KEY ACHIEVEMENTS OF THE UNDP/GEF PROJECT

"Improving Energy Efficiency in the Residential Building Sector of Turkmenistan"

NATIONAL IMPLEMENTING PARTNER: STATE CONCERN "TURKMENGAS"

FOREWORD

Since late 2011, the United Nations Development Programme (UNDP) and several national partners led by the State Concern "Turkmengas" have been conducting a project entitled "Improving Energy Efficiency in the Residential Building Sector of Turkmenistan". This project is funded by the Global Environment Facility (GEF) with co-financing from the Government of Turkmenistan.

The project seeks to achieve transformation of residential building design and construction in Turkmenistan, thereby saving energy and correspondingly curtailing GHG emissions on a large scale.

The project seeks such results via integrated activity in several areas, including implementation of building energy codes, state investment in renovation of existing building stock, improved design and management practice, training of aspiring and practicing professionals, and demonstration and replication of best practices.

This publication presents numerous important achievements, promising a wide impact in construction and design practice in Turkmenistan. This provides a summary of the project's accomplishments and effects of their use in the residential building sector of Turkmenistan.

National partner

MINISTRY OF CONSTRUCTION AND ARCHITECTURE OF TURKMENISTAN

Revised building codes (SNT):

- SNT "Residential Buildings"
- SNT "Roofs and Roofing"
- SNT "Building Climatology"
- SNT "Building Thermal Engineering"

Confirmed
Submitted for confirmation
Under final review

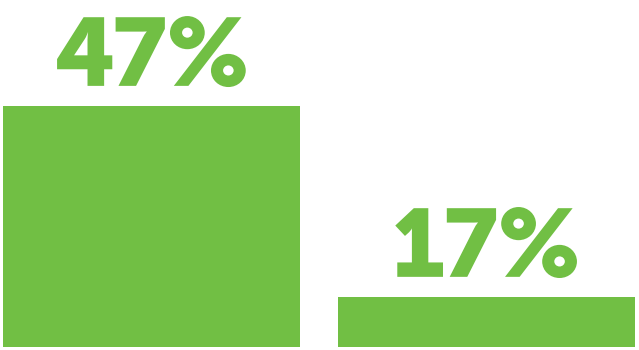
Developed guidance materials:

- Guidance manual to SNT "Residential Buildings"
- Guidance manual to SNT "Roofs and Roofing"
- Guidance manual to SNT "Building Thermal Engineering"
- Software for the building Energy Passport
- Database of Energy Passport data

