RESOURCE EFFICIENCY IN URUMQI (CHINA)

ACTION BRIEF

CODE: URU-AB1

FIRST PASSIVE HOUSE IN WEST CHINA

TOPICS:
ENERGY
PLANNING
CAPACITIES

CHALLENGE

More than 7 million tonnes of coal are burned per year for heating of buildings in the City of Urumqi (population 3.1 million); accounting for a large share of the CO_2 emissions and a major cause of air pollution in the very cold winters. The total building area will double to about 210 million m^2 by 2034, accounting for the increase in population as well as the per-capita housing area. Hence, the City of Urumqi adopted an *Integrated Heating and Building Energy Efficiency Master Plan* in 2010 that calls for implementing higher energy efficiency targets into the construction of new buildings.

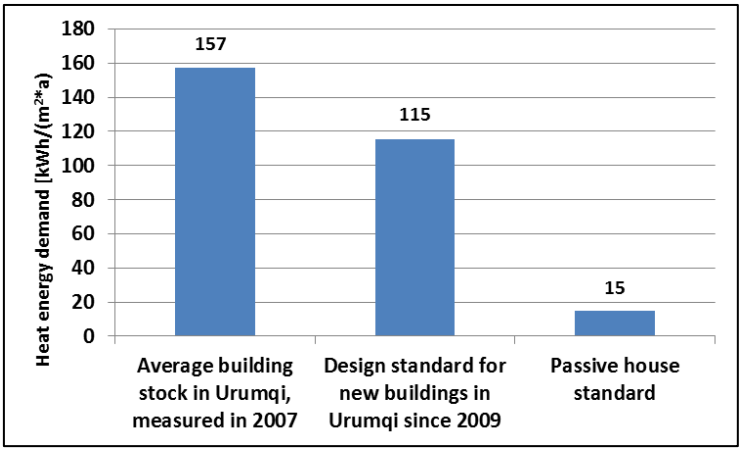
ACTION

Together with the Construction Committee of the City of Urumqi and Dacheng Industries Inc. (a private investor) many extra-low energy buildings in Germany were visited. As a result, it was jointly decided to build the first passive house in West China with just 13% of the heat demand required for new buildings in Urumqi. Located at *Xingfu Lu* (Happiness Road), the 7.700 m^2 mixed-use building called *Xingfubao* with an underground garage, supermarket, restaurants, shops, offices and residential areas is currently under construction. It will be insulated with 30 cm XPS and features windows with a u-value of 0.8 $W/(m^2*K)$ as well as an efficient heat recovery system. Solar collectors on the roof will provide warm water during summer; natural gas will be used for heating and warm water during winter.

Together with Culturebridge Architects and the Darmstadt-based Passive House Institute, the IFEU prepared the initial passive house design. The detailed design is being developed by the Xinjiang Architectural Design Institute. The ground-breaking ceremony took place on May, 3rd 2012, completion by October 2014. Construction costs are estimated to be around 34 million RMB (4.2 million €), the City of Urumqi is provides funding of 2.5 million RMB (300.000 €). The project had to master various challenges:

- A specific passive house standard for Urumqi does not yet exist; this required extensive communication.
- Even though district heating is available, the inflexible fee system makes the use of natural gas more economical.
- Highly efficient passive house windows were produced in China for the first time by REHAU.
- Excellent air tightness of 0.2 h^{-1} at 50 Pa was achieved for the first time in Urumqi.
- Heat recovery units with efficiency of >80% are not available in China and may have to be imported from Germany.
- The investor accepted the risks asscoated with the project. Training of engineers and foremen was required to meet the building quality required for the passive house design standard.

Front view



Heat energy demand (relative to net heated area)

RESULTS

STATE OF IMPLEMENTATION:

- The building was certified as passive house on 25 September 2014. Details include a façade with low heat bridges, passive house windows, and an efficient heat exchanger. Training and course materials were developed and applied.

LOCAL USERS / TARGET GROUPS:

- The extra-low energy construction project in Urumqi benefits architects, energy consultants, construction companies, workers and producers of components.

IMPACTS:

- The *Xingfubao* project has the demonstrated support of political leaders in the City of Urumqi and the province of Xinjiang.
- The energy demand reduction by 87% relative to the design standard is a major step to lower the emissions of fossil fuels in Urumqi.
- Local production for high-efficient/high-quality building components was triggered in Urumqi.
- The long-term economic feasibility of high-quality ultra-low energy houses is considered by stakeholder to be high. The economic benefit is two-fold: in demonstrating that there is a market for such buildings, companies providing innovative solutions will develop including etc. In addition, there is the indirect benefit resulting from energy savings.
- *Xingfubao* demonstrates the opportunities for energy efficient products made in Germany and paved the way for joint ventures.

