RESULTS, LESSONS LEARNED, AND STRATEGY FOR TRANSITION AND SUSTAINABILITY UPON COMPLETION OF THE UNDP/GEF FULL-SIZED PROJECT

Promoting
Energy Efficiency
in Public Buildings

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This document of quantitative
and qualitative evaluation design,
construction and capital reconstruction
of ten selected Public Buildings is prepared by the
joint project of the United Nations Development
Programme (UNDP), Global Environment Facility (GEF)
and the State Committee of the Republic of Uzbekistan
for Architecture and Construction

"Promoting energy efficiency in public
buildings in Uzbekistan"

Introduction

Located in the heart of Central Asia, the Republic of Uzbekistan became independent in 1991 after the collapse of the Soviet Union. Since then, the nation has undergone great political and economic transition, magnified by unusually high birth rates and the resultant rapid growth of the population, from 14 million at the time of independence to more than 30 million in 2015 – by far the largest population of any country of the region. Uzbekistan has met these challenges with notable success, achieving economic growth sooner than any of the other former Soviet republics, and maintaining a consistently rising GDP and steadily declining poverty rates.

In Uzbekistan, the buildings sector has been a major focus of the Government from the points of view of both economic development and the provision of social services. In particular, as children constitute more than 30 percent of the population, the Government forecasts huge new demands on education and health-care services, as well as the facilities where they are provided. But the number and quality of existing facilities are not sufficient to meet demand. In the educational sector, as of 2009, 40 percent of the existing 9,700 schools were located in non-educational facilities, 8 percent were in emergency conditions and almost 30 percent were used in excess of their capacity. In the health-care sector, 1336 of the existing 7921 buildings used as healthcare facilities required capital reconstruction, and 565 facilities were housed in interim space, requiring new, purpose-built facilities. In addition, 66 percent of healthcare facilities require reconstruction of their heating and hot water systems.

To respond to these demographic and social challenges, the Government of Uzbekistan embarked on a series of large-scale programmes for renovation and new construction of public buildings, which include schools, colleges, kindergartens, hospitals, and athletic facilities. Overall, the government invested hundreds of millions of dollars annually to construct and renovate millions of square meters of public space in the educational and health sectors. The Government has conducted efforts of even greater scale to promote the development of new housing.

Even as it aggressively pursued its initiatives in new construction and renovation, the Government of Uzbekistan also recognized the linkages among growing building stock, rising energy demand, and emissions of greenhouse gases. The significant technical potential for energy conservation in buildings was specifically noted in Uzbekistan's First and Second National Communications to the UNFCCC. However, construction continued to proceed according to outdated building norms and practices, and energy efficiency considerations were not factored into the design and construction process, leading to excessive energy consumption and emissions. Neither market-based incentives nor educational support were sufficiently available to prompt building owners or designers to pursue best practices in energy efficiency. Recognizing the need for action, the United Nations Development Programme (UNDP) and the Government of Uzbekistan resolved to develop and implement a set of wide-ranging joint activities to tap the potential of energy efficiency in the building sector, and to seek global environmental benefits while supporting the Government's broader directions in economic development and provision of social services.

The UNDP/GEF project "Promoting Energy Efficiency in Public Buildings in Uzbekistan"

From 2009 to 2015, UNDP and the State Committee for Architecture and Construction of the Republic of Uzbekistan (commonly known by its Russian initials as GKAS) conducted a project to promote energy efficiency in the public building sector in Uzbekistan. This project received financial support from the Global Environment Facility (GEF) and significant co-financing from the state budget of Uzbekistan via GKAS, the Ministry of Health, the Ministry of Public Education, the Ministry of Higher Education, and other collaborating agencies.

The project is entitled "Promoting Energy Efficiency in Public Buildings in Uzbekistan" (hereinafter referred to as the EEPB project). The project has conducted its activities in six areas.

- **Revision and enforcement of building energy codes**
- **Energy audit, management, and certification** of existing buildings
- **Design, construction, documentation, and demonstration** of new and renovated energy-efficient buildings
- **Development and implementation of new educational standards and curricula** in higher and continuing education
- **Documentation and dissemination of project results**
- **Development of national policies** to sustain and expand project results after the project period.

The EEPB project was carried out by a full-time staff of six, working from an office in the GKAS headquarters in Tashkent. Project Manager Kakhramon Usmanov led the team, providing day-to-day oversight as well as strategic planning and coordination with UNDP, GKAS, and other national partners. The technical work of the project was carried out by four Task Leaders – Rustam Kuchkarov on building codes; Petr Pozichanyuk for energy audit, management, and certification; Alisher Temirov for demonstration buildings; and Elyor Abbosov for education, documentation, and dissemination. Alyona Kim oversaw financial and administrative aspects of the project. Climate Change Specialist Rano Baykhanova of the Energy and Environment Unit of UNDP in Uzbekistan, as well as Regional Technical Advisor Marina Olshanskaya of the UNDP's Istanbul Regional Hub for Europe and the CIS, provided oversight and management support.

GKAS and authorized national agencies in building design, construction, development of standards, education, and other areas participated actively with the project staff at every step, under the supervision of National Project Coordinator Mukhammadshakir Khalhodjaev of GKAS. In addition, the project engaged national and international consultants and contracted agencies for numerous technical tasks.

This project is due for completion in the middle of 2015. It has achieved major successes in all of the above-listed areas. Publicly-financed new and renovated buildings now consume 25 to 50 percent less energy for heating than buildings built before the project. Efficiency improvements implemented during the project period are expected to yield nearly 36 million tonnes of avoided CO_2 emissions over their lifetimes, exceeding the project's initial targets by about 20 times.

This report begins by enumerating the project's many achievements. It presents quantitative results, with a discussion of their underlying methodology and assumptions, as well as key factors that caused the project to achieve and exceed its targets. The report presents lessons learned in project design and implementation, in the hope that similar projects in the region and around the world may draw insight from this project's experiences and approaches. Finally, the report discusses next steps for the

Government and the construction sector of Uzbekistan, with a focus on the steps already taken explicitly in order to ensure a smooth transition as the UNDP project draws to a close.

Summary of achievements

The UNDP/GEF EEPB project has achieved essentially all of the deliverables set forth in its original Project Document. It has achieved numerous major successes, including the following.

- Revision of 10 mandatory national building codes. The original Project Document called for the revision of only five codes, but the UNDP project team identified the need to update all ten, and did so with the support of GKAS. Revisions were adopted in 2011.

These codes contain three levels of energy performance, applicable to both residential and public buildings.

— The ***first level*** reflects minimal compliance. It satisfies basic conditions for energy performance and health conditions in the indoor environment. The stringency of the first level has been raised relative to previous requirements, with thermal resistance of walls increased by 10 to 32 percent, and of roofs by 22 to 34 percent.
— The ***second level*** of thermal performance is applicable to all residential and public buildings financed by the government's capital investment funds or municipal budgets, but also recommended for private developers on a voluntary basis. This new second level increases thermal resistance levels for walls by approximately 1.9 to 2.3 times, and for roofs and floors by 1.7 to 2 times.
— The ***third level*** of thermal protection exceeds the new first level by 2.5 to 3 times. This level, like the second, is presented on a recommended basis for private investors to choose if desired.

Increased required thermal performance of building envelopes leads in turn to reductions in overall heat consumption in buildings. These reductions vary by building geometry and climate zone. Table 1 presents a sampling of permitted heat energy consumption levels under building codes in Uzbekistan before and after the 2011 revisions. The data are presented across the full range of the country's climate extremes for the most common types of new and renovated buildings – single-family and multifamily housing.

Table 1
Maximum Permitted Energy Consumption of Typical Buildings in Uzbekistan Before and After the 2011 Revisions of National Building Energy Codes

Region		Maximum allowed specific consumption of heat energy (kWh/m^2 per year)		Reduction (%)
		Before 2011 code revisions	*After 2011 code revisions*	
Karakalpakstan *Coldest climate: >3000 °C-day in heating season*	*Single-family housing*	299-317	145-155	51
	Multi-family housing (5-story building)	158-175	74-82	53

Tashkent region *Intermediate climate: 2000-3000 °C-day in heating season*	*Single-family housing*	217-230	115-123	**47**
	Multi-family housing (5-story building)	110-123	60-68	**45**
Sukhandarya *Warmest climate: <2000°C-day in heating season*	*Single-family housing*	135-144	83-89	**38**
	Multi-family housing (5-story building)	65-74	26-29	**60**

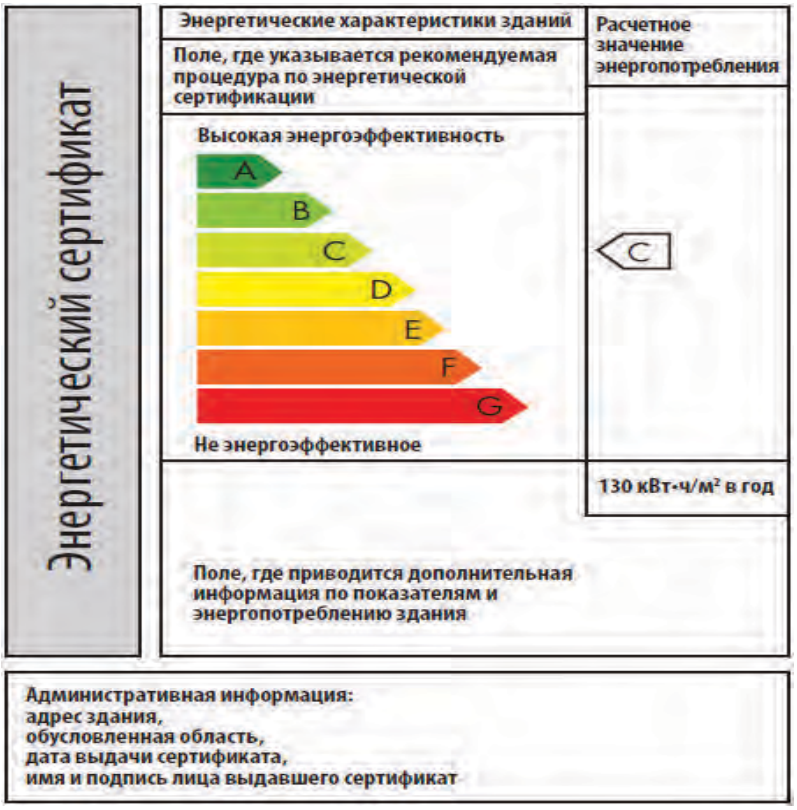
- The revised codes contain many dozens of other technical revisions to encourage energy-efficient building design.