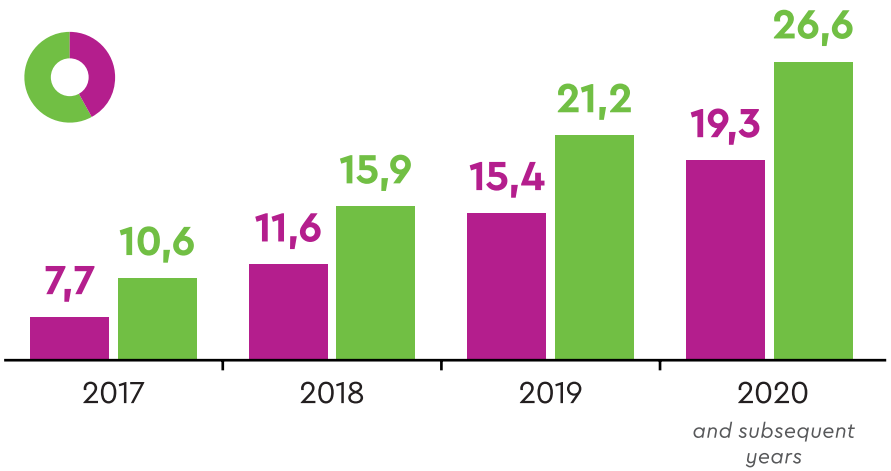
POTENTIAL EFFECTS FROM TRANSITION TO REVISED BUILDING CODES

ENERGY SAVINGS without automated heat control (AHC) in buildings

ENERGY SAVINGS with automated heat control (AHC) in buildings



NATURAL GAS SAVINGS*, mln. m³

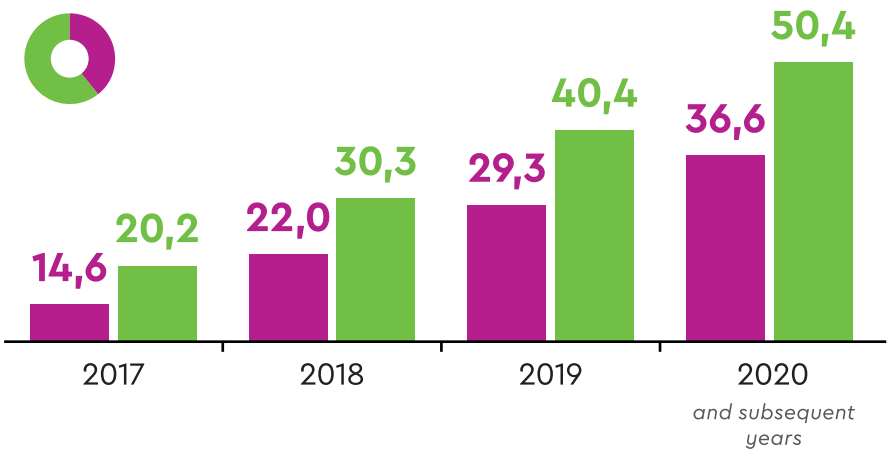


TOTAL 2017-2027:

188,9
WITHOUT AHC

260,2
WITH AHC

REDUCTION IN GREENHOUSE GAS EMISSIONS, thsd. ton CO_2e



TOTAL 2017-2027:

358,8
WITHOUT AHC

494,4
WITH AHC

**Determined in accordance with construction volumes stated in the National Programme for Regional Social Development (2015) and the National Plan for Socioeconomic Development of Turkmenistan for 2011–2030*

National partner

MINISTRY OF CONSTRUCTION AND ARCHITECTURE OF TURKMENISTAN

Developed Compendium of technical solutions for thermal bridges in building envelopes, with calculations of associated heat losses

6-16%
HEAT ENERGY SAVINGS

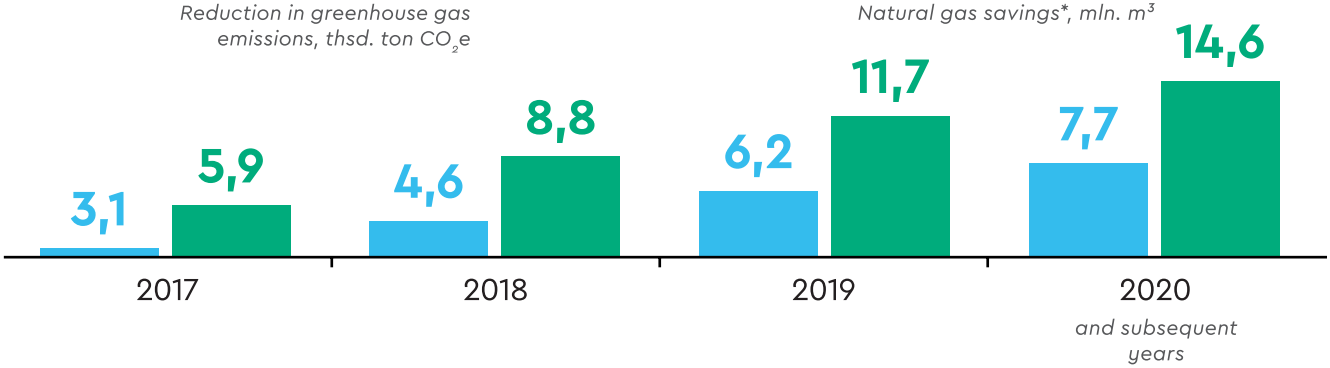
5-8%
ELECTRICITY SAVINGS

The compendium enables building designers to accurately determine thermal resistance of building envelopes and to calculate and reduce heat losses through the building envelope. Use of the given techniques also helps designers to properly select and determine the size of heating systems.

