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Measuring the Capacity for Adaptation to Climate Change in Central Asia

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ABSTRACT

Climate change poses a formidable threat to the Central Asian region, exacerbating preexisting vulnerabilities and necessitating enhanced adaptation efforts. The economic and environmental costs of these changing climatic conditions are substantial, compelling governments to bolster their adaptive capacity. In this study, we employ the United Nations Framework Convention on Climate Change (UNFCCC) adaptation framework and high-quality data to quantitatively measure the capacities of the Central Asian countries to adapt to the impacts of climate change. Our primary objective is to compare the adaptation progress in the Central Asian countries with that of countries outside the region. The results of our analysis indicate that, despite announced adaptation strategies, Central Asia lags behind in this critical area. Several factors contribute to the low scores for adaptation in the region, including heavy reliance on fossil fuels, resource-intensive economies, and limited innovation capacity. This deficiency in adaptive readiness leaves the Central Asian countries ill-prepared for the impending consequences of climate change. Urgent action is imperative for policymakers to address this disparity, formulate effective adaptation strategies, and safeguard the region's future resilience.

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1. Climate change impacts in Central Asia

Central Asia is experiencing a warming trend that surpasses the global average. This rapid climate change has far-reaching implications for both the ecology and the economy of the region. It adversely affects multiple economic sectors and disrupts the social fabric. Consequences include heightened water stress, decreased agricultural productivity, heatwaves, land degradation, and an increased frequency of extreme weather events, such as droughts and floods (Daloz, 2023; Mirzabaev, 2012).

Notably, shifts in temperature and precipitation patterns can have a profound impact on crop yields and distribution, potentially leading to food insecurity in the region (Reyer et al., 2017; Xenarios et al., 2019). While some pastoralist communities have attempted to diversify their economic activities in the face of climate change, agriculture remains their primary income source (Sabyrbekov, 2019). These climate-induced challenges are likely to exacerbate existing issues, including rising healthcare costs, infrastructure damage, increased poverty, forced migration, and regional security tensions (Blondin, 2023; Gerlitz et al., 2020; Mirzabaev, 2012; Poberezhskaya & Danilova, 2022).

The region's vulnerability is compounded by its high exposure to climate risks and its limited adaptive capacity. As the world rapidly transitions to clean energy and decarbonizes its energy supplies, Central Asia faces new challenges. The region relies heavily on fossil fuel exploitation, with most of its infrastructure tailored for fossil fuel use. Notably, Central Asia boasts substantial fossil fuel reserves and includes the petrostates Kazakhstan and Turkmenistan. The ongoing international tightening of climate policies and the implementation of carbon pricing mechanisms, such as the EU's carbon border adjustment mechanism (CBAM), are anticipated to reduce demand for Central Asia's fossil fuel exports in the long term (Buylova et al., 2022; Overland & Sabyrbekov, 2022; Vakulchuk et al., 2022).

In recent years, policymakers in the region have become increasingly aware of the adverse consequences of climate change and have initiated first steps to address these challenges (Mirzabaev, 2023). International development organizations have supported the region's decarbonization efforts. As a result, the Central Asian countries have made various climate commitments, including Nationally Determined Contributions (NDCs) under the Paris Climate Agreement. These commitments, however, vary in their focus, with some prioritizing greenhouse gas emissions reduction while others emphasize enhanced climate resilience and a greater share of renewable energy in the energy mix (Sabyrbekov et al., 2023).

Despite these commitments, the adaptive capacity of countries in the region remains inadequately understood. Scholarly literature on climate change in Central Asia is limited, with existing studies predominantly concentrating on exposure to climate change rather than the capacity to address it (Vakulchuk et al., 2022). Given this knowledge gap in climate change adaptation within these nations, there is an urgent necessity to advance our understanding of their adaptation efforts and effectiveness in the region.

This study makes two significant contributions. First, it addresses the scarcity of literature on climate change adaptation measurement in Central Asia by utilizing state-of-the-art data, enabling comparisons with other countries worldwide. Second, it contributes to the expanding body of scholarly work on the measurement of global climate change adaptation efforts. Ultimately, the study concludes by presenting policy recommendations aimed at bolstering climate change adaptation in the region.

2. Methods

Theoretical framework

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as “the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities” (p. 542 IPCC, 2018). The literature suggests that the measurement of adaptation is complex as it varies across spatial and societal spaces (Aaheim & Aasen, 2008; Adger et al., 2005; Ford et al., 2015). Scholars generally distinguish between incremental adaptation and transformational adaptation. Improvements in transformative adaptive capacity are driven by complex interactions in the social-ecological network, and agency plays a crucial role (Barnes et al., 2020; Dun et al., 2023; Shi & Moser, 2021). Alam and Huq (2019) provide a good overview of various climate change adaptation measurement approaches. Overall, the main components of adaptation are actions that reduce exposure and sensitivity to climate change while improving adaptive capacity.