- Based on recommendations prepared by the project, GKAS has adopted and is fully implementing a comprehensive strategy for capacity-building within the Department of Monitoring of Activity of Design Organizations (UMDPO).

- The EEPB project team has prepared and published five guidance manuals on energy-efficient building design in compliance with the revised codes. Also, at least 1000 architects, construction specialists, teachers, and students of architecture-construction institutes and colleges have participated in master classes around the country on code compliance and EE building design.

- The project developed new tools and procedures for energy management within national agencies, including an energy information management system that includes various levels, including building, district, oblast, and nationwide.

- Seventeen new state standards have been developed and accepted by GKAS, defining an energy performance certification system for buildings. The standards cover wide range of subject matter, including energy audit methodology, credentialing of service providers, labeling of buildings, overall terminology and procedures, and so on. In January 2015, President Islam Karimov issued an order instructing GKAS and the national standards agency UzStandard to develop a plan for phased introduction of this system for new buildings nationwide.



Energy performance certificate, developed by the project and mandated by new national standards

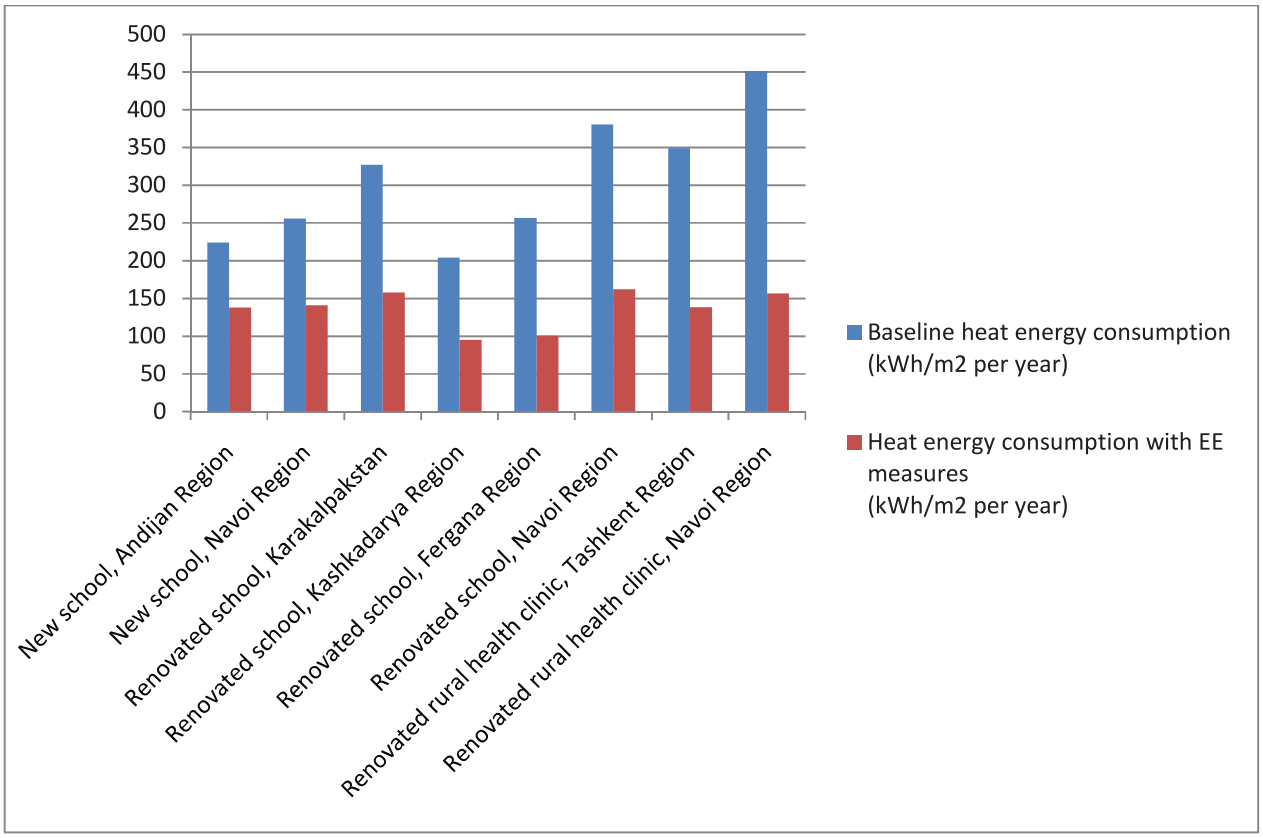
- In conjunction with the Tashkent Architecture and Construction Institute (TACI) and the Tashkent State Technical University (TSTU), the EEPB project has developed and implemented three new state education standards, 8 training programmes, and 11 training modules, educational programmes, and continuing-education programmes for practicing professionals, all with regard to energy efficiency in design and construction of buildings. All of the standards were officially approved by the Ministry of Higher Education and have been implemented since 1 September 2011.

- New bachelor's and master's degree programmes on energy efficiency in buildings are now offered at Tashkent State Technical University (TSTU) and the Tashkent Architecture and Construction Institute (TACI), which are the nation's two leading institutions of higher education in building design, construction and maintenance. Now approximately 200 students per year seek bachelor's degrees and well over a dozen seek master's degrees each year in new degree programmes at these two institutions. The TSTU programmes have been extended to other technical universities across the country, for a total of approximately 400 undergraduate and 32 graduate students in new programmes of study on energy efficiency in buildings nationwide.

- The EEPB project has completed eight demonstration projects embodying advanced energy-efficient building design and construction. These projects include both schools and health-care facilities, and both new construction and renovation. All demonstration projects are achieving 40 to 65 percent savings of heat energy and associated emissions relative to baseline levels. These energy savings are summarized in Figure 1.

Figure 1.

Baseline and reduced heat energy consumption in new and renovated demonstration buildings



Initial construction and completed school in Andijan, designed and built by the EEPB project. Energy-efficiency measures in the design result in a calculated 38 percent savings of heat energy.

Renovation of school, Fergana region. Measures implemented by the EEPB project resulted in heat energy savings of 60 percent.

School No. 35 in Yangirabad, before and after renovation designed and implemented by the EEPB project. Heat energy consumption has been reduced by 61 percent.

Renovated school in Karshi, Kashkadarya region. Renovations designed and implemented by the EEPB project have reduced heat energy consumption by 60 percent. Teachers note dramatically increased comfort and reduced student illnesses as well.

- The project has also undertaken work to increase the energy efficiency of rural homes – an area not originally included in the Project Document, but added in response to identified need and opportunity. The project has enhanced the energy performance of three typical rural home designs to be confirmed and included in the State Programme "Housing for Comprehensive Rural Development."

At the recommendation of its Midterm Evaluator, the UNDP project and the national design agency ToshujoyLITI prepared a wholly new rural home design, embodying full integrated building design for energy efficiency. This design includes not only enhanced insulation in walls, roof, and basement, but also efficient heating devices, heat recovery in its ventilation system, and solar PV and water heating devices as well. Construction of this wholly newly designed home was completed in 2014.

- The project has conducted a wide range of outreach via mass media, including frequent appearances on television, radio, print news, and Internet, as well as participation in exhibitions and other events throughout the country and abroad. The Project has also taken the lead in developing and maintaining the website www.beeca.net, which is a clearinghouse for information from UNDP/GEF projects on energy efficiency in buildings throughout Central Asia and Armenia, as well as an active Facebook page and YouTube channel.

The EEPB project's booth at the annual UzEnergy and UzPromStroy expo in Tashkent, September 2014. Over 1100 people visited the booth and took materials provided by the project.

- Partners of the EEPB project have contributed more than US $77 million in co-financing, plus additional in-kind support, beyond the $3.1 million in grant funding provided by the Global Environment Facility. The Government of Uzbekistan is the main source of co-financing. Other sources of co-financing include regional administrations and private entities based both in Uzbekistan and abroad. Table 2 below summarizes co-financing sources, amounts, and purposes as of April 2015.

