Clean Household Energy Consumption in Kazakhstan: A Roadmap

Discover methods to reduce heating-related residential sector emissions and transform household energy use.

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Heating in Kazakhstan

Kazakhstan is one of the world's coldest countries. Heating is a basic survival need.

6+
month heating season

13°C
annual average temperature in the south

2°C
annual average temperature in the north

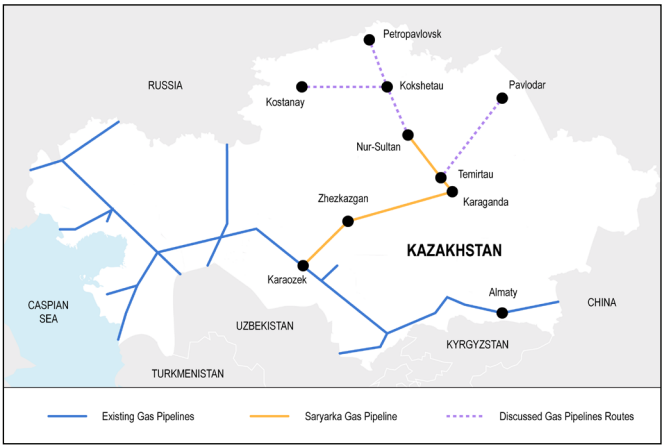
Household coal combustion is one of the reasons for high levels of **winter air pollution** in Kazakhstan. 30% of Kazakh households use coal and/or firewood. Burning coal significantly **reduces outdoor and indoor air quality** and **severely affects public health**. Pollution in Kazakhstan causes 2,800 premature deaths and costs the economy more than USD 1.3 billion annually through increased healthcare costs.

Current Policy Landscape

Despite the residential sector being one of the major sources of pollutant and greenhouse gas (GHG) emissions, **no specific support measures are in place to facilitate energy transitions**.

- Extension of the national gas pipeline network is one goal of the state policy on infrastructure development.
- Natural gas is currently available in only 10 out of 16 regions in Kazakhstan.

Existing and Future Gas Pipeline Routes in Kazakhstan

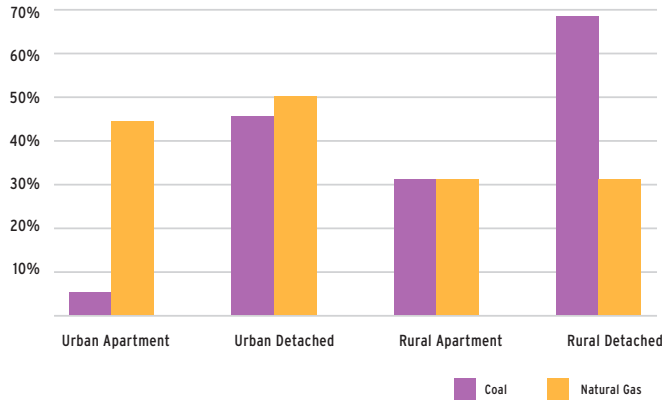


Fuel Use in Kazakhstan

Coal vs. Natural Gas

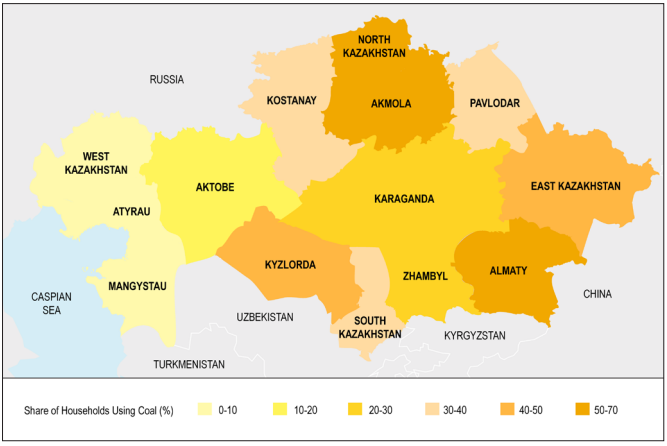
Despite a rate of **100%** electrification in Kazakhstan, solid fuels are widely used for heating owing to their availability and affordability. Moreover, other alternatives such as natural gas and district heating are not universally accessible. **Coal use differs for urban versus rural dwellers, as well as for detached houses compared with apartments.** Coal use is more prevalent in rural areas, where 68% of rural detached houses use coal.

Share of Households Using Coal and Natural Gas by House Type, 2018



Household fuel use varies significantly by region due to differences in climate, access to infrastructure, and shares of housing type.

Share of Households Using Coal, By Region



Efficient and Clean Household Energy Consumption Scenario Results

These four scenarios for household energy consumption explore the implications of taking additional measures to encourage energy efficiency and fuel switching.

1

Business as Usual (BaU) scenario

+ Current shares of fuel use by house type remain unchanged to 2030.
+ Energy efficiency improvement rate remains the same as in the past.

2

Fuel switching (FS) scenario

+ Gas network expands to connect all regions (except for three regions).
+ Urban apartments will phase out coal consumption by 2030 through the expansion of district heating systems.
+ Rural houses will switch from coal stoves to improved coal boilers.
+ Gas provides the remaining energy needed for heating in all regions for all house types (except urban apartments and three regions without access to gas).

3

Fuel switching + energy efficiency (EE) scenario

+ In addition to the assumptions of the previous scenario, the energy efficiency of heating systems will be improved for both district and individual heating. Energy demand falls 15% by 2030.