This study draws upon the literature to investigate the adaptation as a function of three key components: exposure, sensitivity, and adaptive capacity (Aaheim & Aasen, 2008; Adger et al., 2003; Thomas et al., 2019). Exposure refers to the direct dependence of ecosystems, while sensitivity refers to their vulnerability to external shocks. Adaptive capacity, on the other hand, is the ability to withstand and cope with these shocks (see Figure 1).

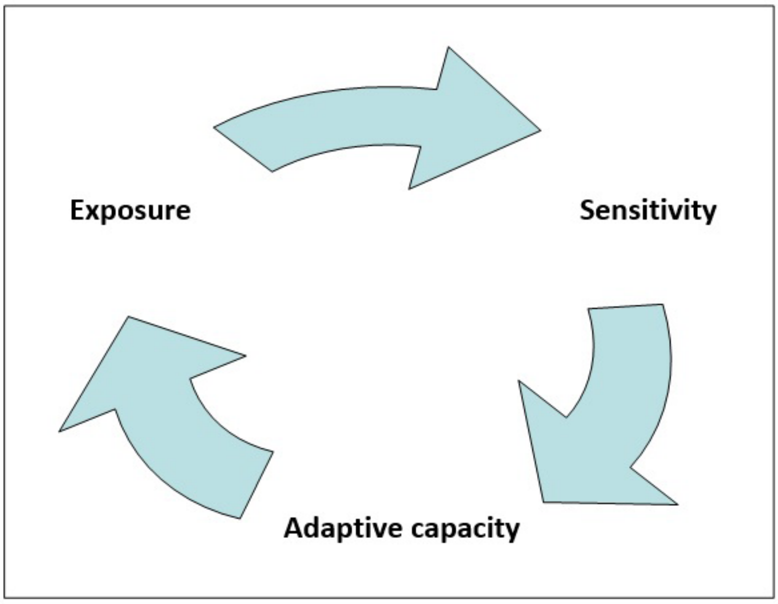

Figure 1. Components of climate change adaptation. Adapted from Adger et at 2005.

It is important to note that these components are interdependent (Gupta et al., 2010). For instance, if climate change results in more frequent droughts, a farmer who primarily relies on rainfall for irrigation will be highly exposed to the effects of this change. If this farmer does not have alternative strategies in place to withstand the drought, this would amplify their sensitivity to natural disasters. However, if farmers have access to targeted state funding, they can enhance their adaptive capacity and reduce their exposure and vulnerability.

Adaptation measurement dimensions

We used an index approach that captures the components of climate change adaptation. Unlike other approaches, the index approach enables the capture of the multidimensionality of the studied phenomena (Saisana et al., 2005). It is mathematically simple but thus also robust easy to verify the results (Cherchye et al., 2008). The index approach is commonly employed to measure multifaceted concepts, as exemplified by the Human Development Index and the literature on globalization measurement.

The index in this paper is in line with the transformational adaptation literature and consists of five dimensions such as exposure and sensitivity; financial resilience; innovation capacity; green energy; and ecosystem and biodiversity protection (Shi & Moser, 2021). In turn each dimension has subdimensions. Table 1 gives a detailed description of the subdimensions and data sources. To ensure reproducibility and transparency, we derived all data from public and internationally recognized sources (see Table I). All data except damages from natural disasters are for the year 2019 because of data availability and to avoid COVID-19 disruptions.

Table I. Description of index dimensions and their indicators.

Dimensions	**Indicator description and data source**
1. Exposure and sensitivity	1.1. Energy intensity. Energy intensity level of primary energy (megajoules per constant 2017 purchasing power parity GDP) (United Nations, 2023).
	1.2. Water use efficiency (USD per cubic meter) (UN-Habitat, 2023).
	1.3. Domestic material consumption per capita of raw materials (tons) (UNEP, 2023).
	1.4. Total damages from natural disasters over the last 20 years (normalized by GDP, PPP in constant 2017 international dollars) (CRED, 2023).
2. Financial resilience	2.1. Green Climate Fund finance per capita (as of January 2023) (GCF, 2023).
	2.2. Financial Development Index, International Monetary Fund (IMF, 2023a)
3. Innovation capacity	3.1. Patent applications per 100,000 people. World Intellectual Property Organization (WIPO, 2021).
	3.2. R&D as a share of GDP. World Development Indicators (World Bank, 2023b)
4. Green energy	4.1. Share of modern renewables in total final energy consumption (%). United Nations Statistics Division (UNSD, 2023b).
	4.2. CO2 emissions per capita (tons) World Development Indicators (World Bank, 2023a).
	4.3. Fossil fuel subsidies as a percentage of GDP International Monetary Fund (IMF, 2023b).
5. Protection of ecosystem services and biodiversity	5.1. Average proportion of terrestrial key biodiversity areas covered by protected areas (%) United Nations Statistics Division (UNSD, 2023a).