MULTIPLICATION:

- A China Passive House Network has been established: http://www.cphn.com.cn/
- News about the project has spread across China. Other projects build on the experience with *Xingfubao,* e.g. in Tianjin and Beijing.
- On-going cooperation with by GIZ and dena provides further dissemination of results.
- Stricter energy performance standards for new buildings in Urumqi including a passive house standard by the Urumqi government have been passed effective September 2014.

LONG-TERM CONSOLIDATION:

- The City of Urumqi is developing a standard for passive houses and provides funding for their construction. Ultra-low energy houses (passive houses and others) will be constructed in a larger number in Urumqi and other Chinese cities, provided that the technology can be successfully demonstrated and that economic incentives are being developed.
- The demand for high-quality buildings is growing in China and the central and local governments accelerate activities to improve the energy efficiency in the building sector.

CONTACT

Project: RECAST Urumqi - Meeting the Resource Efficiency Challenge in a Climate Sensitive Dryland Megacity Environment - Urumqi as a Model City for Central Asia

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RESOURCE EFFICIENCY IN URUMQI (CHINA)

ACTION BRIEF

EXTRA LOW-ENERGY RENOVATION OF EXISTING BUILDINGS

CODE: URU-AB2

TOPICS:
ENERGY
GOVERNANCE
CAPACITIES

CHALLENGE

The City of Urumqi (3.1 million people) is growing fast and is expected to be home to 4.8 million people by 2020. More than 15 million tonnes of coal are burned in Urumqi each year. The winters are very cold, the average temperature in January is -14°C, hence half of the coal is needed for heating - a major contributor to high per-capita CO_2 emissions of 22 tonnes per year. The lack of adequate air pollution control combined with low stack heights in the city center and inversions in the very cold winters result in heavy air pollution, exceeding the national acceptable level by 60%.

In order to address this problem, the City of Urumqi adopted an *Integrated Heating and Building Energy Efficiency Master Plan* in 2010.

The plan includes key activities such as an investment plan to retrofit the energy efficiency of existing buildings, increasing district heating (DH) efficiency for all centralized DH companies and implementing higher energy efficiency targets for the construction of new buildings.

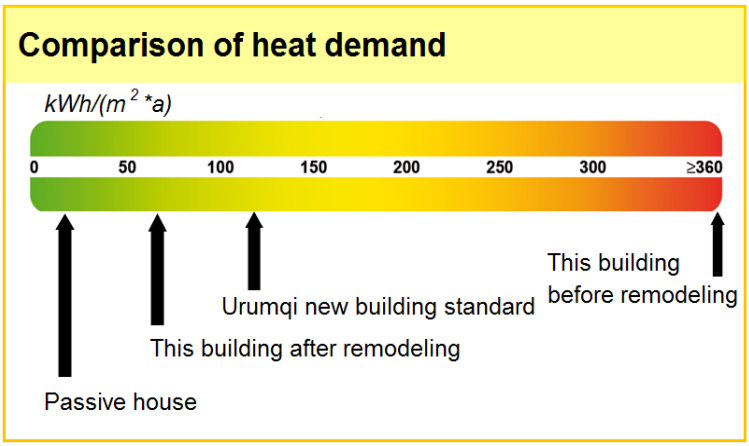
The energy retrofit is typically limited to applying 10 cm of EPS insulation, installing thermostats, two-pane insulation windows and changing heating systems from single to double pipes. An adequate quality control system, e.g. insulation of window frames is not yet established. The current methods reduce the energy demand for heating by about 50%.

ACTION

The aim of the project was to demonstrate that an even higher reduction of the energy demand in existing buildings can actually be achieved at reasonable costs. The local partners (Construction Committee of Urumqi, University of Xinjiang and the Xinjiang New Energy Institute) cooperated with the German partners IFEU Heidelberg, Culturebridge Architects Grünstadt/Beijing and the Passive House Institute Darmstadt to refurbish the existing Nanshan Training Center into the first zero-emission building in Urumqi - located outside the centre of Urumqi.

The building should serve as a role model for planning more effective energy retrofits of existing buildings in Urumqi.

Old building (left) and design of retrofit building (right)



Energy certificate

RESULTS

STATE OF IMPLEMENTATION:

- The project has been completed. The inauguration ceremony was in July 2011.

LOCAL USERS / TARGET GROUPS:

- The project benefitted the City of Urumqi Construction Committee and the building owner, architects, construction companies and developers of renewable energy technology.

