

Climate Shocks and Energy Poverty in Kyrgyzstan

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Outline

- Motivational background
- Conceptual framework
- Methodology
- Descriptive statistics
- Estimation results
- Conclusion and recommendations

Motivational background

- Extreme weather changes such as abnormally hot summers and heatwaves, rainfalls, drought, and more can result in a disruption of energy supply, infrastructure and negative economic impacts, disproportionately affecting vulnerable layers of population such as children, low-income households, women (IMF, 2023).
- UNDP ranked Kyrgyzstan as the third most vulnerable country to climate shocks in Central Asia and 52th in the world (UNDP, 2013), while in 2021, Asian Development Bank rated Kyrgyzstan 75th in the world (ADB, 2021).
- Kyrgyzstan's natural conditions such as its mountainous landscape, reliance on the agricultural sector, and a large number of glaciers make it especially vulnerable to climate change implications (IMF, 2023).
- This study aims to examine how climatic shocks such as rainfall, drought impact energy poverty in Kyrgyzstan.
- **Research questions:**
 - How do climate shocks affect energy poverty in Kyrgyzstan?
 - What are the challenges and vulnerabilities faced by households due to climatic shocks?

Multidimensional energy poverty index (MEPI)

- To measure a multidimensional energy poverty index (MEPI) this research adopts the Alkire-Foster (AF) method approach applied by Ssenono, et al. (2023), Crentsil, et al. (2019).
- The AF methodology assesses the incidence and intensity of multidimensional deprivations through pre-selected indicators, applicable to binary and ordinal data. It involves two steps: identification, using dual cut-offs to identify deprivation and compare scores to a poverty threshold, and aggregation, summarizing deprivation and poverty profiles (Crentsil, et al. 2019).
- The multidimensional poverty index offers a structure for identifying the households that lack access to clean, safe, and sustainable household energy (Crentsil, et al. 2019).

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- MEPI represent access to basic energy services with three dimensions and six indicators, each with a defined deprivation cut-off. Weights indicate the importance of each indicator in assessing multidimensional energy poverty (based on Ssenono, et al. 2023; Crentsil, et al. 2019).

Dimensions	Indicators	Deprivation cutoffs	Weights
Energy access	Capacity	The community has less than a 100 percent share of households with access to electricity.	0.2
	Regular disruptions in power supply	Frequent household power disruptions happening more than once a month.	0.2
Cooking solutions	Cooking exposure	Household mainly uses Tandyr-oven for cooking	0.2
Housing and electricity appliance	Housing	Mud constitutes the primary material for household dwelling walls.	0.1
	Appliances	The household does not own a refrigerator	0.1
		The household does not own a TV or radio	0.1
		Household does not own a mobile phone or fixed telephones	0.1

Table 1. Indicators for constructing MEPI

Methodology

- This study utilizes the four waves of "Life in Kyrgyz Republic" survey conducted during 2011-2019.
- To analyze impact of climate shocks on multidimensional energy poverty in Kyrgyzstan Panel logit Model is estimated.
- Climate shock variables are following:
 - 1 Drought
 - 2 Too much rain or flood
 - 3 Very cold winter
 - 4 Frosts
 - 5 Landslides

Descriptive statistics

		2011	2013	2016	2019
MEPI		0.2631	0.3009	0.2681	0.2413
Energy access	Capacity	0.1282	0.0964	0.1195	0.0624
	Power disruption	0.2823	0.4682	0.2916	0.1998
Cooking solutions	Cooking exposure	0.4411	0.4844	0.5110	0.4809
	Housing	0.6467	0.6576	0.6524	0.6247
Housing and electricity appliance	Radio or TV	0.0121	0.0329	0.0595	0.1351
	Telephone	0.0427	0.0456	0.0254	0.0439
	Refrigerator	0.2263	0.1749	0.0999	0.1236

Table 2. MEPI over 2011-2019 period
Source: Authors' calculations, LIK data

	Mean	N
Energy poor households	0.2980	6932
<i>By regions (oblasts):</i>		
▪ Issyk-Kul	0.1774	682
▪ Jalal-Abad	0.5210	1403
▪ Naryn	0.1931	321
▪ Batken	0.4633	682
▪ Osh	0.3758	1373
▪ Talas	0.4649	342
▪ Chui	0.1196	928
▪ Bishkek city	0.0160	940
▪ Osh city	0.1341	261

Table 3. The share of energy poor households
Source: Authors' calculations, LIK data

Estimation results

	(1)	(2)	(3)	(4)	(5)
Household Head Education (Tertiary=1)	-0.512*** (0.116)	-0.522*** (0.117)	-0.514*** (0.116)	-0.517*** (0.116)	-0.513*** (0.116)
Household Head Gender (Women=1)	-0.037 (0.083)	-0.036 (0.083)	-0.038 (0.083)	-0.039 (0.083)	-0.036 (0.083)
Household Head Age	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)
Household size	0.029 (0.020)	0.029 (0.020)	0.030 (0.020)	0.030 (0.020)	0.030 (0.020)
No. working age adults	-0.070** (0.027)	-0.068** (0.028)	-0.071** (0.028)	-0.072*** (0.028)	-0.069** (0.028)
Residence (City=1)	-1.158*** (0.100)	-1.155*** (0.100)	-1.163*** (0.099)	-1.167*** (0.099)	-1.152*** (0.100)
Climate Shocks					
— Drought	-0.046 (0.081)				
— Too much rain or flood		0.352*** (0.085)			
— Very cold winter			0.051 (0.082)		
— Frosts				0.185** (0.086)	
— Landslides					0.228* (0.124)
Constant	-1.039*** (0.233)	-1.698*** (0.239)	-1.205*** (0.239)	-1.427*** (0.241)	-1.571*** (0.313)
Years	+	+	+	+	+
Regions	+	+	+	+	+
N	6928	6928	6928	6928	6928
Loglikelihood	-3408.93	-3400.38	-3408.89	-3406.79	-3407.37
Chi2	825.42***	825.35***	824.04***	824.49***	823.55***

Table 4 Estimation results for climate shock impact on energy poverty in Kyrgyzstan (Panel random effects)
Source: Authors' calculations, LIK data
Note: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.010

Conclusion and recommendations

- Our findings revealed a noteworthy negative impact of excessive rain, frosts, and landslides on multidimensional energy poverty in Kyrgyzstan. These climatic events were associated with adverse effects on households' access to basic energy services.
- Based on the findings of the study regarding the impact of climate shocks on multidimensional energy poverty in Kyrgyzstan, the following policy recommendations are proposed:
 - Invest in resilient energy infrastructure that can withstand the impact of climate shocks. This includes reinforcing structures against landslides, flooding, and extreme weather conditions.
 - Promote and support climate-resilient agricultural practices that can withstand extreme weather conditions.
 - Invest in ongoing research and data collection to continuously monitor and understand the evolving impact of climate change on energy poverty. This can inform adaptive policies

- Thank you for your attention!

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