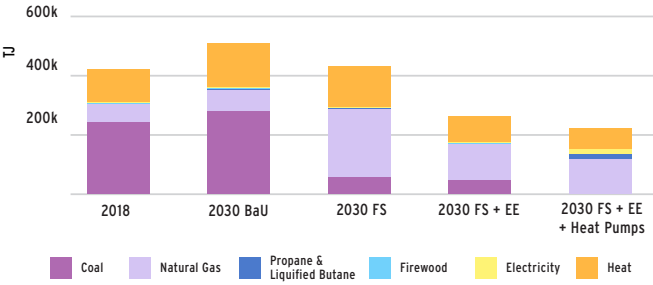
4

Fuel switching + energy efficiency + heat pumps scenario

+ Coal is fully phased out in all regions and all house types by 2030.
+ In addition to the assumptions about heating system energy efficiency improvements in the previous scenario, heat pumps provide 25% of heating energy for all house types (except urban apartments) in all regions (except western regions with inexpensive and abundant gas, where heat pumps provide 15% of heating energy).

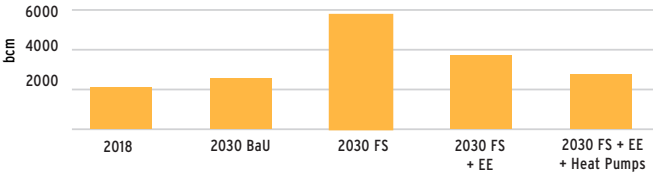
Scenario Results

Kazakhstan Residential Energy Consumption for Heating, by Scenario



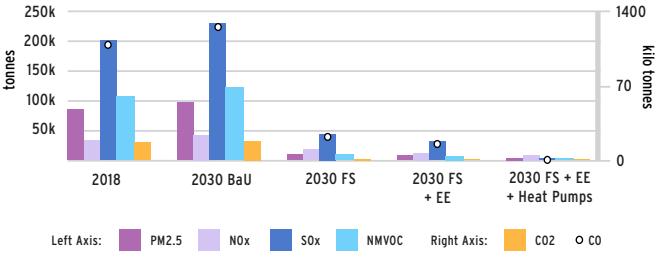
Greater heating system energy efficiency at building level, combined with higher generation efficiency, demonstrably **results in substantially lower residential energy consumption**.

Kazakhstan Natural Gas Consumption for Heating, by Scenario



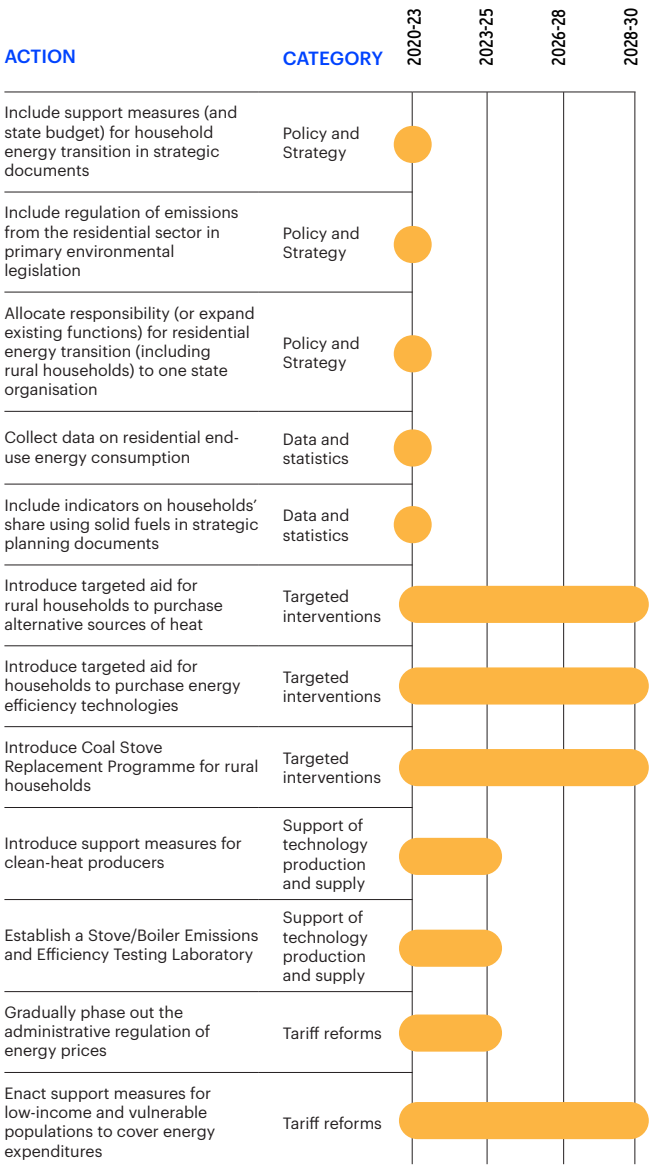
While natural gas consumption increases in all scenarios, findings show that energy efficiency improvements can contribute to a **reduction in natural gas consumption**.

Kazakhstan Pollutant Emissions from Residential Heating, by Scenario



Full coal phaseout and the use of heat pumps (fuel switching + EE + heat pumps) would result in **nearly zero pollutant emissions from residential heating by 2030**.

The Vision for 2030



An extended set of policy recommendations is included in the full roadmap

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