POTENTIAL EFFECTS FROM USE OF THE COMPENDIUM IN DESIGN OF RESIDENTIAL BUILDINGS (2017-2027)

143,4
Reduction in greenhouse gas emissions, thsd. ton CO_2e

75,5
Natural gas savings, mln. m^3*



* *Determined in accordance with construction volumes stated in the National Programme for Regional Social Development (2015) and the National Plan for Socioeconomic Development of Turkmenistan for 2011–2030*

National partners

MINISTRY OF CONSTRUCTION AND ARCHITECTURE OF TURKMENISTAN

MINISTRY OF COMMUNAL SERVICES OF TURKMENISTAN

IMPLEMENTATION OF ENERGY AUDIT (EA):

Developed documents:

- Methodology for energy audit of residential buildings
- Provisions on rules and process for energy audit in residential buildings of Turkmenistan

Under final review

Potential effect from implementation of the recommendations from EA in 22 buildings

Reduction of energy consumption per square meter per year:

69 kWh/m² FOR HEATING AND COOLING

18 kWh/m² FOR LIGHTING

IN 22 RESIDENTIAL BUILDINGS

The methodology for EA was tested in practice in the cities of Ashgabat (Abadan), Turkmenbashy, Balkanabad, Khazar, Mary, Bayramaly, Turkmenabad, Seydi, and Dashoguz.

National partners

CITY ADMINISTRATION OF ASHGABAT

STATE CONCERN "TURKMEN OIL AND GAS CONSTRUCTION"

Design and construction of three new buildings with enhanced energy performance

Overall reduction of greenhouse gas emissions for the three new pilot buildings

1165 TON CO_2e PER YEAR

ANNUAL REDUCTIONS IN ENERGY CONSUMPTION*

	Heat energy savings	*Heat energy savings per square meter*	*Electricity savings*	*Electricity savings per square meter*
9-STORY 54-UNIT *residential building typical standard design*	159933 kWh	32,2 kWh/m²	67795 kWh	13,6 kWh/m²
	31,5%		64,7%	
12-STORY 114-UNIT *high-comfort residential building*	1085225 kWh	30,6 kWh/m²	749514 kWh	21,1 kWh/m²
	35,2%		50,1%	
12-STORY 66-UNIT *high-comfort residential building*	566754 kWh	24,3 kWh/m²	200609 kWh	8,6 kWh/m²
	28,8%		50,2%	

**Data from monitoring of energy consumption after construction*

National partner

MINISTRY OF COMMUNAL SERVICES OF TURKMENISTAN

Renovation of three residential buildings to enhance energy performance

Overall reduction of greenhouse gas emissions from the three renovated pilot buildings

476 TON CO_2e PER YEAR

ANNUAL REDUCTIONS IN ENERGY CONSUMPTION*

	Heat energy savings	*Heat energy savings per square meter*	*Electricity savings*	*Electricity savings per square meter*	*Savings of natural gas*
5-STORY 40-UNIT *residential building typical standard design*	91239 kWh	34,2 kWh/m²	72800 kWh	27,2 kWh/m²	4910 m³
	31,3%		64,9%		71,7%
5-STORY 45-UNIT *residential building typical standard design*	134970 kWh	59,2 kWh/m²	91212 kWh	40,1 kWh/m²	10504 m³
	38,7%		55,7%		76,4%
9-STORY 54-UNIT *residential building typical standard design*	192837 kWh	38,8 kWh/m²	199775 kWh	40,2 kWh/m²	15120 m³
	32,9%		61,1%		81,5%

* *Data from monitoring of energy consumption after reconstruction*

National partner

MINISTRY OF CONSTRUCTION AND ARCHITECTURE OF TURKMENISTAN

○ Developed 11 designs and Energy Passports of individual low-rise houses (cottages) with enhanced energy performance and solar water heaters