Table 2.
Co-Financing Mobilized in Support of the UNDP/GEF Project
"Promoting Energy Efficiency in Public Buildings in Uzbekistan"
(as of April 2015)

I. Government of Uzbekistan (cash)		
Activity	**Amount (US $)**	**Notes**
Construction and retrofitting of 8 project pilot buildings (6 schools and 2 rural health clinics)	3,023,599	Government share delivered via engineering companies of the authorized construction procurement agencies of 5 regions (Andijan, Fergana, Navoi, Kashkadarya, Karakalpakstan).

Construction of pilot 4-room rural family home with code-compliant EE features and use of solar energy	74,242	Government share delivered via engineering companies of the authorized construction procurement agency, Tashkent regional branch
Construction and retrofitting of public buildings in compliance with new mandatory requirements of EE building codes under National Government Investment Programs in 2013 and 2014.	72,662,775	This sum includes only those buildings where the UNDP/GEF project conducted special verification activity. (See the following section for further details.) State funding for construction of code-compliant buildings has far exceeded the listed sum.
SUBTOTAL	**75,760,616**	

II. Government of Uzbekistan (in-kind support)

Activity	Amount (US $)	Notes
Office rent and utilities	245,550	The UNDP/GEF project office consisted of four rooms in the headquarters of GKAS for five years and seven months.
Staff of GKAS	203,400	Includes shares of the salaries of 10 GKAS staff members.
Development and introduction of educational modules and programs on energy efficiency (Bachelor's, Master's, specialized professional education, and continuing education)	78,192	Tashkent Architecture and Construction Institute share delivered via staff time, salaries of professors and other experts, library, materials etc.
Development and introduction of new State Educational Standards, including training modules, programmes and methodological guidelines (Bachelor's, Master's, specialized professional education, and continuing education)	59,494	Tashkent State Technical University share delivered via staff time, salaries of professors and other experts, library, materials etc.
SUBTOTAL	**586,636**	

III. Fund raising

Activity	Source	Amount (US $)	Notes
Airing of reports, interviews with project staff, and an animated short film developed by the project on energy management in buildings	National television and radio companies	164,000	Total of 82 minutes at $2000/minute
Printing and placement of 50 banners (mupies) along city streets (36 months @ $300 per banner per month)	JCDecaux	540,000	Regular fees were waived for public-interest messaging.
Printing and placement of 1,500 posters with energy-saving tips in 300 city buses for 1 month in Tashkent, reaching	City Administration (Hokimiat) of Tashkent	17,350	

approximately 1.5 million people			
Provision of 2 additional boilers for demonstration buildings (rural health clinic Oktepa and School #2 in Rishtan district of Fergana region)	Chirchik Communal Service Company	4,777	
Provision of 48 m^3 of thermal insulation materials for construction of pilot 4-room EE rural house	Knauf	4,551	Materials provided on a complimentary basis.
Study tour to Italy on energy efficiency for 6 national construction industry representatives	Turin Polytechnic University	17,170	Includes staff time of professors and other experts at Department of Energy, access to sites and equipment, and visits to agencies off campus.
Study tour to Berlin, Germany on energy efficiency in buildings	Central Asia Regional Economic Cooperation Program (CAREC) and Initiative Wohnungswirtschaft Osteuropa (IWO)	2,990	CAREC/IWO covered all travel expenses of Project Manager.
Participation of project staff in conferences on advanced architectural design in Moscow (October 2014) and Astana (April 2015)	Knauf CIS	2,500	Knauf CIS covered all travel expenses of two Task Leaders.
Participation of project staff in seminar in Bishkek, Kyrgyzstan on energy efficiency in buildings (April 2015)	Regional Ozone Network	1,000	Regional Ozone Network covered all travel expenses of Project Manager.
Practical seminar on 2 energy management systems for representatives of medical facilities	Advanced Training Center of Ministry of Health	600	In-kind (premises, catering, etc.)
Practical seminar on 2 energy management systems for representatives of public education facilities	Secondary School #28	500	In-kind (premises, catering, etc.)
Three regional master-classes to national construction and design experts and practitioners on energy-efficiency codes and standards	Administrations (Hokimiats) of he cities of Andijan, Karshi, Navoi	900	In-kind (premises, catering, etc.)
Participation of specialists in project activity, including presentations at 2 conferences for national practitioners	Tashkent Architecture and Construction Institute	1,000	In-kind (premises, catering, etc.)
	SUBTOTAL	**757,338**	
TOTAL CO-FINANCING FROM ALL SOURCES		**77,104,590**	

Implementation of new building codes: field verification of transformed design practice and energy savings

In order to confirm the extent to which the revised building codes are being implemented in practice, the project commissioned studies conducted in 2013 and 2014, in which ten buildings were selected and examined for their compliance with code requirements – in terms of building design, associated calculations of energy performance, and verification of actual installation of design features.

These buildings, ***none of which received financial or technical support from the UNDP/GEF project***, included the following:

1. Capital renovation of a building of the Center for Advanced Technology of the National University in Tashkent
2. Capital renovation of a building of the institute of immunology of the Republican Center for Forensic Medicine, Tashkent
3. Construction of a new five-story residential building in the city of Andijan
4. Construction of a 100-bed sanatorium for young tuberculosis patients in the Novbakhor district of Navoi Oblast
5. Construction of a drop-in diagnostic center in the Semashko Medical Center in Tashkent.
6. The building of the National Olympic Committee of the Republic of Uzbekistan and the Republican Scientific-Practical Center of Sports Medicine in Tashkent
7. A clinic serving 250 patients per shift in the Tuzel microdistrict of Tashkent
8. The arrivals building of the airport of the city of Urgench in the Khorezm Oblast
9. A new building unit of the Savitsky State Museum of Arts in the city of Nukus, Republic of Karakalpakstan.
10. Five-story 36-apartment residential building with additional commercial space and services in Andijan.

All ten buildings achieved compliance with the second level of the revised national codes, with associated heat energy savings relative to baseline levels of at least 30 percent, with six buildings attaining heat energy savings above 45 percent. The buildings were also all field-inspected, with verification of required levels of wall and roof insulation, as well as use of advanced techniques such as ventilated facades.

Renovation of Center for Advanced Technology, National University in Tashkent

Ventilated façade, National University in Tashkent

Insulation at heat exchanger at district heat entry point of forensic building, Tashkent

Façade, National Olympic Committee Building

Air duct in Tuzel clinic

High-efficiency boilers, Urgench airport

Insulation in ventilated facade, Urgench airport

Table 3 below summarizes the results of the verification of code compliance for the ten buildings.

Table 3.

Measured Heat Consumption Reductions and Associated Avoided Emissions from Buildings Selected for Verification of Code Compliance

Building	Heated Floor Area	Specific energy consumption			CO_2 emissions			
		Baseline	Actual	Reduction	Baseline	Actual	Reduction	% Reduction Relative to Baseline
	m^2	kWh/(m^2*yr)			Tonnes CO_2			
Renovation – Center for Advanced Technology at National University, Tashkent	7646	185.7	44.5	140.5	336.6	80.4	256.2	**76**
Renovation – national forensic medicine building, Tashkent	4705	197.5	137.7	59.8	220.3	153.5	66.8	**30**
New construction – five-story residential building, Andijan	4922	216.5	135.2	81.3	252.7	157.9	94.8	**37**
New construction – 100-bed sanatorium for tuberculosis patients, Navoi Oblast	3366	223.4	138.6	87.8	178.2	110.6	67.6	**38**
New construction – diagnostic center of the Medical Department, Tashkent	4156	195.4	132.1	63.3	192.6	128.1	64.5	**33**

New construction – National Olympic Committee building and center for sports medicine	9400	162.3	87.5	74.8	361.9	195.0	166.9	**46**
New construction – 250-patient clinic, Tuzel microdistrict of Tashkent	2328	184.1	89.0	95.1	101.7	49.2	52.5	**52**
New construction – Airport arrivals building, Urgench, Khorezm Oblast	4195	246.2	135.9	110.3	245.0	135.2	109.8	**45**
New construction – Building unit of the Savitsky State Museum of Arts, Nukus, Republic of Karakalpakstan	4949	248.4	121.3	127.1	291.6	142.4	149.2	**51**
New construction – five-story 36-apartment residential building and commercial space, Andijan	3432	165.7	86.7	79.0	230.4	120.6	109.9	**48**

Estimated greenhouse gas emission reductions

The success of the project can be assessed in various dimensions, including savings of financial and natural resources for Uzbekistan; enhanced quality of buildings for Uzbek citizens; and improved capacity among Uzbek professionals in building design, construction, and code enforcement.

For the international community – including the Global Environment Facility (GEF), which is the project's main international funder – the defining aspect of the project's value is energy savings and associated avoided emissions of greenhouse gases (GHG), resulting from project activity. In this regard, the project has evidently achieved huge successes, far in excess of its original targets.

Assessing and allocating credit for avoided emissions is a rather complex task, subject to various possible methodologies. The table below shows summary results of an assessment carried out by the project team using the GEF's preferred methodology, as developed by the Scientific and Technical Advisory Panel (STAP).[1]

These figures reflect the following assumptions, all of which are consistent with default conditions specified by the STAP, or even more conservative.

[1] *Calculating Greenhouse Gas Benefits of the Global Environment Facility Energy Efficiency Projects*. Version 1.0. Scientific and Technical Advisory Panel. Global Environment Facility. March 2013.