IMPACTS:

- The heating energy demand was reduced by more than 85 % by optimizing the building design, improving insulation of walls and windows as well as installing floor heating and a heat recovery system.
- An innovative seasonal storage system for solar heat has been developed and implemented.
- The heat energy demand was reduced to a mere 50% of the recently adopted standard for new buildings. In total, 88 tons of CO_2 emissions are avoided per year.
- The total investment cost is 2.8 million RMB (360.000 €), of which 1 million RMB (128.000 €) are government subsidy funds. About 85% of these costs were for energy retrofit and solar energy installation.
- The comprehensive energy certificate for the first zero emission building in Urumqi provides a transparent picture of the improvements and serves as a role model for other projects to come.

MULTIPLICATION:

- The project received media attention throughout China and has been visited by specialists from many cities.
- The lighthouse project was not designed to be immediately copied but to provide solid data on technological options various areas so that Urumqi's ambitious retrofit program can be improved. It is a crucial milestone to this end.

LONG-TERM CONSOLIDATION:

- Reducing CO_2 emissions for heating of Urumqi's buildings requires more energy efficient retrofit of existing building stock. Experience gained in this project will help to tailor energy retrofit options to other buildings.
- Knowledge about energy efficient housing design will be transferred to forthcoming generations of graduates. Media reports will in long-term help to carry on the success of the retrofit to other cities and result in further ambitious retrofits throughout the country.

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RESOURCE EFFICIENCY IN URUMQI (CHINA)

ACTION BRIEF

CODE: URU-AB3

TOPICS:
ENERGY
RESSOURCES

MASS AND ENERGY FLOW ANALYSIS IN THE CHINESE PVC INDUSTRY

CHALLENGE

With a production of 12 million tons in 2010, equivalent to 37% of the global production, China is the world's largest producer of PVC, with a demand driven by its fast growth in the construction sector. ZhongTai Chemical Co. is a global player in the PVC industry and plans to expand its PVC production to 3 million tons per year by 2015 compared to the EU-27 production capacity of 8.2 million tons in 2010. In Europe, the feedstock for PVC production is naphtha from petroleum, whereas PVC in China is produced mainly from coal and limestone via the CO_2 intensive acetylene route.

ACTION

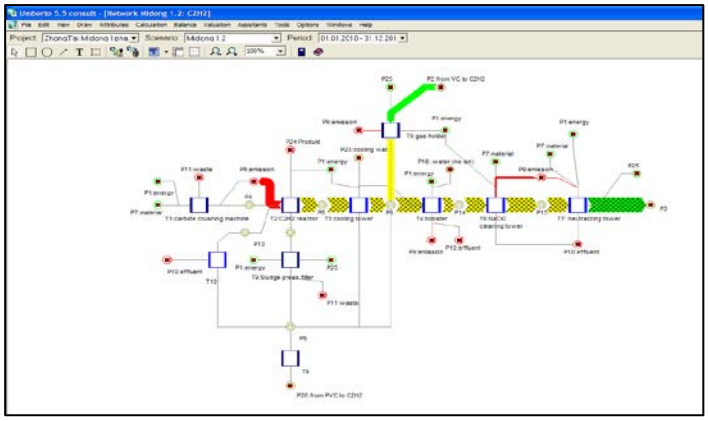
The project seeks to identify economical solutions that reduce the environmental impacts of the PVC production in the province Xinjiang. As a suitable approach, the energy and mass-flow analysis method of gathering data over the entire life-cycle of a product or process was selected using the state-of-the-art software tool Umberto 5.5® that allows identifying potentials to save energy, resources and costs.

As a result, a detailed flow model of the production of suspension PVC (S-PVC) at the Xishan and Midong facilities was developed. This required the following steps: (a) determining a complete list of materials and energy inputs and outputs, (b) designing a flow chart for the current PVC production process, (c) gathering specific data for each component, (d) defining key parameters for evaluation, and (e) analysis of the potentials for improving the efficiency of energy and water use in this particular sector.