Index construction steps

After selecting the index dimensions, the data underwent three steps of treatment: (1) normalization, (2) weighting and aggregation, and (3) robustness checks and sensitivity analyses. The derived index was rescaled from 1 to 100 for visualization purposes, where 100 signified the greatest effort toward climate change adaptation and 1 the least. The data were compiled and analyzed using Stata 16.1.

Normalization

For each dimension, the data were normalized using maximum and minimum values in accordance with Formula 1:

$$I_c = \frac{x_c - min\,(x)}{max(x) - min\,(x)} \qquad (1)$$

where is the dimension for country c, and is the value of the variable ; and are the maximum and minimum values. The resulting normalized values are between 0 and 1.

Weighting and aggregation

Equal weighting was done for all dimensions because the literature suggests no evidence of any hierarchical relationship (see Formula 2).

$$ZI_c = \frac{x - \mu_x}{\sigma} \qquad (2)$$

Where Δ_i is dimension of the index, subscript corresponds to the each dimensions and w is weight. Each dimension of the index has equal weight. All dimensions were added according to their relation to adaptation efforts; that is, the negatively related dimensions were subtracted and the positively related dimensions were added. Energy intensity, material consumption, CO_2 emissions per capita, and fossil fuel subsidies are negatively associated with climate change adaptation efforts.

Robustness checks and sensitivity analyses

To improve the robustness of the index, we used an additional normalization method that drew upon Cherchye et al. (2008) and Saisana et al. (2005). This z-score-based normalization approach uses standard deviation (Formula 3).

$$ZI_c = \frac{x - \mu_x}{\sigma} \qquad (3)$$

where is a z-score normalized dimension, is the mean value of the dimension, and is the standard deviation.

The resulting z-score-based index was compared with the min-max-based index to reveal any significant changes in the rankings. Finally, we performed a sensitivity analysis by dropping one variable at a time in the final aggregated index while ensuring that all remaining dimensions had equal weight in the overall index (Nardo & Saisana, 2008; Saltelli, 2007).

3. Results

Descriptive statistics

Despite being in one region, countries of Central Asia vary significantly in their economic development levels, quality of infrastructure, and climate efforts. Table II compares the descriptive statistics for the Central Asia with the rest of the world.

Table II. Descriptive statistics comparison of index subdimensions for Central Asia and sample of 144 countries.

Subdimension	Sample mean (SD)	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
1. Energy intensity (MJ per USD)	4.82 (2.75)	6.27	4.96	4.84	12.87	8.37
2. Water use efficiency (USD per cubic meter)	48.43 (109.73)	7.49	0.91	0.92	1.33	1.56
3. Domestic material consumption per capita (in tons)	12.76 (10.59)	30.35	8.35	6.27	13.93	9.94
4. Damage from natural disasters over last 20 years (share of GDP in 2019)	0.00297 (0.008)	0.0000678	0.0000634	0.005254	0	0.0000344
5. Green Climate Fund financing per capita	45.02 (215.47)	8.10	6.51	9.59	0.38	3.22
6. Financial development index	0.33 (0.22)	0.32	0.12	0.13	0.10	0.26
7. Patent applications (per 100,000 people)	30.01 (82.76)	0	2.49	1.12	0	1.35
8. Research and development expenses (in percent of GDP)	0.56 (0.96)	0.12	0.09	0.09	0	0.11
9. Share of renewables in total final energy consumption (in percent)	13.89 (14.27)	1.7	27.88	38.56	0.06	1.57
10. CO_2 emissions per capita (in tons)	4.24 (4.91)	11.46	1.56	1	11.83	3.48
11. Fossil fuel subsidies (percent of GDP)	7.39 (9.21)	29.38	22.02	16.22	22.14	22.23

12.Average proportion of Key Biodiversity Areas covered by protected areas (in percent)	45.78 (25.84)	28.55	23.6	16.8	14.04	17.73

In terms of material use, the economies of Central Asia exhibit inefficiency. The energy intensity of all countries in the region surpasses the global average of 4.82 MJ per USD, with Turkmenistan recording the highest intensity at 12.87 MJ per USD (see Table II and Figure 3). Water use efficiency is remarkably low, with Kazakhstan leading the region with a rate of 7.49 USD per cubic meter, in stark contrast to the global mean of 48.83 USD.