- Energy savings and associated avoided emissions are calculated for building code implementation and for demonstration projects. All other project activity - including development of energy performance certification and management systems, as well as educational programmes – is considered to provide support for code implementation and replication of demonstration projects, but not to generate environmental benefits separately.
- Building code implementation is assumed to generate benefits in terms of avoided natural gas consumption from greater efficiency in building envelopes and space heating. Accordingly, reduction in heat energy consumption in the building is assumed to lead to reduced natural gas consumption, which in turn translates into avoided emissions according to a default emissions factor for natural gas. But these assumptions constitute a simplification of the actual picture in Uzbekistan. Most notably, some buildings still use coal as fuel for space heating. In these cases, the avoided emissions from energy-efficiency improvements being proportionally higher, because coal has a higher emissions factor than gas.
- Estimates for the volume of new construction and renovation are based on available national statistics for recent years. The estimates also reflect the STAP methodology's default of a 2 percent increase in new construction rates per year.
- Code compliance is very conservatively assumed to be incomplete, with an initial rate of 70 percent compliance rising to 80 percent by 2025.
- Reductions in specific heat energy consumption are based on code requirements, design calculations, and measured data from the demonstration projects.
- In accordance with the STAP methodology, a "dynamic baseline" is assumed, with improvement in energy efficiency by one percent per year even without program activity.
- Building codes generate direct energy savings and avoided emissions from implementation both during and after the project period.
- Energy savings and avoided emissions from demonstration projects are based on measured results from pre-retrofit and post-retrofit audits. These data, which include savings of electricity as well as heat energy, are available in separate documents published by the project.
- Demonstration projects generate direct energy savings and avoided emissions during and after the project period. Implemented measures are assumed to have a 15-year lifetime. The eight demonstration projects discussed above are included here. Note that the prototype rural home built in the last year of the project is not included.
- Replication of demonstration projects yields indirect bottom-up avoided emissions. The analysis assumes replication of demonstration project designs in 320 buildings. This replication assumption can be viewed as extremely conservative, given estimates that in the next two decades, thousands of new buildings are expected to be built in the educational and health-care sectors.

The results of the application of the STAP methodology are presented in Table 4.

Table 4.

Summary of Projected Energy Savings and Avoided Emissions from the UNDP/GEF Project

	Cumulative			*Annual*		
	Total	*2009-2014*	*2015-2034*	*2014*	*2025*	*2035*
Direct Electricity Savings (MWh)	2,010	402	1,608	134	134	0
Direct Natural Gas Savings (GJ)	282,903,432	31,462,293	251,441,139	12,573,159	12,573,159	12,570,405
Direct Total Energy	**282,910,668**	31,463,740	251,446,928	12,573,641	12,573,641	12,570,405

Savings (GJ)						
Direct GHG Emission Savings (tCO2)	**15,872,149**	1,765,288	14,106,861	705,439	705,439	705,200
Direct Post-project GHG Emission Savings (tCO2)	**35,921,898**		35,921,898	0	1,896,372	3,516,862
Indirect Bottom-up Emission Savings (tCO2)	**143,376**		143,376			

These results far exceed the original targets set forth in the Project Document. The original targets and actual achieved/projected results are presented together below.

Original target: By end of project: **35,000 tons CO_2 emissions per year** less than the baseline (life-cycle savings = **700,000 tons CO_2**). By the end of 10-year project influence period: 87,500 tons CO_2 per year less than the baseline

Projected result: By end of project: **700,000 tons CO_2 emissions per year** less than the baseline (twenty-year savings = **35.9 million tons CO_2**).

The approximately 20-fold difference between original projections and expected results, even with conservative assumptions such as the dynamic baseline and incomplete compliance, can be explained by three key factors.

* ***Expanded scope via inclusion of residential buildings***. Most importantly, the project and its partners in GKAS, while still maintaining a focus on public buildings, dramatically expanded the scope of the building-code portion of the project to include residential buildings as well. According to available national statistics and projected trends for new construction and renovation, this inclusion of residential buildings increased the affected floor area by 30 to 40 times.
* ***Higher baseline energy consumption.*** Baseline energy consumption levels, upon detailed analysis and actual measured results of energy audit, turned out to be much higher than assumed in the original project document.
* ***More stringent code requirements for many buildings.*** Building codes included multiple performance levels, including a second level required for public buildings and publicly-financed residential buildings embodying 25 to 50 percent greater efficiency than baseline (far beyond the 25 percent targeted by the project document).

Lessons learned

Lessons learned arise from both successes and difficulties, and from both routine execution of planned work and unexpected situations. The project has achieved notable successes in the past six years with energy efficiency in buildings, thanks to a wide range of factors – most importantly, the strong support of government partners, especially GKAS. The project has faced its share of such difficulties as well, but generally did an excellent job in identifying and quickly addressing problems, or at least limiting their disruptive effects. In the following sections, we enumerate lessons learned from the project, across all components as well as overall project management, including both factors leading to success as well as responses to emergent challenges.

Inclusion of residential buildings dramatically expanded the scope of project results. The main reason that the project far exceeded its initial GHG emissions reduction targets is that the building code revisions developed by the project applied not only to public buildings, but to the residential sector as well. According to available national statistics and projected trends for new construction and renovation, this inclusion of residential buildings increased the affected floor area by 30 to 40 times, while only modestly increasing the amount of time and effort needed from the project and its partners.

Historical context for codes and enforcement. Each country has its own historical particularities, market conditions, political institutions, and national priorities, which all work together to create a unique enabling environment for energy efficiency in buildings. Depending on this environment, a country may be ready for very ambitious work, as in China and Europe, or may require years of capacity-building before substantive technical or normative-legal work may be carried out.

In the case of Uzbekistan, one significant factor in the success of the first project component (building code revision and enforcement) is the country's long tradition of centralized planning in the construction sector, which in turn has made building codes familiar and influential for decades. Building designers in Uzbekistan treat building codes as a defining part of the normal process of building design. Enforcement processes are well established, especially expert review of building designs for compliance with codes. Therefore, a building code is likely to mean much more than words on paper; given the historical context, code requirements actually define real practice in the country.

Importance of training and other activities in support of building codes. But even with the traditional prominence of building codes in Uzbekistan, implementation of major revisions is more than just a matter of approving and publishing them. Implementation requires that building designers actually understand the new code requirements and can create design solutions to achieve compliance. Indeed, the widespread familiarity of existing codes may in a certain way impede the implementation of new code requirements, as designers and enforcement staff must "unlearn" some of what they already know about code requirements, and then go through a learning period of what the new requirements mean and how they should be implemented in practice.

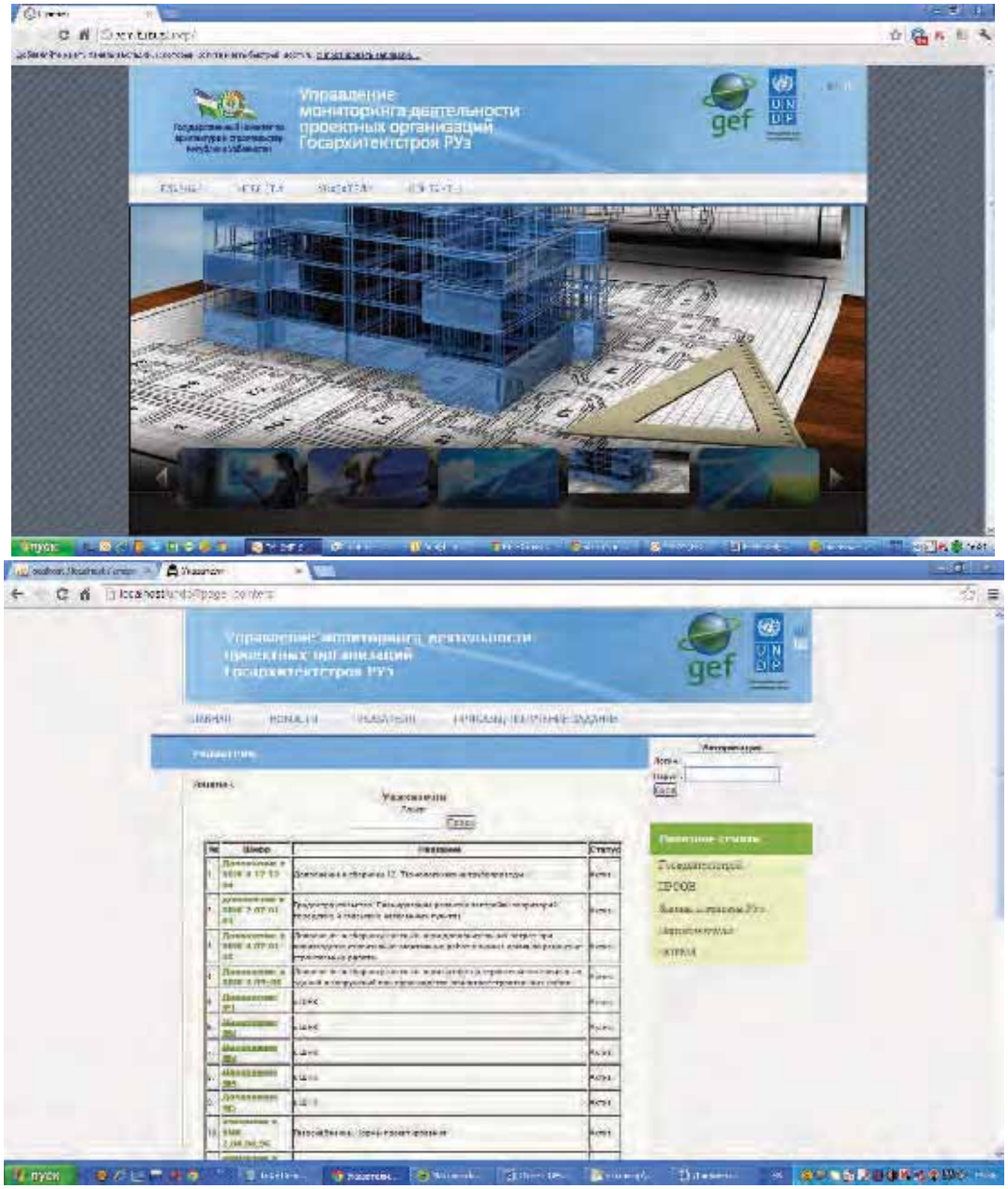
The goal, then, is to accelerate this learning period through support and training. The project has done an exemplary job in these areas, with regard to both building designers and enforcement staff. The project has conducted numerous master classes for practicing professionals in all regions of the country, reaching over 1000 participants within the first four years of the project. Task Leader Rustam Kuchkarov, who was the lead instructor in these master classes, reports that especially in remoter areas, participants were unaware of important new code requirements until they received this training. GKAS, with the help of Kuchkarov and the project team, has provided further needed support for compliance through the publication of official guidance manuals for several of the new codes, with information about how to use the code, make necessary calculations, and choose design solutions in compliance.

