable Housing Project Investment & Construction Co. Ltd., what were the most important lessons learned from the project?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
To what extent do the target group, executing agencies and partners demonstrate resilience to future	Do you have feedback from residents how they rate the refurbishments in retrospect?	Interviews: • PM • Beijing Office • Executing agency			

risks that could jeopardise the impact of the programme?	Have residents mentioned other non-energy-related benefits (for example, health, social, economic, ecological) as a result of the energy-efficient refurbishment of the buildings?	• Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Evaluation dimension: Contribution to supporting sustainable capacities:			3	o	
Did the programme contribute to the target group, executing agencies and partners being institutionally, personally and financially able and willing (ownership) to maintain the positive effects of the programme over time and, where necessary, to curb negative effects?	What are the current Chinese standards for the energy-efficient refurbishment of residential buildings? What are the main differences (e.g., technical standards and approval procedures by public authorities) compared to 2012–2018?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Did the programme contribute to strengthening the resilience of the target group, executing agencies and partners to risks that could jeopardise the effects of the programme?	Were there individual technical solutions or proposals by the consultant that were new to you at the time and that you were able to use successfully in this project and subsequent projects?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
Did the programme contribute to strengthening the resilience of particularly disadvantaged groups to risks that could jeopardise the effects of the programme?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents:			

		• internal project documents • secondary literature comparable evaluations			
Evaluation dimension: Durability of impacts over time			3	o	
How stable is the context of the programme (e.g. social justice, economic performance, political stability, environmental balance)? (*Learning/help question*)		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
To what extent is the durability of the positive effects of the programme influenced by the context? *(Learning/help question)*	What were the most important maintenance measures in the renovated buildings that you carried out in the following years from 2019 until today?	Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			
To what extent are the positive and, where applicable, the negative effects of the programme likely to be long-lasting?		Interviews: • PM • Beijing Office • Executing agency • Consulting company Documents: • internal project documents • secondary literature • comparable evaluations			