On the other hand, Kazakhstan's per capita material consumption stands at 30.35 tons, significantly higher than the international average of 12.76 tons, while the other countries in the region fall below this global average. The subdimensions related to green finance in the region are underperforming, with minimal utilization of the Green Climate Fund and insufficient financial development (see Table II). In absolute terms, Kazakhstan and Uzbekistan are the leading recipients of funds from the Green Climate Fund, with 150 million USD and 110 million USD, respectively. However, when normalized by population, Tajikistan takes the first position, followed by Kazakhstan (see Figure 2).

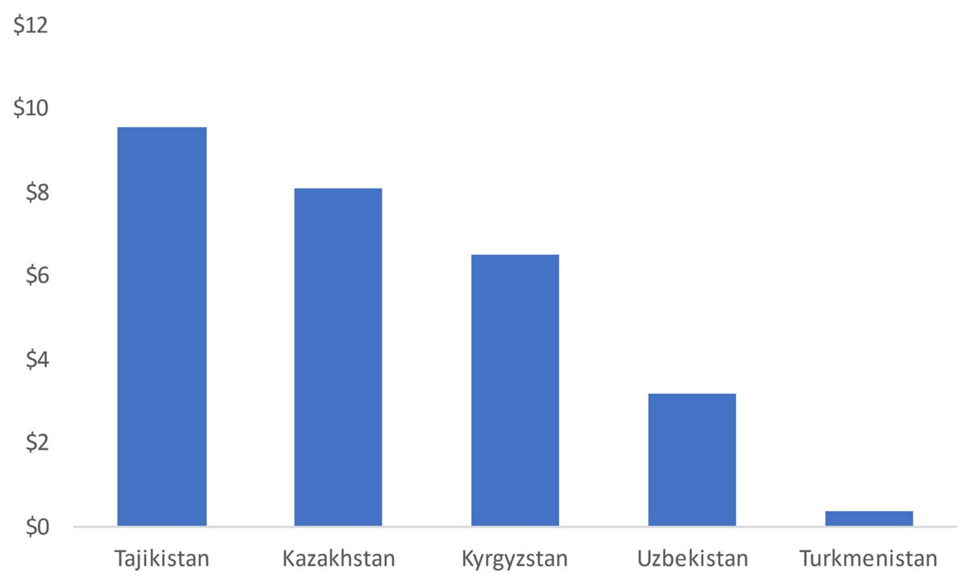

Figure 2. Funds from Green Climate Fund per capita. Source: authors calculations based on data from Green Climate Fund (2023) and World Bank (2022).

The innovation capacity components also receive low scores, with a low number of patent applications and a mere 0.1 percent of GDP allocated to research and development, as opposed to the global average of 0.56 percent.

When it comes to the share of renewable energy in final consumption and CO2 emissions per capita, Kazakhstan and Turkmenistan demonstrate the poorest performance. In contrast, Kyrgyzstan and Tajikistan showcase a higher share of renewable energy and lower per capita emissions when compared to global standards.

However, the region suffers from an alarmingly high level of fossil fuel subsidies, with a regional average of 22.4 percent of GDP, far exceeding the global average of 7.39 percent. Additionally, protected areas in the region fall significantly short of the global average of 45.78 percent (see Table II).