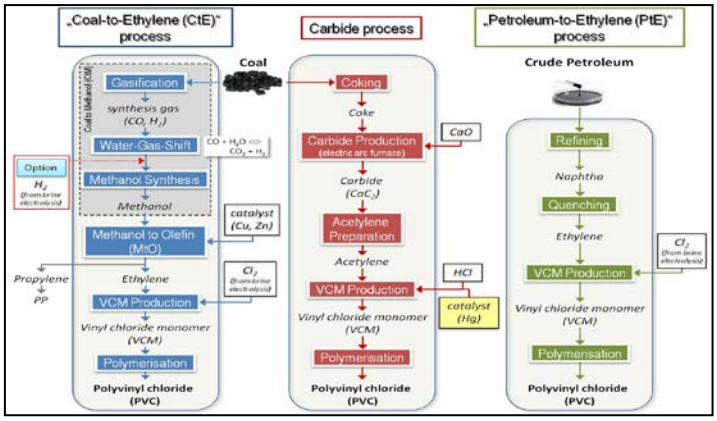
For many production steps or machines within a process line, measured data was not available. Therefore, the electricity demand was estimated by allocation based on installed electrical capacity of the equipment. The seasonal variability of energy and water demand at the facility (e.g. the cooling demand is lower during the cold winters) was reflected in the model. The material and energy flows of the pre-chains (e.g. energy demand for carbide and chlorine production) were analyzed.

The project is part of the cleaner production audit performed by the Xinjiang Academy of Environmental Protection Science. A total of 42 improvements were achieved. For production capacity expansion, the carbide-based PVC production process alternative production processes ("Coal-to-Ethylene (CtE)" and "Petroleum-to-Ethylene (PtE)") are currently being analyzed; preliminary results show a reduction of the environmental impacts for both alternatives.

In addition to the energy and mass-flow analysis, improvements for occupational safety were suggested: the manual filling of used mercury catalyst in bags, to be replaced by pneumatic technology.



ZhongTai material flow analysis in Umberto 5.5



Analysis of PVC production alternatives

RESULTS

STATE OF IMPLEMENTATION:

- An energy and mass flow model of ZhongTai Chemical Co was prepared and introduced as part of a Cleaner Production Audit in 2011. The study of PVC production alternatives was completed in 2013.

LOCAL USERS / TARGET GROUPS:

- ZhongTai Chemical Co., Xinjiang Academy of Environmental Protection Science, Xinjiang Department of Environmental Protection

IMPACTS:

- A total of 68 improvements were identified in the audit, most of which were implemented.
- It was demonstrated that a mass and energy-flow analysis of a complex industrial facility is a helpful tool to determine technological options to improve energy efficiency and environmental-performance of companies in China. It was also shown that an analysis can be conducted in a reasonable timeframe.
- Workshops with scientists and engineers from Xinjiang Academy of Environmental Protection Sciences (XAEPS) and ZhongTai Chemical Co. were held in Urumqi and Heidelberg. RECAST Urumqi contributed to a Special Policy Study of Mercury Management in China of the China Council for International Cooperation on Environment and Development (CCICED).
- Since the carbide process is a factor of 3.8 higher than for PVC from the petroleum-to-ethylene process and is currently the most profitable option under the present economic conditions strong economic incentives or regulatory decisions are needed to trigger investments into alternative production methods (PtE or CtE).

MULTIPLICATION:

- The Xinjiang Department of Environmental Protection will promote the use of energy and mass flow modeling in other contexts as well.

LONG-TERM CONSOLIDATION:

- A Research Base for the Sino-German cooperative Industry Energy Efficiency & Wastes Recycling at the ZhongTai chemical plant was officially inaugurated on 17 July 2011 in Urumqi.
- Collaborative work with the Xinjiang Academy of Environmental Protection Science on mass flow modeling will continue.
- If policies for CO_2 reduction and mercury use would be better implemented a switch to a more energy efficient PVC production process could take place at Zhong Tai.

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ACTION BRIEF

REDUCING MERCURY USE IN THE CHINESE PVC INDUSTRY

CODE: URU-AB7

TOPICS:
RESSOURCES
GOVERNANCE

CHALLENGE

In 2009 about 90% of all PVC plants in China used the calcium carbide process with coal as the feedstock to produce vinyl chloride monomer (VCM) from which PVC is polymerized. This process requires mercury (Hg) as a catalyst for VCM production from acethylene and hydro-chloric acid (HCl). China's PVC manufacturing industry is the most significant consumer of mercury in the world today, in the order of 1,000 tonnes per year.

The carbide process results in large amounts of wastes: mercury-containing catalysts, mercury-containing activated coal, mercury-laced hydrogen chloride and mercury-containing alkaline agents as well as mercury contaminated wastewater. All steps from mercury extraction to the disposal of waste pose potentially serious environmental and health risks.

China has ratified the Minamata Convention in January 2013, a global, legally-binding treaty to prevent mercury emissions and releases prepared under the auspices of the United Nations Environment Program. Then ultimate goal is the phase-out of mercury use.