ENERGY SAVINGS

50% FOR COOLING AND VENTILATION

57% FOR HEAT AND VENTILATION

27% FOR DOMESTIC HOT WATER SUPPLY

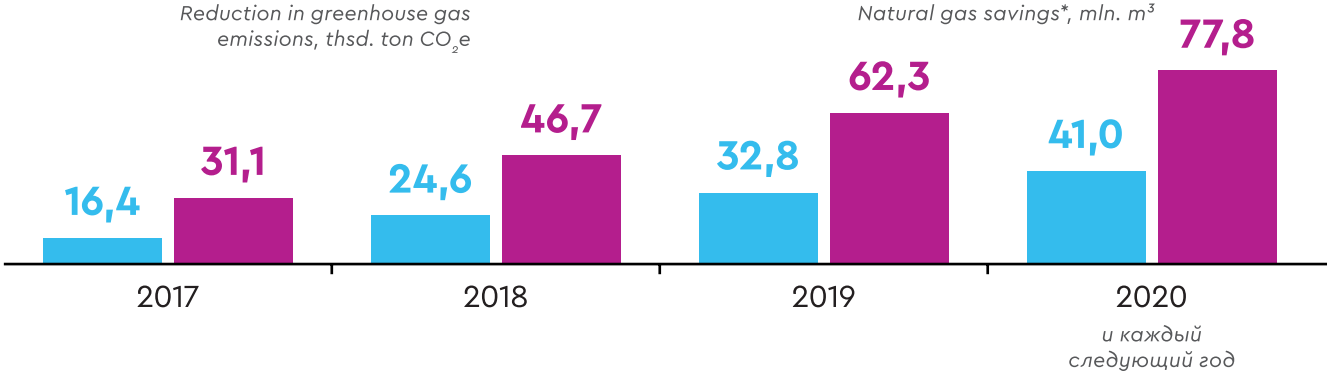
POTENTIAL EFFECT FROM IMPLEMENTATION OF THESE DESIGNS FOR CONSTRUCTION OF LOW-RISE HOUSES (2017-2027)

762,9

Reduction in greenhouse gas emissions, thsd. ton CO_2e

401,5

Natural gas savings, mln. m^3*



○ *Submitted for confirmation*

* *Determined in accordance with construction volumes stated in the National Programme for Regional Social Development (2015) and the National Plan for Socioeconomic Development of Turkmenistan for 2011–2030*

National partner

MINISTRY OF COMMUNAL SERVICES OF TURKMENISTAN

Created Energy management system for collection and transmittal of data for energy consumption, from meters installed in 5 residential buildings and the boiler house in the Koshi residential complex in Ashgabat

POTENTIAL EFFECT FROM USE OF THIS SYSTEM TOGETHER WITH AUTOMATIC HEAT SUPPLY CONTROLS

16-20%

ENERGY SAVINGS FOR HEATING AND COOLING

The purpose of energy management is to reduce energy consumption through implementation of the following measures:

- control energy consumption;
- measure energy consumption;
- collect, archive and transmit the information on operation of heat supply control devices and data taken from meters to interested organizations;
- analyze the information, take decisions, invoice for consumed heat energy.

National partner

MINISTRY OF COMMUNAL SERVICES OF TURKMENISTAN

Automatic heat supply control (AHC) device for residential buildings prepared for domestic assembly

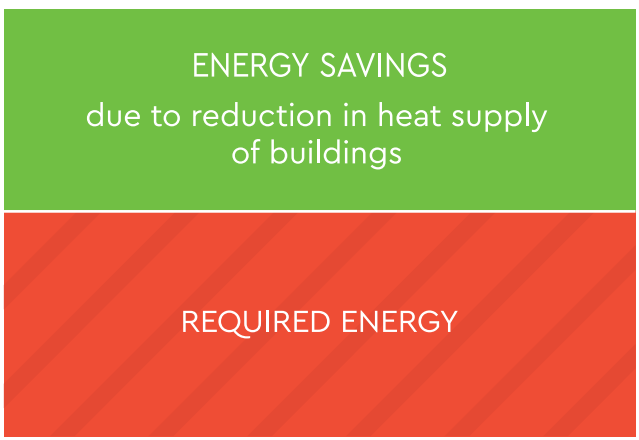
5 prototypes of the automatic heat supply control device assembled, installed and tested in 5 residential buildings in the Koshi residential complex in Ashgabat