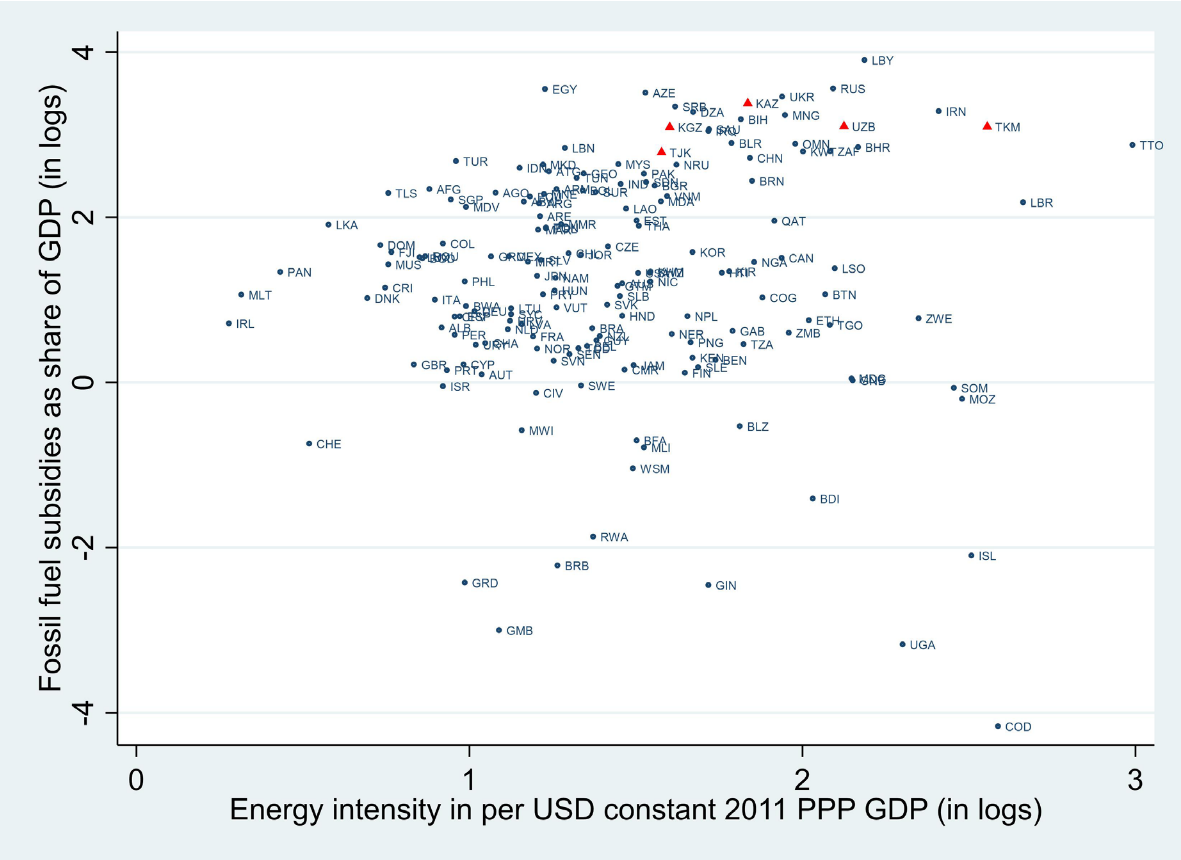

Figure 3. Fossil fuel subsidies and energy intensity in 2019 across the sampled countries. Central Asian countries have red triangle labels. Source: authors' calculations using data from IMF (2023) and UN (2023).

Five Central Asian countries have economies that heavily subsidize use of fossil fuels (see Figure 3). Kazakhstan and Uzbekistan have the highest fossil fuel subsidies in the region. Even non-oil country Kyrgyzstan has the level of subsidies comparable to the one of Saudi Arabia. In terms of the energy intensity, Central Asia has high levels with Turkmenistan being the leader. Among the five countries Tajikistan has both the lowest fossil fuel subsidy level and the lowest energy intensity.

Climate change adaptation index

In the ranking of climate change adaptation index Central Asian countries are at the lower bottom of the list (see Figure 4). Out of 144 countries, Tajikistan and Kyrgyzstan are in 125th and 126th places, with 30 and 29 points, respectively. Uzbekistan is 136th with 23 points, Kazakhstan in 142nd place with 21 points, and Turkmenistan in 143rd place with 9 points. The full ranking can be seen in Table A1 in the Appendices. The robustness check using Z-score confirmed that the index is robust with 0.98 significant correlation level (see Table A2 and Table A3 in Appendices).

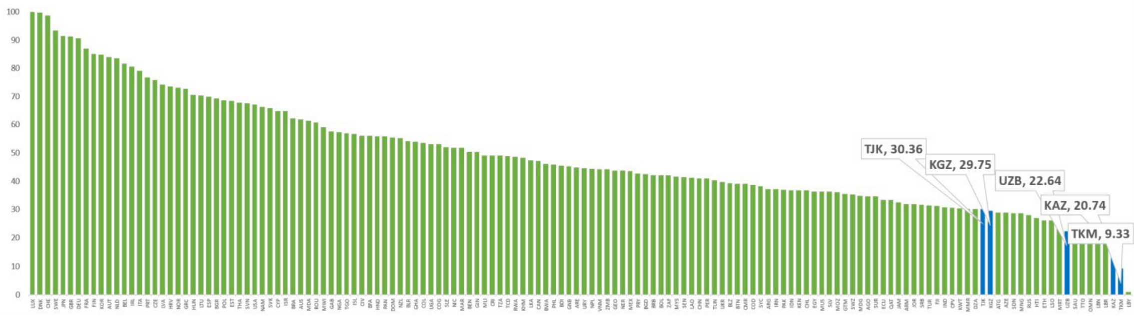

Figure 4. Climate Change Adaptation Index ranking. 100 indicates the highest adaptation capacity and 1 is the lowest adaptation capacity.

The results reveal that the governments of Central Asian states must address fundamental issues related to exposure and sensitivity to climate change. Notably, Tajikistan and Kyrgyzstan exhibit higher exposure and sensitivity compared to the rest of the region. The overall low index scores for Central Asia can be attributed to the region's inefficient economies, characterized by high material and energy intensity.

From a governance perspective, the region possesses an underdeveloped financial system, does not actively attract climate change adaptation funds, and continues to heavily subsidize the use of fossil fuels. Additionally, the petrostates in the region, namely Kazakhstan, Turkmenistan, and Uzbekistan, exhibit low adaptation indexes primarily due to their minimal reliance on renewable energy sources in final consumption and their substantial state subsidies for fossil fuels.