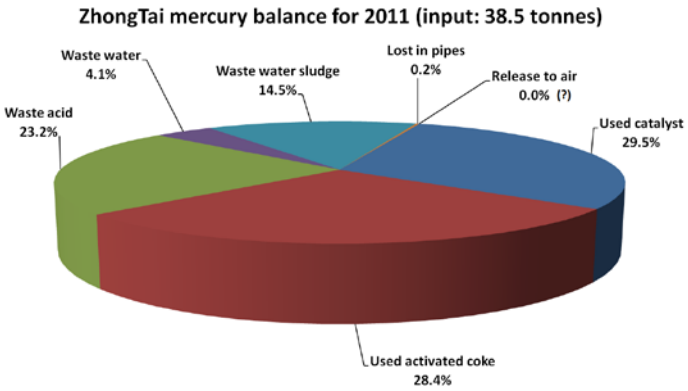
ACTION

To better understand the mercury flows in VCM production using the carbide process, a mercury balance of the Midong plant of ZhongTai Chemical Co. was carried out and recycling options for mercury-laced waste water and waste acid were evaluated. A site inspection revealed that workers manually fill used mercury catalyst into bags for shipment to the recycling company. For occupational health and safety reasons, pneumatic technology would be preferable; an option that ZhongTai Chemical Co. is considering but has not yet realized.

To reduce the amount of mercury in the VCM production following options were identified by IFEU:

1. Feedstock change (alternative production technologies without a mercury catalyst)
2. Use of mercury-free catalyst
3. Use of low-mercury catalyst

For option 1, alternative production processes ("Coal-to-Ethylene (CtE)" and "Petroleum-to-Ethylene (PtE)") were identified and analyzed.
For options 2 and 3, IFEU collaborated with the China Council for International Cooperation on Environment and Development (CCICED) in drafting the "Special Policy Study of Mercury Management in China". The mercury topic is also addressed by the Xinjiang Academy of Environmental Protection Science.



Recycling of mercury in waste water and waste acid can be improved

Manual collection of used mercury catalyst should be stopped

RESULTS

STATE OF IMPLEMENTATION:

- A mercury balance for ZhongTai was established, recycling options will be implemented, and alternatives to use of mercury catalysts have been evaluated.

LOCAL USERS / TARGET GROUPS:

- ZhongTai Chemical Co., Xinjiang Academy of Environmental Protection Science, Xinjiang Department of Environmental Protection, China Council for International Cooperation on Environment and Development (CCICED)

IMPACTS:

- ZhongTai Chemical Co. has shown transparency, provided sensitive production information and has demonstrated readiness to optimize the processes.
- The manual collection of mercury catalyst will soon be replaced by pneumatic technology.
- Waste water from the VCM process containing mercury is now evaporated and no longer discharged into the sewage treatment plant.
- Alternative production processes (CtE and PtE) will significantly reduce of mercury flow since both avoid the use of mercury as a catalyst but are currently not economical because of the low price of coal.
- Research into mercury-free and low-mercury catalyst for the carbide system is on-going.

MULTIPLICATION:

- Workshops were carried out together with GIZ with representatives of China's PVC industry who were keen to learn from experience at ZhongTai.
- IFEU provided support to the China Council for International Cooperation on Environment and Development (CCICED) for the "Special Policy Study of Mercury Management in China".

LONG-TERM CONSOLIDATION:

- Development and application of Hg-free PVC production methods should be encouraged and further promoted and the development of Hg control and phase-out policies at central and local levels should be supported. In order to achieve this goal, a combination of regulatory action and economic incentives is necessary.
- The use of a low-mercury catalyst (6% Hg compared to current 12% Hg) will be implemented in a shorter timeframe; recent test results are encouraging to this end.
- Support of research for economical mercury-free catalyst is provided by central government agencies.
- Hg-related process control in upstream and downstream processes should be improved.
- Capacity building has established an international perspective of Chinese partners, e.g. the growing need to provide life-cycle impact data for products exported to Europe.

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RESOURCE EFFICIENCY IN URUMQI (CHINA)

ACTION BRIEF

CODE: URU-AB7

TOPICS:
ENERGY
CAPACITIES

CAPACITY BUILDING FOR ENERGY EFFICIENT BUILDINGS

CHALLENGE

The growth of the cities in Xinjiang is accelerating faster than anticipated, by migration as well as by the demand for larger apartments with more appliances. This increases the pressure on the energy supply system. The infrastructure that is now being built will dominate the residential energy needs for decades to come. If the energy efficiency of Chinese buildings does not improve drastically and fast – with most new buildings of the world to be constructed in China during the next decades – the battle to limit GHG emissions will be lost. Fast policy changes and implementation of model projects for highly energy efficient buildings are needed. This requires the support of residents, the training of workers and the certification of buildings which needs to be ensured quickly.