18% **HEAT ENERGY SAVINGS**

Potential effect from use of the automatic heat supply control device

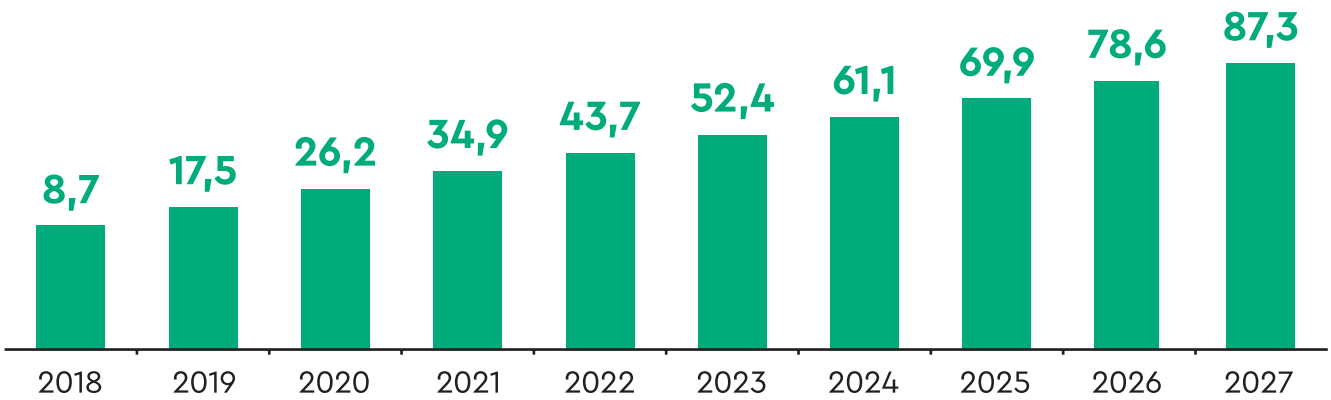
NEEDS TO CONTROL HEAT ENERGY CONSUMPTION

Before implementation of the energy savings measure



After implementation of the energy savings measure

POTENTIAL EFFECT FROM USE OF AHC IN EXISTING BUILDINGS (2018-2027)