Conclusion

There is little existing research on climate change in Central Asia, and even fewer studies have been published on adaptation in the region. Under the Paris Climate Agreement, the governments of Central Asia pledged to reach ambitious targets for climate change mitigation and adaptation. In their national climate commitments, they promise to implement a number of measures, but their actual adaptive capacity is unknown and unmeasured.

The worldwide transition to clean energy is a key factor that should be considered by the governments of the region. The region's petrostates will have to significantly transform both their export structure and domestic energy supply systems. In this regard, the growing demand for critical materials may potentially reduce the fossil fuel export dependence of the Central Asian countries (Vakulchuk & Overland, 2021). The transformation of the domestic energy supply is likely to be more challenging in the region due to the existing built infrastructure and lower costs of fossil fuels.

Our study aims to fill this gap by measuring adaptation efforts in comparison to other countries around the world using a multidimensional index. The index is based on published literature and includes three main components: exposure, sensitivity, and adaptive capacity. These components are further divided into five dimensions, which consist of 12 indicators. The data were carefully selected from internationally verified sources, and the index was developed using state-of-the-art methods.

The results of the study show that Central Asian countries are at the bottom of the index ranking. This low climate change adaptation level has several possible causes. A plausible explanation is that these countries have inefficient economies with high material and energy intensities. In addition, they have low innovative capacity and energy systems that rely heavily on fossil fuels, which are subsidized by the governments.

The limitation of the index approach is its simplicity in measuring complex phenomena such as climate change adaptation. It is often argued that measuring adaptation is extremely challenging or even impossible. However, the simplicity of the index is also an advantage because it provides a clear picture for policymakers of a country's climate change adaptation effort and allows a global comparison.

Discussion and policy implications

Central Asian governments are confronted with new challenges in the face of severe climate change impacts. High exposure and vulnerability demand a strategic shift towards transformational adaptation, leading to structural changes in the region's economies. The Climate Change Adaptation Index serves as a vital tool for policymakers to monitor and assess the region's progress in climate change adaptation, revealing key areas for improvement.

In pursuit of effective adaptation, policymakers should prioritize several critical areas:

1. Enhance resource efficiency: Central Asian economies exhibit some of the world's highest material, water, and energy intensities. Addressing resource efficiency offers a "low-hanging fruit" opportunity for improvement, drawing from the experiences of other nations and readily available technology.

2. Strengthen innovation capacity: Public policy must emphasize the development of innovative capacity through increased investment in research and development, particularly in areas related to adaptation and decarbonization. Innovation is key to finding sustainable solutions to climate challenges.

3. Institutional transformation: A larger-scale transformation in the institutional setup is essential, including financial development. A well-developed financial system enhances adaptive capacity, enabling the efficient allocation of resources for climate resilience initiatives.

Considering these challenges and opportunities, Central Asian policymakers have a critical role to play in guiding their region toward a more sustainable and adaptive future. The Climate Change Adaptation Index, combined with focused efforts in resource efficiency, innovation capacity, and institutional development, can pave the way for effective adaptation and climate resilience in Central Asia.

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Appendix

Table A1. Index

Rank	Country	ISO	Climate Change Adaptation Index
1	Luxembourg	LUX	100
2	Denmark	DNK	99.84
3	Switzerland	CHE	98.71
4	Sweden	SWE	93.40
5	Japan	JPN	91.65
6	United Kingdom	GBR	91.30
7	Germany	DEU	90.76
8	France	FRA	87.15
9	Finland	FIN	85.20
10	Korea	KOR	84.90
11	Austria	AUT	84.23
12	Netherlands	NLD	83.72
13	Belgium	BEL	81.87
14	Ireland	IRL	80.84
15	Italy	ITA	79.33
16	Portugal	PRT	76.87
17	Czechia	CZE	76.11
18	Latvia	LVA	74.34
19	Croatia	HRV	73.70
20	Norway	NOR	73.39
21	Greece	GRC	72.99
22	Hungary	HUN	70.74
23	Lithuania	LTU	70.48
24	Spain	ESP	70.17
25	Bulgaria	BGR	69.42
26	Poland	POL	68.90
27	Estonia	EST	68.61
28	Thailand	THA	67.91
29	Slovenia	SVN	67.77
30	United States of America	USA	67.43
31	Namibia	NAM	66.60
32	Slovakia	SVK	66.06
33	Cyprus	CYP	65.09
34	Israel	ISR	64.93
35	Brazil	BRA	62.53
36	Australia	AUS	62.14
37	Moldova	MDA	61.61
38	Romania	ROU	60.90
39	Malawi	MWI	59.20