Top-down policies from Beijing as well as competition for green/low-carbon city programs need to be complemented by networking between municipal governments with the inclusion of residents and workers.

ACTION

RECAST Urumqi's activities in the area of energy efficiency started in January 2007 with a Sino-German conference on energy efficiency of buildings. Many Urumqi stakeholders participated and local media provided coverage. Since then, more than 10 workshops and related activities on the planning of low-energy houses with a focus on passive house design, policy development and excursions took place in Heidelberg and Urumqi. Chinese experts visited Heidelberg for 3-month training in low-energy and passive house design and to learn about municipal energy strategies. Experts from the Urumqi Construction Committee, investors and architects visited Heidelberg-Bahnstadt Germany's largest passive house development project on several occasions. Architects and senior personnel from the City of Heidelberg provided training in Urumqi.

In preparation for the building of the first passive house in China a practical training at the Vocational Training Center for Sustainable Construction in Cottbus in November 2012 was organized for senior personnel responsible for the construction of the Xingfubao passive house in Urumqi. Further workshops and training activities will take place in 2013 and 2014 in Urumqi.

IFEU provided scientific and logistical support for a German-Chinese school exchange (focusing on energy efficiency and climate protection. A student group from Middle School No. 8 in Urumqi/Xinjiang visited the Internationale Gesamtschule (IGH) in Heidelberg in May 2009. Training material in Chinese was provided for the KlimaNet website, a virtual classroom with educational material.

Training of Chinese construction personnel in Cottbus

KlimaNet website with a virtual school tour on energy

RESULTS

STATE OF IMPLEMENTATION:

- More than 10 workshops and capacity building events were carried out to establish a high level of knowledge and joint understanding on building designs regarding low-energy building sector, complementing the lighthouse activities.
- Know-how of TU Berlin regarding training of construction workers will be transferred to Urumqi in 2013/14.
- A network with the major actors in the construction sector in Urumqi and other cities in Xinjiang was established, extending to manufacturers of building components.
- Training of the next generation was implemented with the Sino-German student exchange.

LOCAL USERS / TARGET GROUPS:

- City of Urumqi Construction Committee, University of Xinjiang, architects, construction companies, workers, producers of components, schools, students and teachers.

IMPACTS:

- Based on the impressions of the passive house visits, it was decided to build the first passive house in West China with just 13% of the heat demand required for new buildings in Urumqi.
- Local architects, construction companies, workers as well as city personnel enhanced their capacity for low-energy construction and low-carbon planning in Urumqi.
- Students developed skills and motivation to promote energy efficiency and climate protection, communicating with friends, family and neighbours.

MULTIPLICATION:

- Capacity building was provided to the Xinjiang cities of Karamay and Changji where other extra-low energy building projects are in the planning stages.
- Networking and exchange was established with GIZ, dena (German Energy Agency), University of Tianjin, UN Habitat and other actors promoting and planning low-energy and passive house projects in China and beyond.

LONG-TERM CONSOLIDATION:

- The institutional and technical capacity of the local stakeholders will be significantly improved (architects, construction companies and their workers, local authorities and residents).
- The sustainability of the urban sector will be increased by improving the energy efficiency of Xinjiang's residential buildings, creating opportunities for partnerships with actors in Germany and other European countries.

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RESOURCE EFFICIENCY IN URUMQI (CHINA)

ACTION BRIEF

CODE: URU-AB9

TOPICS:
ENERGY
PLANNING

PLANNING FOR A HIGH-RISE IN PASSIVE HOUSE STANDARD

CHALLENGE

The growth of Urumqi is accelerating at a pace of about 10 million m^2 of gross floor area per year. The increased densification increases the cost for land and triggers the planning for high-rise buildings. Many existing and new projects are designed with glass facades that require a large amount of air conditioning. Dacheng Co, a major real-estate company in Urumqi is planning the construction of a 173-metre-high high-rise building, the Dacheng International Tower B, which would be the second-highest building in Urumqi and is committed to an extra-low energy design, which the initial plan did not address. The challenge was to combine an attractive design for mixed-use that complies with the ambitious passive house standard.