Comprehensive strategy for capacity-building for code officials. GKAS and the project have developed a comprehensive strategic program for capacity-building for officials within UMDPO. This strategy includes training as a featured element, but is much more comprehensive and well integrated than training alone. The strategy includes the following:

1. Definition of new functional responsibilities for UMDPO
2. Training on new roles and responsibilities
3. Definition of process for training and credentialing of UMDPO staff
4. Training on design, construction, and operation of energy-efficient buildings

5. Study and training of content of revised building energy codes
6. Seminars delivered to architects and engineers on areas 4 and 5, as enumerated just above
7. Increasing of the material and technical base of UMDPO work, including procurement of computers, video equipment, web-based information system including software, infrared imaging equipment, and more
8. Enhancement of technical linkages with other GKAS departments

The comprehensiveness of this strategy, as well as the strong support it has received from GKAS, are important aspects that should be replicated wherever possible in similar projects worldwide.



Screen captures of new website of UMDPO. This site includes numerous technical resources, agency news, and contact information, as well as a library of documents, searchable by keyword.

Lessons learned from promotion of energy audit, management, and certification

Overall context and goals for this component. This project component was by far the broadest of the project, encompassing various disparate activities and purposes. The elements and their respective purposes included the following.

- Execution of energy audits before and after construction/reconstruction of the demonstration projects, according to initial and refined methodologies, in order to allow for assessment of energy saving potential and actual achieved energy savings and avoided emissions.
- Development of an energy management program for the Ministry of Health and Ministry of Public Education, in order to enhance the ability and motivation of these agencies to maintain and improve energy performance of existing buildings.
- Development of an energy information management system in order to support implementation of the energy management system.
- Development of a national system for energy performance certification of buildings, mainly via the drafting and eventual adoption of state standards, in order to fill information gaps among building owners and other stakeholders about energy efficiency.

Note that most of these activities have benefits of a rather indirect character. Unlike demonstration projects and implementation of building codes, both of which actually lead directly to lower energy consumption in buildings, activities related to energy certification and management do not yield direct savings in themselves, but rather provide information requiring further action before energy savings and avoided emissions are attained. The component tends to support other components, rather than standing alone.

This perspective is helpful for understanding the component and its purposes. It is also helpful in defining success. Given that building codes and demonstration projects have been hugely successful on their own, certain challenges and shortfalls with energy performance certification and energy management can be recognized as relatively minor problems that do not affect the overall impact of the project.

Energy performance certification for buildings: necessary conditions for creation of a system. The development of a national energy performance certification system for buildings has proven to be very complex and time-consuming for the project and its partners. At the heart of this complexity has been the need for this system to have a definitive basis in mandatory regulations, as agreed by national experts and government partner agencies. Creating the system required composition and/or amendment of 17 national standards, with subject matter including energy audit methodology, credentialing of service providers, labeling of buildings, overall terminology and procedures, and so on. Drafting these standards required more than one full year of effort by the authorized national contractor, the Center for Standardization and Certification in Construction. These standards were submitted to GKAS in late 2013 and accepted in 2014.

The system is rather complex, as one could infer from the sheer number of national standards involved. But the project team made an effort to ensure mutual consistency and clarity.

Now, the system on paper is ready for implementation. GKAS and the national standards agency Uzstandard have received a mandate by order of the President to develop a detailed plan for introduction of the certification system in practice nationwide. But further fulfillment of necessary conditions is required for the system to become a reality. Foremost, there remains a large void in the Uzbek market of providers of energy audit and certification services. Upon official adoption of the state

standards, this market may spontaneously emerge, but support from GKAS and if possible, UNDP, will likely be needed. Adoption of the National Energy Efficiency Program may be the logical vehicle for the needed market development and associated supporting activity.

The purpose of energy performance certification for public buildings – beyond stimulation of market demand. Energy performance certification in the United States and Europe is intended largely to overcome information barriers in the market and to create demand and associated competition for lower energy costs and greater energy efficiency in buildings. The purpose in Uzbekistan needed to be different, as market competition based on energy performance makes less sense in a country with a much less active private real-estate market and with significantly subsidized energy prices. This need for a different purpose applies especially given the project's focus on public buildings, which of course are not subject to sales and rental on the open market at all.

It is possible that the energy performance certification system may create some internal competition among buildings within various regional or agency portfolios, with the goal of keeping up with others in terms of energy efficiency. Mainly, though, the system has two simple, highly appropriate objectives, both unrelated to competition: 1) documentation of code compliance and 2) revelation of the need for improvement in underperforming buildings. Ratings posted on buildings may also serve as a public relations tool, by which people who visit visible public buildings can learn about energy efficiency and acquire interest in pursuing it themselves.

Institutional limitations for implementation of energy information management system. Under contract to the project, the Institute for Energy and Automation has elaborated a system for energy information management at the various levels (individual buildings, organizations, districts, oblasts, and the whole country), with information from the former levels feeding into the latter. The system is extremely ambitious, but well organized, with step-by-step instructions on how to use the information-management software.

The challenges of implementation lie not with the technical functioning of the spreadsheets and linkages between them, but rather the human and institutional elements of the system – particularly the question of whether staff members of national organizations can effectively carry out the extra work needed to make the system effective. This extra work includes the most basic but very labor-intensive tasks, such as gathering of temperature and energy-consumption data in buildings twice daily or more frequently, as well as less frequent but equally important tasks of preparing data reports and feeding them into the system.

Training can help, and indeed the project has provided it extensively to agency staff. But as it has turned out so far, implementation of information management in the Ministries of Health and Public Education has indeed lagged because of insufficient staff resources and the need to prioritize work more directly related to the core functions of these agencies.

Future implementation will likely depend on one of two possible solutions. One would be to try to raise the will of these agencies and their leadership to apply the energy management system. Even so, however, sheer constraints of time will make full implementation difficult. Therefore another solution, which was considered even during the development of the system, would be to create something simpler – a process for scheduled monitoring of individual buildings and addressing identified operational problems, but without the most labor-intensive elements of the system, including the twice-daily data-

gathering, frequent detailed reporting, and review throughout the supervisional hierarchy of the Ministries.

Lessons learned from demonstration projects

Balancing replicability with best practices in integrated building design. The project conducted eight demonstration projects in public buildings, all fulfilled within the project period and all with energy savings of 40 to 65 percent relative to baseline levels. Notably, the quantity and geographic diversity of the projects – eight projects in six regions – far exceeded the original target of three projects, set forth in the Project Document.

Among international observers familiar with ambitious demonstration projects on EE buildings in their own countries, it is common to expect that demonstration projects in developing countries should be similarly ambitious, demonstrating and field-testing the most advanced technologies, to help pull the market into previously unexplored areas. But in the project in Uzbekistan, it has proven expedient, for the most part, for the project to adopt a different, less ambitious approach with its demonstration projects. The project team recognized the need to balance various goals and constraints in planning the pilots: the need to ensure cost-effectiveness; the desirability of short-term and medium-term replicability; and the value of introducing new technical solutions for EE building design.

As in other countries in the UNDP portfolio in Central Asia, the demonstration projects in Uzbekistan had the strong support of government partners. At the same time, they also had to be implemented within certain institutional constraints. Government cost-sharing needed to come from budgets of state investment programmes approved long before design and construction began. Furthermore, given timetables and processes for necessary government approvals, wholly new designs were not possible within the time constraints of the project.

In the end, the eight demonstration projects on public buildings all embodied typical designs already in wide use in Uzbekistan, but with certain enhanced materials and design features, such as illustrated in the small sampling of photos below, taken at the actual demonstration project sites.

Wall insulation, window sealing, and plastic frames with sealed glass

Enclosed entryway with plastic frames and sealed glass

Reflective insulating panel behind radiator

Ventilated façade

Even with the constraints of typical designs, the demonstration projects fulfilled various important purposes.