40	Gabon	GAB	57.83
41	Nigeria	NGA	57.69
42	Togo	TGO	57.20
43	Iceland	ISL	56.93
44	Côte d'Ivoire	CIV	56.31
45	Burkina Faso	BFA	56.23
46	Honduras	HND	56.16
47	Panama	PAN	56.05
48	Dominican Republic (the)	DOM	55.69
49	New Zealand	NZL	55.45
50	Belarus	BLR	54.43
51	Ghana	GHA	54.18
52	Colombia	COL	53.69
53	Uganda	UGA	53.32
54	Congo	COG	53.27
55	Sierra Leone	SLE	52.35
56	Nicaragua	NIC	52.16
57	Morocco	MAR	51.98
58	Benin	BEN	50.66
59	Guinea	GIN	50.50
60	Mali	MLI	49.28
61	Costa Rica	CRI	49.24
62	Tanzania	TZA	49.22
63	Chad	TCD	49.12
64	Rwanda	RWA	48.95
65	Cambodia	KHM	48.46
66	Sri Lanka	LKA	47.70
67	Canada	CAN	47.37
68	Botswana	BWA	46.33
69	Philippines	PHL	46.12
70	Burundi	BDI	45.80
71	Guinea-Bissau	GNB	45.57
72	United Arab Emirates	ARE	45.01
73	Uruguay	URY	44.90
74	Nepal	NPL	44.71
75	Viet Nam	VNM	44.53
76	Zambia	ZMB	44.42
77	Georgia	GEO	44.06
78	Niger	NER	44.00
79	Mexico	MEX	43.76
80	Paraguay	PRY	42.99
81	Bangladesh	BGD	42.67
82	Barbados	BRB	42.39
83	Bolivia	BOL	42.23
84	South Africa	ZAF	42.21
85	Malaysia	MYS	41.80

86	Senegal	SEN	41.62
87	Lao	LAO	41.52
88	China	CHN	41.26
89	Peru	PER	41.17
90	Tunisia	TUN	40.69
91	Ukraine	UKR	39.87
92	Belize	BLZ	39.61
93	Bhutan	BTN	39.42
94	Cameroon	CMR	39.25
95	Congo, Dem. Rep.	COD	38.89
96	Seychelles	SYC	38.42
97	Argentina	ARG	37.46
98	Iran	IRN	37.34
99	Pakistan	PAK	37.20
100	Indonesia	IDN	37.09
101	Kenya	KEN	37.08
102	Chile	CHL	37.06
103	Egypt	EGY	36.60
104	Mauritius	MUS	36.56
105	El Salvador	SLV	36.53
106	Mozambique	MOZ	36.41
107	Guatemala	GTM	35.66
108	Eswatini	SWZ	35.49
109	Madagascar	MDG	35.09
110	Angola	AGO	34.90
111	Suriname	SUR	34.79
112	Ecuador	ECU	33.68
113	Qatar	QAT	33.55
114	Jamaica	JAM	32.83
115	Armenia	ARM	32.20
116	Jordan	JOR	32.16
117	Serbia	SRB	31.95
118	Turkiye	TUR	31.58
119	Fiji	FJI	31.49
120	India	IND	31.07
121	Cabo Verde	CPV	30.82
122	Kuwait	KWT	30.52
123	Myanmar	MMR	30.46
124	Algeria	DZA	30.41
125	Tajikistan	TJK	30.36
126	Kyrgyzstan	KGZ	29.75
127	Antigua and Barbuda	ATG	29.22
128	Azerbaijan	AZE	29.14
129	Sudan	SDN	29.01
130	Mongolia	MNG	28.83
131	Russia	RUS	28.30
132	Haiti	HTI	27.17

133	Ethiopia	ETH	26.35
134	Lesotho	LSO	26.31
135	Mauritania	MRT	24.97
136	Uzbekistan	UZB	22.64
137	Saudi Arabia	SAU	22.09
138	Trinidad and Tobago	TTO	21.36
139	Oman	OMN	21.32
140	Lebanon	LBN	21.20
141	Liberia	LBR	21.02
142	Kazakhstan	KAZ	20.74
143	Turkmenistan	TKM	9.33
144	Libya	LBY	1

Robustness check

Table A 2. Correlation analysis

	Climate Adaptation Index	Z-score based Index
Climate Adaptation Index	1	
Z-score based Index	0.9875	1

Table A 3. Z-score based index

Rank	**Country**	**Z score-based Index**
1	Luxembourg	1.454438
2	Switzerland	1.412844
3	Denmark	1.233636
4	Sweden	1.141129
5	Japan	0.9948891
6	Germany	0.9667522
7	United Kingdom	0.9548028
8	Korea	0.9475421
9	Finland	0.8559719
10	Austria	0.8490195
11	France	0.8315545
12	Netherlands	0.7846761
13	Belgium	0.7390823
14	Ireland	0.7361833
15	Italy	0.6389611
16	Norway	0.6167389
17	Portugal	0.5901883
18	Latvia	0.5642675