ACTION

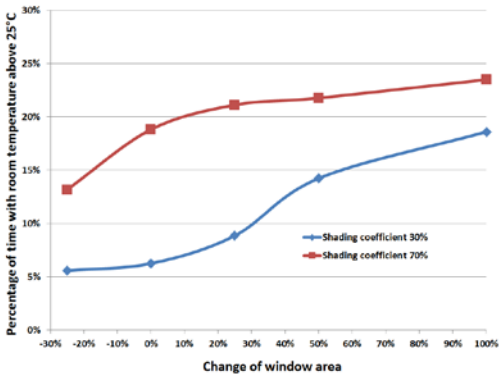
A feasibility study was conducted together with Dacheng Co. for a 173-metre-high high-rise building, the Dacheng International Tower B, which would be the second-highest building in Urumqi. Although this project is in the first planning stages, the RECAST Urumqi team has analysed the possibility of building a true passive house with a heat energy demand of <15 kWh/(m2*a) and a primary energy demand of <120 kWh/(m2*a).

Main features of the concept design

- 46 storeys
- Gross floor area: 120,000 m^2; net heated area: 92,000 m^2
- Main street facade south oriented
- Very low shading of south facade only in the bottom storeys. High shading of west facade by high-rise Dacheng A in late afternoon.
- Broad variety of designated uses: large stores in the bottom storeys, offices, hospital, habitation, optional restaurants and swimming pool in the top storey.
- Possible heat sources: district heating available at site, optional natural gas

A passive house standard can be achieved with an intelligent building design which includes 15 cm insulation on external walls, passive house windows, and a high quality heat recovery system. Simultaneously, the size of the window area and the external shading coefficient in summer need to be optimised in order to keep the cooling demand as low as possible. Compared to the current building code for high-rise buildings (the so-called 65% standard), Dacheng B Tower would use 80% less energy for heating. Assuming natural gas is used for heating, the greenhouse gas emissions will be from 1,600 to 310 tonnes CO_2-eq per year.

Dacheng B High-rise in passive house standard



Minimizing the need for air conditioning: window area and shading

RESULTS

STATE OF IMPLEMENTATION:

- A concept design was funded by Dacheng Co. and provided by Culturbridge Architects.
- A feasibility study has been completed.
- Training of architects and planners was provided.

LOCAL USERS / TARGET GROUPS:

- City of Urumqi Construction Committee, real-estate companies, architects, universities

IMPACTS:

- Visits of passive houses in Germany led to the decision to build Xingfubao, the first passive house in West China with just 13% of the heat demand required for new buildings in Urumqi and the wish to include the high-rise sector.
- Local architects and construction companies are keen to realize the ambitious project.
- The proof that an attractive building design can be combined with extra-low energy features has helped Dacheng Co. to win approval from the owners of the property. It convinced stakeholders in the real-estate company, local architecture firms and the City of Urumqi to go ahead with the next steps for realization.

MULTIPLICATION:

- The feasibility study is being studied by representatives of the Xinjiang cities of Karamay and Changji and is used in networking with GIZ, dena (German Energy Agency), University of Tianjin, UN Habitat and other actors promoting and planning low-energy and passive house projects in China and beyond.

LONG-TERM CONSOLIDATION:

- It is expected that in the near future, ultra-low energy houses (passive houses etc.) will be constructed in larger numbers in Urumqi and other Chinese cities, provided that the technology can be successfully established and that economic incentives are being developed.
- The demand for high-quality high-rise buildings with extra-low energy consumption in China is growing, and the central and local governments are increasingly promoting activities to improve energy efficiency in the building sector.
- Many stakeholders see prototype projects as being an important milestone in this development. The process of careful analysis and demand-driven prototype project development is considered a suitable approach for other emerging megacities.

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RECAST URUMQI
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ACTION BRIEF

CODE: URU-AB10

TOPICS:
ENERGY
PLANNING

A PLAN TO SUBSIDIZE ENERGY EFFICIENT HOUSES INSTEAD OF NATURAL GAS IMPORTS FROM TURKMENISTAN

CHALLENGE

In 2012, 90% of Urumqi's coal-fired heating plants were replaced by natural gas boilers at an investment cost of 12 billion RMB (1.4 billion €). This has helped to improve Urumqi's air quality but has led to significant government subsidies for natural gas. The residential customer pays only around one third of true costs of heating; two-thirds are covered by government subsidies. The annual subsidies for natural gas are estimated to be approximately 1.5 billion RMB (180 million €). REACST Urumqi designed a plan for the partial conversion of these subsidies.