- They proved the viability and cost-effectiveness of compliance with the second level of the new codes.
- They provided local building designers all around Uzbekistan with replicable examples, based on familiar base designs that already had government approval as typical designs.
- They allowed for the application and refinement of methodologies for energy audit and energy performance documentation.
- They provided an important vehicle for site tours and related public relations outreach for various constituencies, including building designers; print and television media; local citizens; and national decision makers.
- They quantitatively verified both baseline and post-construction energy consumption levels.
- They all achieved energy savings of approximately 40 to 65 percent relative to baseline levels.
- The Mid-term Evaluator of the project recognized the value of the eight demonstration projects, but also the limitations of typical designs. Therefore he recommended that the project should endeavor to create one more demonstration project based on a wholly new design, not an existing typical design, thus allowing for the introduction of "full Integrated Building Design (IBD)." The evaluator made various recommendations for inclusion of international expertise early in the process, and also specified that incremental costs should still be kept low in order to facilitate replication. The Mid-term Evaluator explicitly recommended that the project ***not*** pursue a passive-house design, which maximizes energy efficiency, but at such high costs that replication would not be feasible.

To fulfill these recommendations, the project took up new work, unforeseen in the original project document, on design of rural houses in conjunction with the five-year state program entitled "Housing for Comprehensive Rural Development," which calls for the construction of more than 40,000 new rural homes by December 2016. Notably, GKAS and the Ministry of Economy proposed the involvement of the UNDP/GEF project based significantly on the successful results achieved in the eight original pilot projects.

As specified by the Mid-term Evaluator, the new work has included the design and construction of a new demonstration rural home. This design includes not only enhanced insulation in walls, roof, and

basement, but also efficient heating devices, heat recovery in its ventilation system, and solar PV and water heating devices as well. Design work on this building was completed in early 2014, and construction completed by fall 2014. All documentation of this building design has been presented to GKAS for consideration for inclusion in the state programme.

Meanwhile, recognizing that the state programme is already ongoing, the project revised three existing confirmed designs of rural houses for greater energy efficiency. With the participation of representatives of the Housing Initiative for Eastern Europe (Initiative Wohnungswirtschaft Osteuropa, or IWO), a design team coordinated by the project and led by an authorized national agency completed the revision of typical designs of three rural homes, including energy-efficiency measures. Confirmed by GKAS, the revised energy-efficient designs have been included in the state rural-housing program as a choice for home-buyers.

Thus, for both rural homes and public buildings, the project has introduced practical building design solutions with maximum replicability, which indeed are already being implemented in the case of the State Programme for Rural Construction. At the same time, the wholly new rural home design allows for introduction of a more fully-realized application of integrated building design. All within the project budget, far exceeding the original target of merely three buildings, the project seems to have achieved a good balance, with all of the benefits that demonstration projects have to offer.

Lessons learned from cross-cutting issues and project management

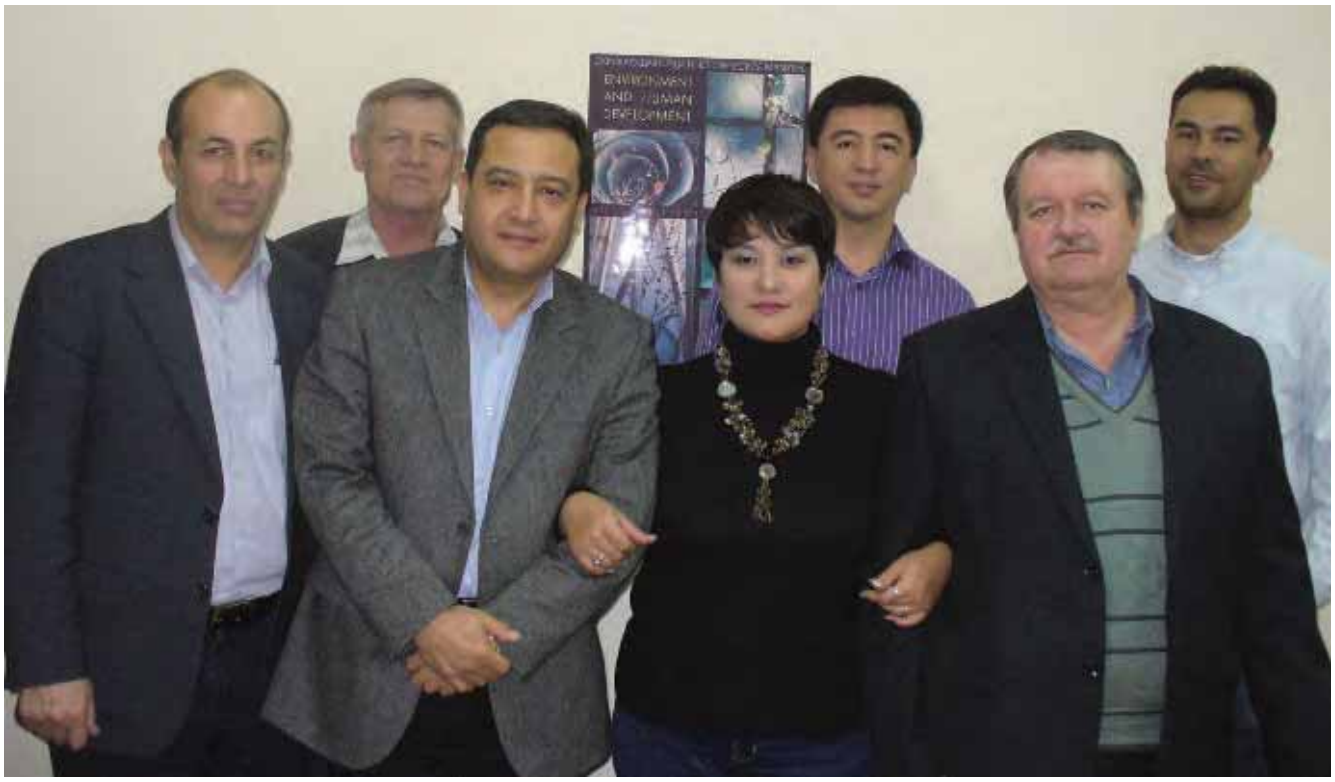
Integrated components. During the initial formulation of the project, UNDP and its national partners in Uzbekistan correctly identified all of the main barriers to energy efficiency in the building sector, then designed all the components to address these barriers and complement each other. Recognizing that building codes offered the greatest potential impact across the entire building sector, UNDP and GKAS devoted their core efforts to revision of the codes, completing this work within a little more than one year. And further recognizing that the success of building codes depends on enforcement and implementation, the project team developed and implemented a whole array of supporting activities across the other components.

Technical capacity and effective cooperation of the project team. The project team consists of four technical specialists – one for each of the components enumerated above – under the direction of Project Manager Kakhramon Usmanov, with administrative, managerial, and financial support from Alyona Kim and technical support from national agencies and international consultants. Collectively, the team has comprehensive familiarity with existing practice and markets of Uzbekistan, as well as best practices in building codes, certification, and design from Europe and the rest of the world. This balance of expertise is one of the major strengths of the project.

Another strength is the strong camaraderie and mutual support among the team. Not only do these qualities create a positive work environment and enhanced motivation, they also contribute to the actual organization of work. As all components are interrelated – for example, as demonstration projects need coordination with revision of building codes, energy audit methodology is refined in the demonstration projects, and educational outreach connects with all other work – each specialist needs to coordinate with and rely upon each other.

At the outset of the project, the project team did not fully foresee the extent to which activity needed to be coordinated and properly sequenced between components. Near the end of the first project year, one of the four experts, Petr Pozichanyuk, developed a chart that shows all of the complex interrelations among components and tasks. This proved to be a helpful way for the team members to sort out

responsibilities. Similar such charts, where possible, should be considered as enhancements of the simpler hierarchical organizational charts that one usually sees in UNDP/GEF Project Documents.



The EEPB project team. Left to right: Rustam Kuchkarov (Task Leader, building codes), Anatoly Verkhnyatsky (driver), Alisher Temirov (Task Leader, demonstration buildings), Alyona Kim (Administrative/Finance Assistant), Kakhramon Usmanov (Project Manager), Petr Pozychaniuk (Task Leader, energy audit and energy management), Elyor Abbosov (Task Leader, educational programs and public outreach)

National, regional, and local support. In setting the direction of the building sector in Uzbekistan, GKAS is strongly committed to the introduction of world best practices and integration with national policies on environmental protection, particularly the national Law on Rational Use of Energy. Therefore GKAS has given its active and unwavering support to the revision of building codes, plus the whole array of supporting activities as described above. Mukhammadshakir Khalhodjaev of GKAS has exercised strong personal leadership as the National Project Coordinator.

Working relations between GKAS and the project team are exemplary in their closeness and mutual support. Notably, GKAS has provided the office space for the project, within GKAS's own building. This arrangement lends legitimacy to the project, and also the sheer convenience of physical proximity.