19	Czechia	0.5464702
20	Israel	0.5395391
21	Croatia	0.5324876
22	Lithuania	0.4895906
23	Greece	0.4743143
24	Spain	0.4559536
25	Hungary	0.4423874
26	United States of America	0.4161497
27	Slovenia	0.4086333
28	Poland	0.3793502
29	Estonia	0.3769489
30	Slovakia	0.3679126
31	Thailand	0.3603199
32	Namibia	0.356961
33	Bulgaria	0.3545908
34	Brazil	0.3385248
35	Cyprus	0.3340529
36	Iceland	0.299421
37	Gabon	0.2702418
38	Malawi	0.2666903
39	Romania	0.2583331
40	Moldova	0.2341239
41	Australia	0.222241
42	Panama	0.1823182
43	Côte d’Ivoire	0.1769805
44	Nigeria	0.1614055
45	Honduras	0.155455
46	Togo	0.1548797
47	Burkina Faso	0.1526275
48	Barbados	0.1412169
49	Colombia	0.1377407
50	Ghana	0.1346961
51	Dominican Republic	0.1344288
52	New Zealand	0.1242345
53	Congo	0.1114407
54	Sierra Leone	0.1072908
55	Costa Rica	0.0970396
56	Uganda	0.0945546
57	Nicaragua	0.0772326
58	Morocco	0.0653947
59	Rwanda	0.0616249
60	Benin	0.0550713
61	Belarus	0.0474258
62	Mali	0.0351708
63	Guinea	0.0335615

64	Uruguay	0.0316303
65	Sri Lanka	0.0301487
66	Tanzania	0.0288249
67	Cambodia	0.0198034
68	Chad	0.0195267
69	Botswana	-0.0252843
70	Philippines	-0.0297402
71	Paraguay	-0.0384813
72	Zambia	-0.057174
73	Burundi	-0.0580541
74	Guinea-Bissau	-0.0617612
75	Georgia	-0.0663474
76	Canada	-0.0689331
77	Viet Nam	-0.0783362
78	Niger	-0.0802523
79	Mexico	-0.0812155
80	Nepal	-0.0823869
81	Seychelles	-0.083435
82	Bangladesh	-0.0906244
83	Senegal	-0.1029658
84	China	-0.1082112
85	Peru	-0.1090781
86	Cameroon	-0.1221821
87	Lao	-0.1277801
88	Bolivia	-0.1383186
89	United Arab Emirates	-0.1399975
90	Tunisia	-0.1407847
91	Mauritius	-0.1664417
92	Bhutan	-0.1787199
93	Malaysia	-0.1787823
94	Eswatini	-0.1846147
95	South Africa	-0.1913755
96	Kenya	-0.1959899
97	Angola	-0.1978166
98	Argentina	-0.2065502
99	Congo, Dem. Rep.	-0.2074168
100	Belize	-0.2102809
101	Indonesia	-0.2110328
102	El Salvador	-0.2154232
103	Pakistan	-0.2216633
104	Madagascar	-0.2254482
105	Guatemala	-0.2278338
106	Antigua and Barbuda	-0.2439769
107	Ukraine	-0.2545434
108	Fiji	-0.2596758

109	Ecuador	-0.2613492
110	Chile	-0.2617678
111	Mozambique	-0.2698155
112	Egypt	-0.2739385
113	Jordan	-0.2782733
114	Cabo Verde	-0.2805252
115	Armenia	-0.2897893
116	Turkiye	-0.2996437
117	Jamaica	-0.2998401
118	Suriname	-0.3127374
119	India	-0.3143847
120	Tajikistan	-0.319213
121	Myanmar	-0.3229816
122	Iran	-0.3269665
123	Sudan	-0.3386789
124	Kyrgyzstan	-0.3525397
125	Serbia	-0.3560895
126	Lesotho	-0.40904
127	Ethiopia	-0.4108078
128	Mauritania	-0.4145442
129	Algeria	-0.4203112
130	Azerbaijan	-0.4378115
131	Qatar	-0.4599148
132	Mongolia	-0.4682806
133	Kuwait	-0.4953425
134	Russia	-0.5023787
135	Haiti	-0.5051296
136	Lebanon	-0.5333602
137	Uzbekistan	-0.5580967
138	Liberia	-0.57787
139	Saudi Arabia	-0.6158974
140	Oman	-0.6524624
141	Kazakhstan	-0.6628439
142	Trinidad and Tobago	-0.6944034
143	Turkmenistan	-0.8916247
144	Libya	-1.056957