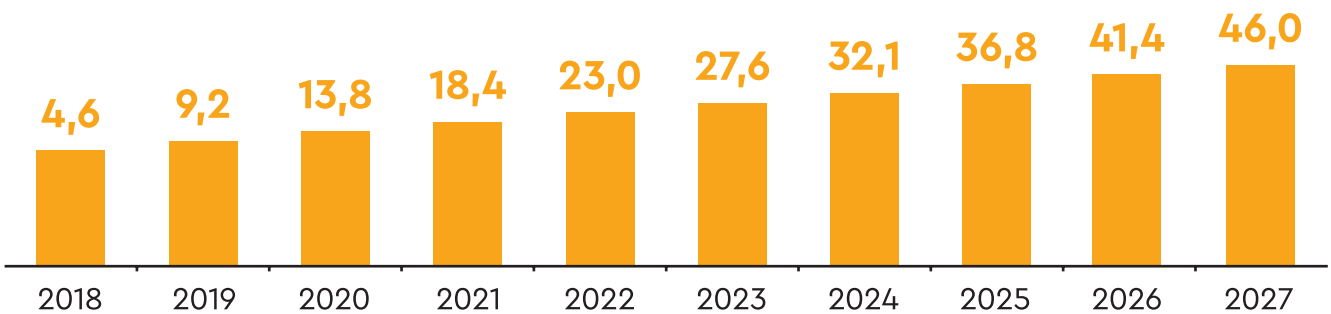


480,3

Reduction in greenhouse gas emissions, thsd. ton CO_2e

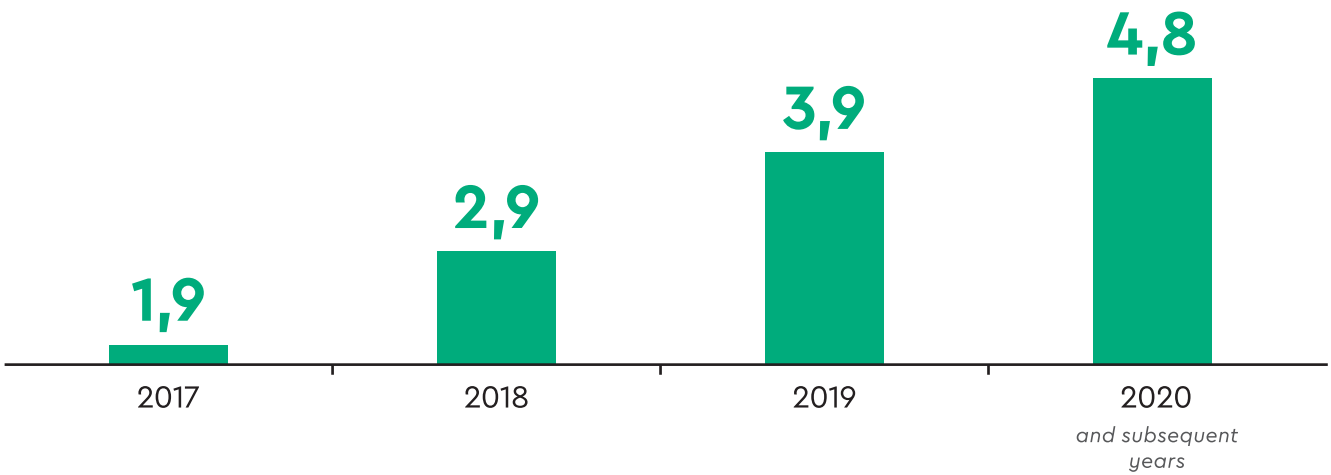
252,8

Natural gas savings, mln. m^3*



**Determined in accordance with the investment plan developed by the UNDP / GEF project for modernization of the residential building stock of Turkmenistan for increasing energy efficiency*

POTENTIAL EFFECT FROM USE OF AHC IN NEW RESIDENTIAL BUILDING STOCK (2017-2020)

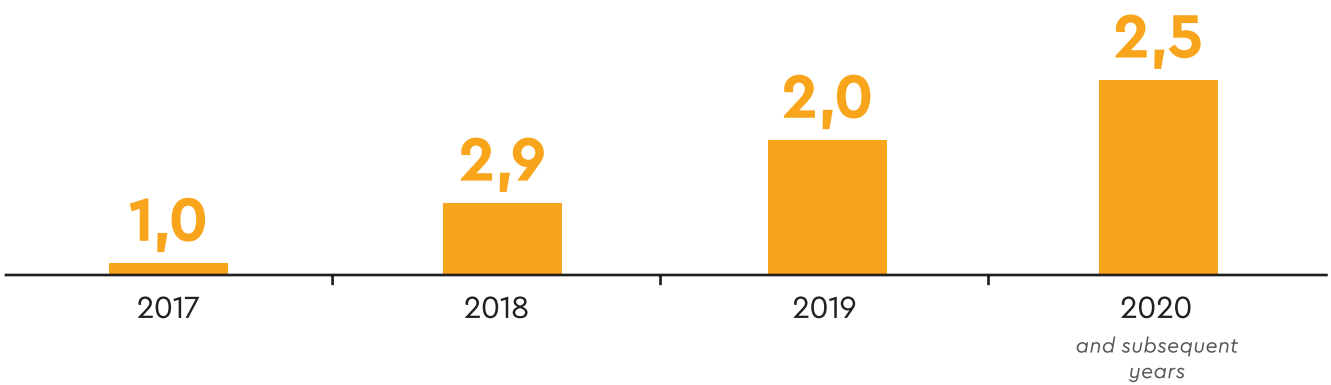


47,4

Reduction in greenhouse gas emissions, thsd. ton CO_2e

24,9

Natural gas savings, mln. m^3*



**Determined in accordance with construction volumes stated in the National Programme for Regional Social Development (2015) and the National Plan for Socioeconomic Development of Turkmenistan for 2011–2030*