More broadly, other agencies of the Government of Uzbekistan joined GKAS and UNDP in an efficient, consistently supportive Project Board and Inter-Agency Working Group. These agencies included the Ministry of Health, the Ministry of Public Education, the Ministry of Higher and Specialized Secondary Education, the Ministry of Finance, the Ministry of the Economy, the State Hydrometeorological Committee, and the State Committee for Nature Protection. Representatives of these agencies met as a group annually or more often throughout the project period, and also were accessible to project staff year-round. Support at high levels from these national agencies led in turn to enthusiastic collaboration from regional and district administrations, institutions of research and higher education, and the Qishloq Qurilish Bank. Such support "on the ground" manifested itself in various areas, from the provision of space for seminars, to participation in drafting standards and curricula, to cost-sharing in the actual construction and renovation of demonstration buildings – essentially, all the key activities of the project.

Quantitative evaluation of project impact. From the beginning, the project has placed due emphasis on qualitative and especially quantitative evaluation of results. With the demonstration projects, the project has conducted comprehensive energy audits for assessment of both baseline energy consumption and post-installation performance. From this work, the project has been able to make definitive statements about the results of the demonstration projects; such clarity is helpful in multiple ways, from technical learning to quality control to publicity.

The project has also documented quantitative results of various forms of education and outreach, including numbers of students enrolled in new courses and programmes, as well as numbers of participants in master classes and seminars.

Assessing the results of building code implementation has proven somewhat more difficult, because of the sheer scale of expected impacts. It is simply impossible to field-test every single new or renovated building for compliance. But the project has conducted various steps to assess quantitative impacts as thoroughly as possible. These steps include calculation of expected results via the GEF STAP methodology; separate assessment of results by international consultants; and field assessment, including documentation of code compliance by all ten buildings in selected samples of new and renovated buildings (and indeed, over-compliance in some cases).

Comments have been submitted separately to the GEF STAP about the methodology, which had some limitations given the types and patterns of data in Uzbekistan. The final numbers could vary widely depending on what actual construction volumes and code compliance turn out to be. Still, the numbers generated by the application of the methodology seem robust, especially given the strongly conservative assumptions regarding code compliance, dynamic baseline, etc.

Challenges and successes with output-based reporting. Mr. Usmanov and Ms. Rano Baykhanova of the UNDP country office have provided strong and steady leadership and day-to-day management of the project. They have provided technical staff and consultants with clear direction, based largely on careful monitoring of the Project Results Framework and a related UNDP output-based framework of targets and indicators.

In a couple of instances, the two frameworks had different wording for similar outputs, creating some confusion among the project team. The Mid-term Evaluator and the International Chief Technical Advisor of the project both noted these problems, and the Mid-term Evaluator issued a formal recommendation to make the two documents consistent with each other. The project team did so after this evaluation, and problems were essentially eliminated.

Adaptive management. Project management has also appropriately exercised adaptive management in several areas, adjusting activities based on dynamic conditions, particularly with the demonstration projects. In projects throughout the region and indeed throughout the world, it happens quite commonly that demonstration projects envisioned during the project period, or even identified during the first year or two of project operations, need to be changed for one reason or another (including mismatched timetables, complexities with funding, inflexibility of a design and construction process already under implementation, and so on).

Linkages with other UNDP projects in Uzbekistan. UNDP in Uzbekistan made a point of ensuring synergy and direct collaboration between this project and other projects in its portfolio. The project developed two analytical strategy papers jointly with UNDP projects on modernization and reform (via

the Center for Economic Research, a joint initiative of UNDP and the Government), and on low-emission development. These reports were duly presented to the Government. The buildings project also joined other projects, including one on climate risk management, in conducting a number of seminars and workshops.

Sharing experience with other projects in the region. Based on his experience in the project, as well as his own decades of technical expertise, Rustam Kuchkarov, the manager of the project's building code component, has served as an advisor to an analogous UNDP/GEF project in Turkmenistan, which focuses on energy efficiency in the residential sector. Like the project in Uzbekistan, the project in Turkmenistan also seeks the revision of building codes, the implementation of energy audits and energy management for existing buildings, and capacity-building for architects and engineers. Mr. Kuchkarov shared his perspectives across a wide range of areas, from building design to code development to overall project strategy. His input played an important role in helping the Turkmenistan team to revise its strategies and hone its work planning for 2014 and 2015.

"South-south" information exchange also extends from this project to Kyrgyzstan. At the invitation of the Regional Ozone Network, the project's experts will take part in a seminar on energy efficiency in buildings, to be held in Bishkek on 8 April 2015. More broadly, the project also engages in regular information exchange with projects throughout all of Central Asia and the Caucasus, as the most active contributor of information to beeca.net information portal on the Internet.

Post-project transition and sustainability of project results. Long before the end of the project, the UNDP project team and GKAS recognized the need to plan for a post-project transition to ensure continued progress on energy efficiency in the sector. The project developed an entirely new area of activity, not explicitly foreseen in the original Project Document, to define a strategy for the transition and to lay a foundation for its implementation. This work is discussed in depth in the following section.

Assuring the sustainability of project results

At its simplest level, an effective transition requires that ongoing work of the UNDP project team be completed and responsibility for next steps handed off to others. More broadly, there is also a need for a strategic vision so that the progress achieved by the project may be sustained and expanded into the future – with the organization, political will, and financial support necessary to turn this vision into a reality on a national scale. In this light, the project team and GKAS have already devised a strategy and have begun to implement concrete steps toward this transition, with support from the highest levels of Government.

A strong policy foundation

In a certain sense, several of the most important achievements of the project are already "built to last" because they carry the force of policies officially adopted in Uzbekistan, with no timetable or provisions for expiration. Building codes are firmly in place and are mandatory. Code enforcement is carried out routinely by UMDPO, whose strategy for capacity-building is also being implemented on an ongoing official basis. Similarly, standards for building energy certification and education on energy conservation in buildings are also officially adopted, and are expected to remain in force indefinitely.

So a sound policy foundation for sustained progress has already been built during the course of the project. Now the priorities for assuring sustainability of results are twofold. **First, energy efficiency in**

buildings needs to continue to be implemented in practice, not just on paper. Real implementation, in turn, depends on continued support for effective code enforcement, education for practicing and aspiring building designers, and investment in support of advanced building design and construction. **Second, the policy foundation itself needs to be periodically examined and updated** in order to reflect technological advances and changing economic conditions.

Fulfilling these priorities depends primarily on three related factors:

- the political will of the Government;
- sufficient funding for needed programmes and activities; and
- organization of institutions to carry out these programmes and activities.

National strategy and Cabinet-approved provisions for energy efficiency in the building sector

In the second half of 2013, having already identified the need for a comprehensive strategy for post-project transition and long-term sustainability of results, the project team launched a wholly new activity. This work called for the elaboration of a National Energy Efficiency Program (NEEP) for the building sector, in which general priorities, specific activities, and agency responsibilities would be defined.

The UNDP project team and national expert Elena Shipachyova developed a brief initial concept for this program. Then in March 2014, an expert working group led by Ms. Shipachyova, was formed, consisting of representatives of the Ministry of the Economy of Uzbekistan, the Ministry of Finance of Uzbekistan, GKAS, and the UNDP project team. This working group spent the next several months conducting analysis and defining proposed elements in detail.

The work culminated in the preparation of a findings report, which was integrated into policy recommendations by the Extended Board of GKAS and approved as ***Protocol №01 05/23-3*** by the Cabinet of Ministers of Uzbekistan on 27 November 2014. Its provisions can be considered as a mandate from the highest level of the Government. Approval of the Protocol also carries a mandate for associated allocations from the annual state budget, as well as extra-budgetary funds of the Government. In subsequent government decisions developed on the basis of the Protocol, financial outlays from the state budget and extra-budgetary funds will be defined concretely.

Key mandates of the Cabinet-approved Protocol include the following.

1. Introduction of compulsory changes to current building regulations in line with advanced international standards, as well as development of new building codes as needed *(clause 20 of the Protocol).* This clause reflects the Government's recognition that building codes must be periodically revised to account for the evolution of technology and design practice. This process will begin with an inventory of the existing normative base, definition of a timetable for revisions, and identification of needed amendments and/or wholly new normative documents as needed.

2. Establishment under GKAS of a Center on Development and Improvement of Building Codes and a Center on Innovations in Architecture and Construction *(clause 25).* The mandate to update building codes means that there is a need for a lead agency to do the work. Since the project's inception, the UNDP project team has played this lead role in revising building codes. Recognizing the need to establish an entity to fill the void that will be created in this area when the project ends, GKAS has sought and obtained a mandate to create a new Center whose explicit mission will be the development and updating building codes. GKAS also will create a Center to foster innovation in building technology and design. Together, these two centers will lead GKAS's efforts toward creation of modern energy-

efficient buildings, much as the UNDP project has done for the past six years. Moreover, apart from their direct functions conducted within their own walls, both Centers will also coordinate the activities of scientists, architects, designers and manufacturers of construction materials and HVAC equipment in other public and private institutions nationwide.

3. Establishment of a Center for Continuing Education and Advanced Training for Architects under the Tashkent Architecture and Construction Institute *(clause 12).* This Center is to deliver mandatory advanced courses for architects to ensure their mastery of code-compliant building design with regard to energy efficiency, as well as their familiarity with best design practices from the CIS, Europe, and Asia.

4a. Encouragement of building designers regarding (i) application of cost-effective and energy-efficient materials and technologies (ii) introduction of low-cost solutions during development of architectural design and cost estimation.

4b. Encouragement of State Expert Plan Review agencies to mandate the use of cost-effective and energy-efficient materials and technologies, as well as the most economical technical solutions during review of documentation on design and cost estimation.

