

项目背景

北京农村住宅以砖瓦结构为主，建筑外围护结构保温性能差，户均冬季采暖用燃煤折算成标准煤约为每年1.8吨（1.8 tce/year），产生的二氧化碳排放约每年4.5吨。随着农村生活品质和居住舒适度提升，农村煤炭、电力、天然气等能源消费不断增长。同时，北京周边农村地区冬季燃煤供暖被认为是北京地区大气环境中pm2.5的重要因素，是导致北京雾霾天气一个原因。世界卫生组织下属国际癌症研究机构指出：pm2.5为普遍和主要的环境致癌物。

目前京郊仍在用烧煤取暖的村庄有3278个，存在100多万农户，在农村居住的人数超过了500万。北京农村低能耗农宅示范工程是以《低碳住宅与住区应用技术导则》为指导，新建一栋208平方米的二层农宅，通过技术创新，采取多种措施，使其成为农宅节能减排的示范工程，以期引导北京农民建房和生活用能等活动向绿色低碳方向发展，并助力“北京农村地区减煤换煤—清洁空气行动政策”的实施。

项目概况

项目位于北京市顺义区马坡镇石家营村，该村183户，是北京36个市级新型农村试点社区之一。项目周期从2014年10月至2016年6月，实际上花费了更长的准备时间。项目目标是：1.降低北京农村地区建筑的用能需求，并减少污染排放；2.调动农民的积极性，促使他们自愿参与减排行动；3.推动政府调整或出台相关政策，推广低能耗低排放建筑。本项目受赠单位为中国环境文化促进会，执行机构为北京新地时空信息咨询公司。石家营村委会和农宅业主予以了支持和配合。

项目活动

1. 对项目村建筑节能现状以及生活用能进行调查



项目工作人员现场调查村民用能情况

2. 对村民进行节能减排培训



联合国开发署代表参加培训活动

3. 进行村民动员、收集村民意见、确定改造农户



项目启动会的来宾在村委会大楼前的合影

4. 构建示范工程的技术集成方案

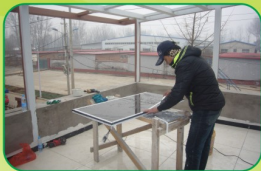


项目工作人员在北京大兴宏光新型保温材料厂讨论图纸

5. 低能耗农宅示范工程施工

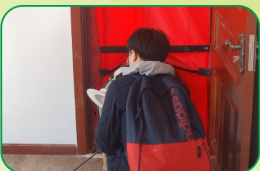


工程现场负责人指导工人现场安装墙板



光伏安装人员正在准备薄膜光伏发电材料

6. 跟踪监测及对比分析



科研人员进行房屋气密性测试

7. 示范推广



众人参观示范工程

项目成果

- 项目建筑设计的耗热量满足《北京市居住建筑节能设计标准》（DB11/891-2012）（俗称75节能设计标准）限值（该限值为 14.50w/m^2 ），项目建筑耗热量为 13.72w/m^2 。本项目采暖热负荷 36w/m^2 ，约为村新建农宅采暖热负荷（ 77w/m^2 ）的一半，大幅度减少项目冬季采暖用能需求。
- 通过太阳能光热+空气源热泵+水源热泵+地暖+风机盘管提供采暖、制冷、生活热水服务，在冬季替代了燃煤供暖，消除了每年直接燃煤采暖导致的超过4.5吨的二氧化碳排放（因为是二层楼，实际上每年采暖用煤会超过1.8吨标准煤。）。同时，由于这套系统起到中央空调作用，业主不用另行安装窗式空调。由于优化利用了可再生能源，在合理使用情况下，应节省电能。
- 安装光伏发电系统已经并网发电，薄膜光伏板充当阳光房屋顶，同时与其他组件组成发电系统，目前并网后发电量平均每天9度，年发电度数将超过2000度。
- 增加了暖廊和阳光房，有利于房屋自然得热，房屋气密性增强，在拓展生活与休闲空间的同时提升了节能潜力。
- 项目在建设过程中，引起了众多村民的关注，也吸引了众多新型材料和设备厂商的关注。项目建成后接待了北京市住建委、伊朗政府代表团等现场考察参观。
- 向北京市农委、住建委等汇报了项目情况，还向有关国际机构介绍了项目情况。已举办多次培训和多次专题会议，超过300人获得了节能减排知识。多家媒体对项目给予了报道。
- 项目已在当地产生积极影响，新型保温与结构一体化网格墙、薄膜光伏发电系统在部分村民建房过程中得到复制。



北京农村低能耗农宅示范工程项目

Beijing Rural Low Energy Consumption Houses Demonstration Project



节能减排 驱赶雾霾

Energy Saving and Emission Reduction
Haze Elimination and Fog Eradication

全球环境基金小额赠款计划
Global Environment Facility (GEF) Small Grants Programme (SGP)

联合国开发计划署
United Nations Development Programme

中国环境文化促进会
China Environmental Culture Promotion Association

北京新地时空信息咨询公司
Beijing Xindishikong Information Consulting Company

合作机构简介

联合国开发计划署

联合国开发计划署同社会各阶层的人们建立伙伴关系，帮助各国克服危机，推动和维持能够改善每个人生活品质的发展类型。在全球170多个国家和地区，联合国开发计划署提供全球观点和深入本土的见解，帮助建立民强国盛的国家。三十多年来，作为联合国从事发展的全球网络，联合国开发计划署充分利用其全球发展经验，支持中国制定应对发展挑战的解决之道，并为中国开展南南合作和参与全球发展提供协助。联合国开发计划署目前在中国的重点工作领域为：减少贫困、善治、危机预防与恢复及能源与环境。

全球环境基金小额赠款计划

作为全球环境基金资助项目的组成部分之一，小额赠款计划成立于1992年，由联合国开发计划署负责实施，联合国项目事务厅负责执行。小额赠款计划直接向非政府组织和社区组织提供资金和技术，支持他们保护和恢复自然，同时提高人们福祉和生计的活动。小额赠款计划支持的优先领域为：保护生物多样性、减缓气候变化、保护国际水域、防止土地退化以及消除持久性有机污染物和全球关注的化学品。目前，这个计划已经在全世界125个国家支持14500多个社区项目。

中国环境文化促进会

中国环境文化促进会是本项目主申请机构，成立于1992年，是国内环境文化领域唯一一家具有独立社团法人资格的跨地区、跨部门、跨行业的全国性社会团体。本会以“弘扬生态文明、传播环境文化”为办会宗旨，主要业务是：联系理论、文艺、新闻等界别的知名人士，进行生态文明理念倡导与环境文化宣传，开展环境保护领域课题研究和社会服务，组织环境文化交流活动，提高公众环境意识。

北京新地时空信息咨询公司

本项目执行机构北京新地时空信息咨询公司，拥有十年以上绿色建筑以及能源领域的政策研究与技术开发的经验。多年建筑、电力等行业节能减排政策研究经验。已经取得多项部委和企业委托的与节能减排、低碳发展有关的研究成果，具体包括《绿色生态办公建筑评估手册》、《电力行业节能减排研究》、《低碳住宅与社区应用技术导则》等。参与了《村镇规划、建设、管理条例修订与住建部三定关系研究》、《健康住宅技术要点》等研究课题。公司策划和实施了10多次包括6届全国写字楼年会在内的以城市建设与发展，城市基础设施与公用事业，房地产，建筑技术为主题的全国性会议，是全国写字楼年会商标持有者。

Demonstration Project on Low Energy Farmer's House at the Rural Area in Beijing

Project Background

In Beijing rural areas, traditional brick houses have the common problems of poor heat preservation and energy conservation. A typical rural house burns 1.8 tons of standard coal per year (1.8 tce/year) for winter heating, producing 4.5 tons of carbon dioxide emissions. As life quality and residence comfort improves in rural areas, the energy consumption of coal, electricity and natural gas is increasing. Therefore, coal heating in winter in Beijing rural areas is considered as a key source of PM 2.5 in Beijing atmospheric environment, which causes fog and haze weather in Beijing. The International Agency for Research on Cancer (IARC) attached to the World Health Organisation (WHO), considers that PM 2.5 is a common and major environmental carcinogen.

Currently, there are more than 5 million rural residents from over 1 million rural households of about 3,278 villages in Beijing burning coal for heating. A two-storied rural house with an area of 208 square meters was constructed by the Beijing Rural Low Energy Consumption Houses Demonstration Project. The rural house, which adopts technological innovation and various measures, is a demonstration project of energy saving and emission reduction. This project is expected to guide the construction of rural houses, household energy consumption and other activities in Beijing towards green and low carbon development. Also, it contributes to the implementation of the "Action Policy of Reducing Coal Use and Replacing Coal Use with Cleaner Fuel to Cleanse Air in Rural Areas of Beijing".

Project Overview

The project was conducted in Shijaying Village, Mapo Township, Shunyi District, Beijing. The 183 households of the village make up one of the 36 new municipal experimental communities in rural areas of Beijing. The project was implemented from October 2014 to June 2016. The actual project period is longer if the preparation work is included. The project objectives are as follows - first, to reduce energy demand of buildings in Beijing rural areas and reduce pollution emissions; second, to mobilize the initiative of rural residents and encourage them to voluntarily take mitigation action; third, to suggest that the government make adjustments or introduce related policies to promote the buildings with properties of low energy consumption and low emission. The major grant recipient of the project is the China Environmental Culture Promotion Association. The chief executive agency is Beijing Xindishikong Information Consulting Company. The project received great support and cooperation from Shijaying Village Committee as well as the owners of rural houses.

Project Activities

1. Conducting a survey on the status quo of building energy efficiency and household energy consumption in the village
2. Organizing training on energy saving and emissions reduction for villagers (Picture 2)
3. Mobilizing the villagers, collecting their opinions and confirming the demonstration rural households
4. Reviewing the technology integration schemes
5. Constructing the Rural Low Energy Consumption Houses Demonstration Project
6. Tracking, monitoring and comparative analysis
7. Promotion of the demonstration project



State of the building in Beijing's shunyi District after roof-sealing has been finished

Project Results

1. Energy consumption of the project is 13.72w/m2, which meets the limit (14.50w/m2) of the Design Standard for Energy Efficiency of Residential Buildings (DB11/891-2012) (commonly known as 75 Design Standard for Energy Efficiency). The heating load of the project is about 36w/m2, which is half that (77w/m2) of the newly built rural houses in the village. Energy demand for heating in winter has obviously decreased.
2. The project replaced coal heating in winter by using solar thermal, air source heat pumps and water source heat pumps, and installing floor heating and fan coil system to provide triple co-generation service of heat, refrigeration and hot water. The system avoid over 4.5 tons of carbon dioxide emission per year resulted from coal-fired heating (For this is a two-storied building, if heating by using coal, the actual annual amount of standard coal burnt for heating is over of 1.8 tons on average).

Meanwhile, the house owner does not need to install window air conditioning because the system can act as central air conditioning. Due to the optimum usage of renewable energy, the system should save electricity under rational usage conditions.

3. The photovoltaic power generation system was installed and has been integrated to the grid. The thin film photovoltaic panels can act as the roof of the sunroom. Also, it forms part of the power generation system with other units. The current average electricity production is 9 kilowatt-hours per day. The total annual electricity is expected to surpass 2,000 kilowatt-hours.
4. The warm corridor and sunroom contribute to natural gains of heat and enhancing house airtightness. The energy saving potential was increased while the life and recreation space were expanded.
5. The construction process of the project drew attention from a number of villagers as well as many new materials and equipment factories. Officials from Beijing Municipal Commission of Housing and Urban-Rural Development and a delegation of the Iranian Government visited the project after its completion. The project was also introduced to relevant international organizations.
6. Several training activities and workshops were organized. Over 300 people gained knowledge of energy saving and emission reduction. The project was reported by media organizations.
7. The project has had positive local impacts. Some villagers began to build houses with new-type thermal insulation and structural synthesis grid wall. Additionally, some villagers bought and installed thin film photovoltaic power generation systems to produce clean electricity.

Project Partners

United Nations Development Programme (UNDP)

UNDP partners with people at all levels of society to help build nations that can withstand crisis, and drive and sustain the kind of growth that improves the quality of life for everyone. On the ground in more than 170 countries and territories, UNDP offer global perspective and local insight to help empower lives and build resilient nations.

UNDP has drawn on world-wide experience for over three decades to assist China both in developing solutions to its own ongoing development challenges, and in its south-south cooperation and engagement in global development. Domestically, our work focuses on Good Governance, Energy & Environment, Poverty Reduction and Disaster Management.

The Global Environment Facility (GEF) Small Grants Programme (SGP)

As a corporate programme funded by the Global Environment Facility (GEF), Small Grants Programme was established in 1992, implemented by the United Nations Development Programme (UNDP) on behalf of the GEF partnership, and executed by the United Nations Office for Project Services (UNOPS). SGP channels financial and technical support directly to NGOs and CBOs for activities that conserve and restore the environment while enhancing people's well-being and livelihoods. SGP supports activities in these priorities - biodiversity conservation, abatement of climate change, protection of international waters, prevention of land degradation and elimination of persistent organic pollutants and chemicals of global concern. With presence in more than 125 countries, SGP has supported more than 14,500 community-based projects worldwide.

China Environmental Culture Promotion Association (CECPA)

Established in 1992, CECPA is the only trans-regional, trans-department and trans-industry national social organization with independent corporate legal person qualification in the field of environmental culture in China. CECPA aims to "carry forward ecological civilization and spread environmental culture". Its primary mission involves conducting theoretical studies on ecological civilization and environmental culture, advocating the concept of ecological civilization, propagandizing environmental culture, organizing the exchange activities of environmental culture and raising the environmental awareness of the public.

Beijing Xindishikong Information Consulting Company

Beijing Xindishikong Information Consulting Company, the chief executive agency of the project, has over ten-year experience in policy research and technology development of green building and energy sector. The company has conducted research on policies of energy saving and emission reduction in construction and electric power industries for several years. It has achieved several results of research on energy saving and emission reduction and low carbon development which is delegated by ministries and commissions as well as enterprises. The results include Green Ecological Office Building Appraisal Handbook, Research on Energy Saving and Emission Reduction in Electric Power Industry, Low Carbon Housing and Community Applied Technology Guideline, etc. The company has also participated in research projects such as Research on Town Planning, Construction and Revised Regulations and the Relations with Ministry of Housing and Urban-Rural Development of the People's Republic of China, Healthy Housing Technology Essentials, etc. It has planned and held over ten national meetings on the themes of urban construction and development, urban infrastructure and public utilities, real estate, and construction technology. The company has held six national office building annual meetings, and is the holder of the meeting trademark.