National partner

MINISTRY OF COMMUNAL SERVICES OF TURKMENISTAN

- Assessment of potential energy savings in the residential building stock of Turkmenistan
- Financial analysis and investment plan for modernization of the residential building stock of Turkmenistan for enhanced energy performance

191 MLN. M^3 PER YEAR

Reduction of domestic consumption of natural gas

362 THSD. TON CO_2e PER YEAR

Reduction of greenhouse gas emissions

US $250 MLN.

Investment distributed over 5 years

7 YEARS

Return on investment from export of saved gas

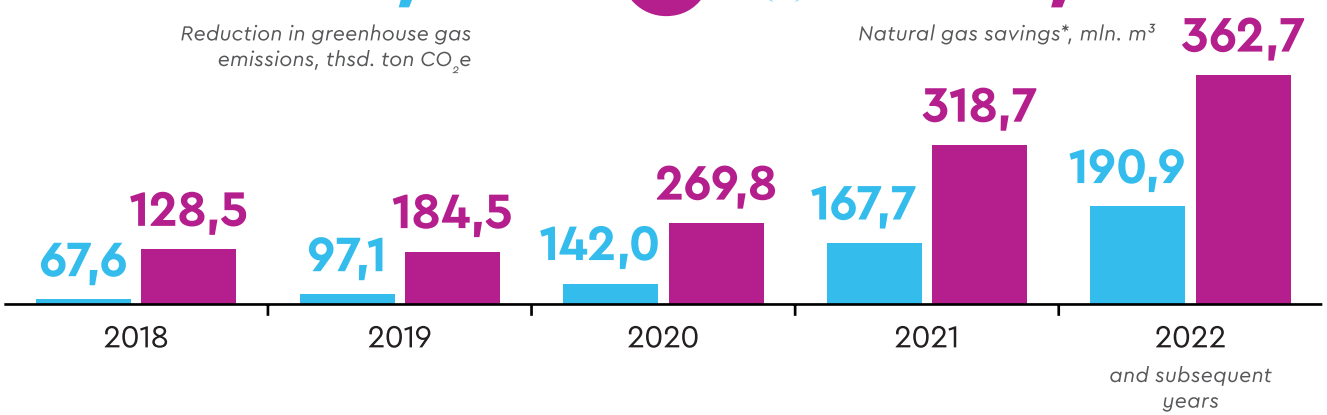
Potential effect of modernization of the residential building stock for enhanced energy performance(2018–2027):

1619,9

Reduction in greenhouse gas emissions, thsd. ton CO_2e

3077,8

Natural gas savings, mln. m^3*



*Determined in accordance with the researches of the UNDP/GEF project

Developed National Action Plan for Rational Use of Energy in the residential building sector

The goal of the plan is the reduction of annual consumption of energy resources by no less than 0.5 percent in the residential sector of Turkmenistan.

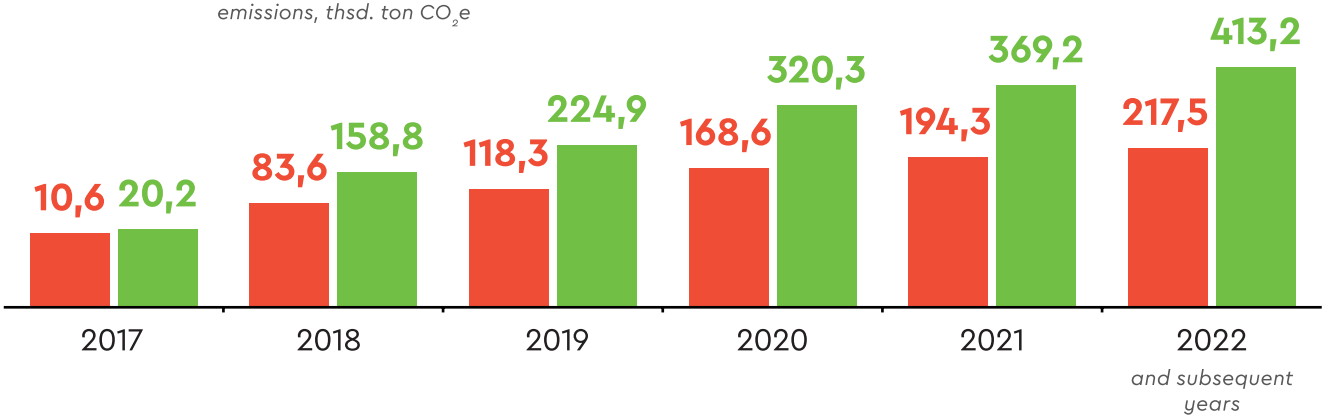
POTENTIAL EFFECT FROM IMPLEMENTATION OF THE NATIONAL ACTION PLAN (2017-2027)