ACTION

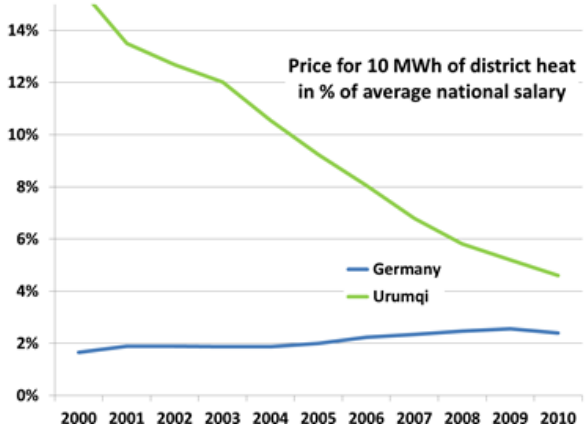
Following initial discussions with representatives of Urumqi's Construction Committee, we reviewed to what extent subsidies for natural gas could be shifted to increase the energy efficiency of houses.

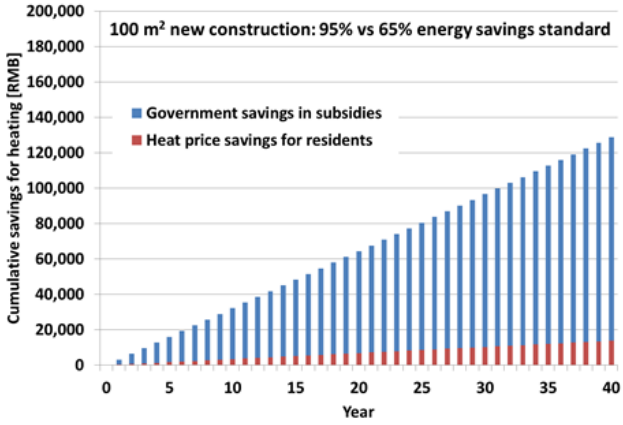
The price to heat a home in Urumqi has decreased by 22% from 2000 to 2010 if one corrects for inflation. What really matters is how much residents feel the heat price in their pockets shown in Figure 1. A modest increase in the prices for district heat for residential customers appears acceptable for Urumqi, at a minimum an adjustment for inflation.

As an example, we calculated that over 25 years a 100 m^2 apartment in passive house standard (95% energy savings standard) will save government subsidies of about 71,900 RMB (Figure 2). This represents about 36% of the basic construction costs estimated at 200,000 RMB. These savings can and should be utilized by providing incentives for higher standards for energy efficiency.

A subsidy program should be based on the following principles:

- Energy efficiency standards will be clearly defined.
- Saved government subsidies will be converted to subsidies to investors.
- Implementation of better standards needs to be verified by inspection.
- In addition to the Xingfubao (95% savings standard), demonstration projects for more ambitious standards in new construction are needed, e.g. for the 75% and 85% energy savings standards.
- Likewise, demonstration projects for more ambitious standards in retrofit of existing buildings, e.g. according to the 65%, 75% and 85% energy savings standard are needed.
- The program will create jobs in Urumqi and reduce the import of natural gas from Turkmenistan.





RESULTS

STATE OF IMPLEMENTATION:

- A study to determine the subsidy savings for more ambitious energy saving codes has been completed in collaboration with the Urumqi Construction Committee.
- Discussion with the City government is ongoing to implement a subsidy system.

LOCAL USERS / TARGET GROUPS:

- City of Urumqi Construction Committee, Government of Xinjiang, Central Government of China, investors, residents

IMPACTS:

- A change in subsidy programs is complex and requires discussions with the government agencies that are currently ongoing.
- The City of Urumqi has asked the Construction Committee to develop design objectives for energy efficient houses exceeding the current legal standard, the so-called 65% standard.
- Beyond energy, environmental, and economic benefits, there are also obvious security benefits, reducing the need to import natural gas from Turkmenistan.

MULTIPLICATION:

- The study has been fed into the existing networking with GIZ, dena (German Energy Agency), University of Tianjin, UN Habitat and other actors who promote low-energy building projects in China.

LONG-TERM CONSOLIDATION:

- It is expected that in the near future, subsidies to construct ultra-low energy houses (passive houses etc.) will be initiated in Urumqi and other Chinese cities, provided that a viable system can be demonstrated.
- Over time, as a supply chain for various components is established and experience in building to a 95% standard is increased, the government will be able to reduce the subsidy level. In the German experience, the more passive houses are being built; the added investment cost of a home compared to the 65% standard should be on the order of 10%. This indicates that, in time, most of the subsidy can be eliminated at least for new buildings.

CONTACT

Project: RECAST Urumqi - Meeting the Resource Efficiency Challenge in a Climate Sensitive Dryland Megacity Environment - Urumqi as a Model City for Central Asia
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