4c. Improvement of procedures on final approval of buildings at the end of construction or renovation, just before issuance of permits allowing buildings to enter into operation.

4d. Revision of the building codes that define these procedures and the form and content of associated permits.

4e. Application of energy-efficient materials and technologies in new construction and retrofitting of public buildings, funded from centralized (Government) sources *(all from Clause 21).*

During the project period and now during this time of transition, GKAS and the UNDP project team recognize that success regarding energy efficiency in the building sector requires engagement and support for all stakeholders, from building designers themselves to code-enforcement officials. The Protocol explicitly instructs GKAS to encourage all these stakeholders to do their part in introducing modern energy-efficient solutions and technologies. The mandate is even more direct and explicit for energy efficiency in public buildings funded via the state budget. Aside from the definition of broad principles, this clause of the Protocol also instructs GKAS to enhance the final stages of inspection and the issuance of permits. Likely steps in this area will include: 1) improved procedures to accept buildings into service, with itemization of requirements for energy-conserving measures to be taken during building maintenance; 2) development of a system of incentives for architects and designers to achieve unusually high energy efficiency of new and retrofitted buildings; and 3) definition of specific obligations for state plan review agencies to require the use of modern energy-efficient materials, construction techniques, and HVAC equipment in building designs.

5a. Recognition of application of modern, cost-effective, energy-efficient, ecological, and economically optimal solutions and technologies into design estimates <u>as a primary duty for design organizations</u>.

5b. Inclusion of promotion of energy efficiency in the construction sector as a primary requirement to obtain a license for design activities in the republic *(clause 22).* The Protocol takes

note of the institutional responsibility of design organizations to study international experience, familiarize themselves with new code requirements, and to integrate modern energy-efficient planning and design concepts into practice. This mandate is backed up by new authorization for GKAS to revoke the licenses of those design organizations that do not correspond to requirements in this area.

6. Revision of requirements for manufactured construction materials and testing procedures for energy-efficient and resource-saving technologies based on advanced international standards" ***(****clause 17).* At present, domestic production of energy-efficient construction materials in Uzbekistan is quite limited. Moreover, national experts have determined that technical conditions in the manufacture of various building materials do not sufficiently meet modern international standards associated with thermal performance. But the construction-materials industry has begun to respond to the new demand that revised building codes create for energy-efficient products. Investment, research, and development are supported by expanded production targets for energy-efficient materials in state programs for the building materials industry.

Revision of production standards in accordance with international best practice is now needed, as well as the updating of testing procedures for thermal performance. These steps will provide a basis for orderly expansion of production of high-quality energy-efficient materials, and buildings made with such materials, via scale-up at existing facilities.

7. Drafting of proposals by GKAS and the Uzbek National Standards Agency (UzStandard), together with other relevant ministries and agencies, on distribution and/or division of functions of oversight and certification regarding energy consumption of buildings and structures, as well as construction materials and equipment *(clause 19).* As noted above, a new system of certification of energy efficiency in buildings has been created via the adoption of 17 state standards developed under the UNDP/GEF project. Now the next step is to assign institutional responsibility for the process defined in these standards. GKAS and UzStandard are the natural agencies to take the lead in this area.

8. Organization of study tours by Uzbek architects to China and South Korea to exchange experience and to obtain advanced training, and organization of master-classes inviting foreign experts to Uzbekistan *(clause 13).* China and South Korea were noted specifically because of their climatic similarities to Uzbekistan, their proximity, and their regional leadership in energy efficiency in buildings.

9. Establishment of 2 to 3 specialized colleges in each region of the republic. Organization of training seminars and exhibitions in these colleges, inviting experts from China and South Korea. Identification of talented students to be selected for further study in the architecture and construction institutions *(clause 14).* The colleges are intended to attract a wide pool of participants in regions across the country. Top performers from these colleges would then be invited to participate in further study in advanced architecture and construction, thus creating a wide-ranging and balanced expert knowledge base throughout the country.

In sum, the Protocol and all its provisions articulate both the general principles and the specific steps, including agency responsibilities, for continued effective implementation of energy efficiency in the building sector in Uzbekistan. It directly addresses the most important policy instruments – building codes – and assures that they will remain up-to-date and well enforced. It also provides integrated support for implementation via support for education, testing of materials, certification, and innovation. The Protocol defines specific responsibilities, and measures to assure the accountability of all

stakeholders, from building designers to design institutions to code enforcement officials. And where there is a need for wholly new agencies, the Protocol will lead to the creation of three important new Centers, which will fill the essential role played by the UNDP project team for the past six years in building code development, promotion of innovation, and advancement of education for practicing professionals.

Additional policy advances for sustaining and expanding project results

The Protocol is not the only policy document recently adopted in Uzbekistan in support of energy efficiency in buildings. On 22 January 2015 the Cabinet of Ministers issued an Order signed by the President of Uzbekistan, one of whose provisions is that UzStandard will implement a staged system for certification of the energy efficiency of newly constructed buildings, as well as domestic appliances.

Furthermore, the UNDP project team has introduced additions and amendments into the draft of an Order of the President of the Republic of Uzbekistan "On a Program of Measures for Reduction of Energy Intensity, Implementation of Energy-Conserving Technologies, and Systems in Sectors of the Economy and the Social Sphere, 2015-2019". This order is in the process of obtaining its signature.

In the execution of the Protocol and these two Orders, it is expected that many further government orders and regulations will be developed in coming years.

Next steps for UNDP

Based upon the completed project, UNDP has developed a concept for a new project focusing on market transformation for sustainable rural housing in Uzbekistan. The completed project has laid a sound foundation via its initial work on research, design and demonstration of energy-efficient rural homes, as well as building codes, enforcement, and education. Now, UNDP and GKAS are making the case that a new project with direct sectoral emphasis on rural housing has immediate potential to sustain and significantly expand energy savings and emissions reductions, in a way that is cost-effective and therefore attractive to international donors. This proposal has been submitted to GEF for funding under the GEF-6 replenishment.

Longer-term sustainability: market drivers for energy efficiency in Uzbekistan

Essentially all of the successes of the UNDP project, as well as plans for transition and post-project sustainability of key activities and directions, rely on strong and effective state authority – building codes and their enforcement, implementation of educational standards and programmes, and so on. It is expected that this will remain the case.

At the same time, officials and experts in Uzbekistan recognize the potential for the country gradually to make a transition to more open markets. Such potential applies particularly with regard to energy, which is still heavily subsidized for individual and institutional end-users. Removal of subsidies would create new financial incentives for energy efficiency not only among building owners, who would benefits from lower energy bills, but also among designers and builders, who could charge a premium for buildings with advanced, energy-efficient designs, materials, and equipment.

The main barriers to the introduction of market dynamics to Uzbekistan include the following.

1) the prospect of social hardship and discontent that would result from removal of energy subsidies

2) the low level of domestic production of affordable, high-quality thermal insulation materials and technologies
3) the limited availability of service providers in energy efficiency in buildings, especially with regard to energy audit and management of existing buildings.
4) the absence of financing mechanisms to encourage the implementation of energy efficiency and renewable materials and equipment.

With the adoption of policies during and after the project period, and with the gradual maturing of national capacity in energy-efficient building design, services, and materials, these barriers are already being gradually eliminated. One can expect these directions to continue, and for energy efficiency truly to become business as usual in Uzbekistan's building sector. When it does, then opportunities for dynamic markets for energy conservation in buildings may well emerge, with both healthy demand and adequate supply of services.

But it is important not to be reckless in placing one's faith in the open market in Uzbekistan. Indeed, it seems quite clear that not only Uzbekistan's unusually rapid and steady rise to economic growth, but also its success specifically in implementing energy efficiency, result from its continued strong state authority and caution in freeing the economy to open market forces. Building codes and associated implementation support will remain critically important. And clearly, the Government of Uzbekistan and specifically GKAS will remain the central figures defining the directions of the country's building sector into the foreseeable future. The sustained success of energy efficiency will depend most of all on them.

Conclusion

Among several UNDP/GEF projects on energy efficiency in buildings in Central Asia and indeed, among many such projects around the world, the project in Uzbekistan stands out for the ambitious scope of its activity and the successful fulfillment of goals. It deserves recognition as a remarkable success story, and as a model for similar projects around the world.

Much credit for the project's success should go to the individuals who worked so hard to make it happen, particularly Project Manager Kakhramon Usmanov, the full-time project staff, and National Project Coordinator Mukhammadshakir Khalhodjaev of GKAS. Success also arose from the project's very formulation – conceived with a focus on building codes, with integrated support for enforcement and education, as well as work on energy management in existing buildings. Notably, the focus on building codes enabled the project to achieve a very impressive scale in its results, extending not only to its initial focus area of public buildings but also to residential buildings as well. Uzbekistan's strong traditions of central planning in construction and the long-standing importance of building codes made this focus all the more effective.

The crowning achievement of the UNDP project and its Government partners is the development of a national strategy, adopted by the Cabinet of Ministers, defining general principles, specific steps, and agency responsibilities to ensure that work on updating and enforcing building codes, educating architects, and promoting innovation and market transformation will continue even after the UNDP project closes its doors in mid-2015. Two new Centers of GKAS and another Center under TACI will play leading roles. With the sustained support of the Government, prospects are very bright for the advances of the project to continue as a lasting and defining aspect of construction in Uzbekistan.

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