3572,2

Reduction in greenhouse gas emissions, thsd. ton CO_2e

1880,1

Natural gas savings, mln. m^3*



*Determined in accordance with the researches of the UNDP/GEF project

National partner

TURKMEN STATE INSTITUTE FOR ARCHITECTURE AND CONSTRUCTION (TSIAC)

- Curricular program revised for students at TSIAC
- Materials developed for instructors and students at TSIAC

Confirmed

A section entitled "Energy Conservation" has been included in the curricular program for students in four specialties of the architectural-construction faculty of TSIAC

Lecture material, practical guidance manuals for the section "Energy Conservation"

Laboratory guidance manuals for the section "Energy Conservation"

An energy conservation laboratory established at TSIAC

Contest on energy-efficient residential building design held among TSIAC students

Supervision provided for two diploma theses of TSIAC students

National partners

- STATE CONCERN "TURKMENGAS"
- MINISTRY OF CONSTRUCTION AND ARCHITECTURE OF TURKMENISTAN
- MINISTRY OF COMMUNAL SERVICES OF TURKMENISTAN
- STATE CONCERN "TURKMEN OIL AND GAS CONSTRUCTION"

TRAININGS, SEMINARS AND PUBLICATIONS

8 TRAINING SESSIONS FOR **120 SPECIALISTS**

on design of energy-efficient residential buildings

1 NATIONAL SEMINAR

on implementation of energy management of residential buildings

5 TRAINING SESSIONS FOR **100 SPECIALISTS**

on energy audit of residential buildings across all five velayats

5 TRAINING SESSIONS FOR **100 SPECIALISTS**

on organization and implementation of energy management of residential buildings across all five velayats

1 NATIONAL SEMINAR

on implementation of energy audit of residential buildings

8 ROUNDTABLE MEETINGS

5 WORKING-GROUP MEETINGS

4 NATIONAL CONFERENCES

4 PRESENTATIONS DELIVERED FOR ANNUAL INTERNATIONAL CONSTRUCTION CONFERENCES

4 STUDY TOURS

to Germany-Denmark, Croatia, Belarus, and Russia

PUBLICATIONS IN THE LOCAL MASS MEDIA

GUIDANCE MANUALS

- Guidance manual developed on energy efficiency of residential buildings
- Guidance manual developed on planning and implementation of energy management for existing residential buildings of Turkmenistan


1
NO POVERTY
2
ZERO HUNGER
3
GOOD HEALTH AND WELL-BEING
4
QUALITY EDUCATION
5
GENDER EQUALITY
6
CLEAN WATER AND SANITATION
7
AFFORDABLE AND CLEAN ENERGY
8
DECENT WORK AND ECONOMIC GROWTH
9
INDUSTRY, INNOVATION AND INFRASTRUCTURE
10
REDUCED INEQUALITIES
11
SUSTAINABLE CITIES AND COMMUNITIES
12
RESPONSIBLE CONSUMPTION AND PRODUCTION
13
CLIMATE ACTION
14
LIFE BELOW WATER
15
LIFE ON LAND
16
PEACE, JUSTICE AND STRONG INSTITUTIONS
17
PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS