

May 2024

# Indexing Internet Resilience in Central Asia



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# What We'll Discuss Today

## **Internet Resilience**

- What is it?
- Tools to measure it
- What is the situation in Central Asia

## **Internet Fragmentation**

- Threats
- What we can learn from other countries

## **Discussion**

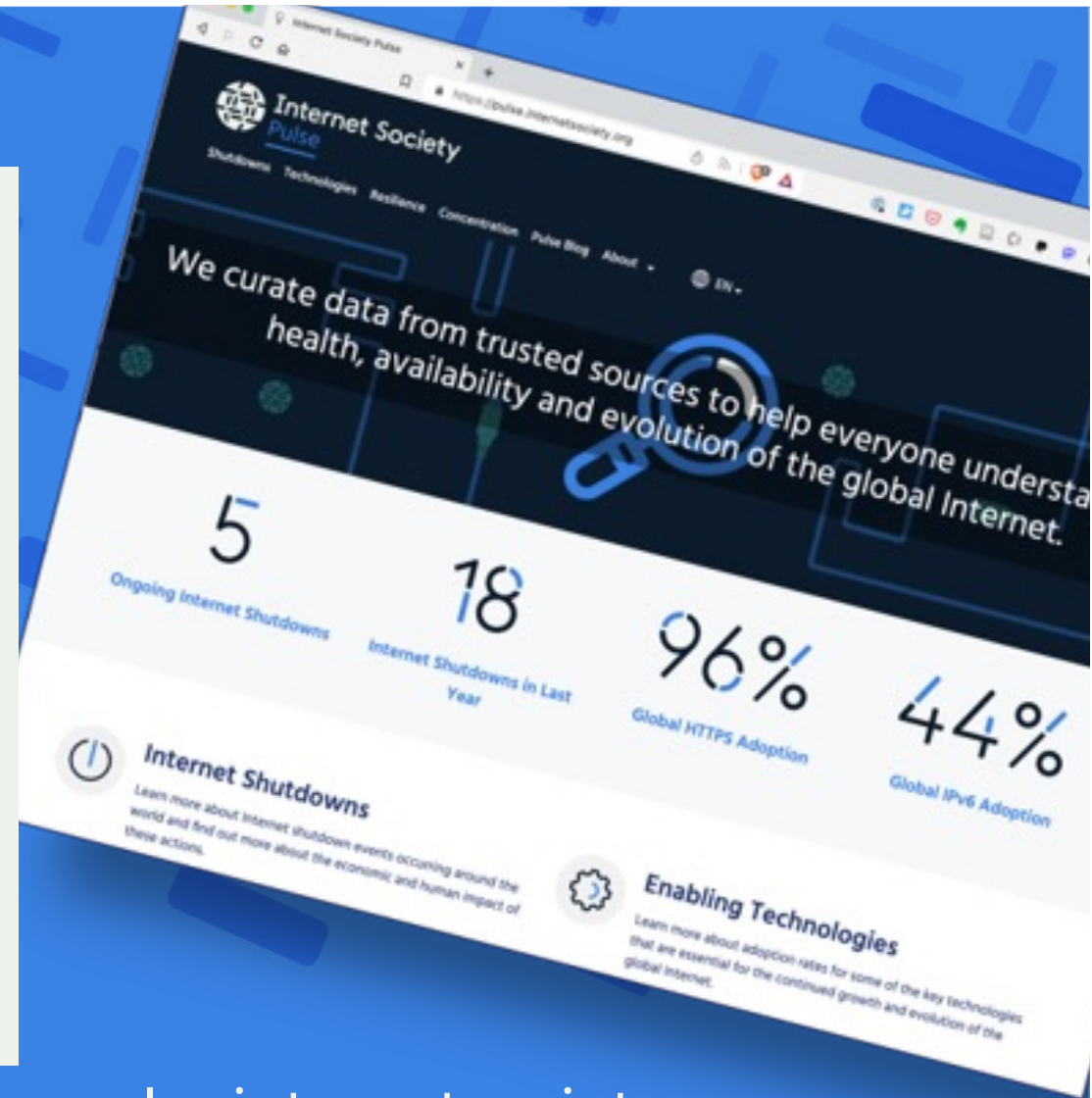
- What data are you collecting and sharing?
- What data can help you in your advocacy efforts?
- How can we collaborate to improve the health of the Internet in your countries?



- Launched December 2020.
- We curate Internet measurement data from trusted sources to help everyone gain deeper, data-driven insight into the Internet.

#### Trusted data from multiple sources:

- **Benefit:** Helps to assess whether efforts to ensure that the Internet remains open, globally connected, secure, and trustworthy are working.
- **Benefit:** Allows policymakers, researchers, journalists, network operators, civil society groups, and others to better understand the health, availability, and evolution of the Internet.



[pulse.internetsociety.org](https://pulse.internetsociety.org)



# Pulse Data Partners



- Data is provided by our trusted data partners



## Pulse tracks

**Shutdowns:** Where do Internet Shutdowns take place and what is the economic cost?

**Technologies:** What is the state of deployment of technologies critical for the evolution of the Internet?

**Concentration:** How much are services concentrated in the hands of a few?

**Resilience:** How robust is the Internet ecosystem?



## What I'll cover today

**Shutdowns:** Where do Internet Shutdowns take place and what is the economic cost?

**Technologies:** What is the state of deployment of technologies critical for the evolution of the Internet?

**Concentration:** How much are services concentrated in the hands of a few?

**Resilience:** How robust is the Internet ecosystem?

**Country Reports:** Consolidate and illustrate critical Internet health metrics



# What's impacting the health of the Internet?









## Resilience

A resilient Internet connection maintains an acceptable level of service despite faults and challenges to normal operation.



# The Internet Resiliency Index (IRI)

[pulse.internetsociety.org/resilience](https://pulse.internetsociety.org/resilience)

The framework collates around 30 sets of public metric data that relate to **four pillars** of a resilient Internet:

## Infrastructure

The existence and availability of physical infrastructure that provides Internet connectivity.

## Performance

The ability of the network to provide end-users with seamless and reliable access to Internet services.

## Security

The ability of the network to resist intentional or unintentional disruptions through the adoption of security technologies and best practices.

## Market Readiness

The ability of the market to self-regulate and provide affordable prices to end-users by maintaining a diverse and competitive market.



**Methodology** <https://pulse.internetsociety.org/wp-content/uploads/2023/07/Internet-Society-Pulse-IRI-Methodology-July-2023-v2.0-Final-EN.pdf>

## Types of indicators

- **Relevance:** The indicator should work towards showing an increase or decline in the resilience of the Internet in a selected country.
- **Accuracy:** The indicator should correctly estimate or describe the quantities or characteristics they are designed to measure.
- **Coverage:** The data should cover as many countries as possible, as the Index is intended to be a global index. An indicator is not included if there is missing data on more than 25% of countries in the Index.
- **Freshness:** Any dataset should be at most two years old. Some datasets such as performance or network coverage should be recent. Some other datasets such as number of exits points do not change considerably over years, so it is acceptable to use a dataset which is a year or two old.
- **Continuity:** To objectively compare the index over the years, it is important to work with a stable list of indicators, which will provide data consistently over time.



## Types of indicators

1. **Direct indicator:** A direct indicator is a direct measure of an aspect of resilience e.g., percentage of HTTPS adoption, latency, bandwidth, etc. They have a specific unit of measurement, and the raw value can be on different scales depending on what is being measured.
2. **Composite indicator:** A composite indicator provides a score, which itself has been derived from multiple other variables. Examples are the MANRS score, EGDI index, Market Concentration, etc. The scale of a composite indicator is usually between 0 and 100.
3. **Proxy indicator:** A proxy is used where it is difficult to find a specific metric to measure an aspect of resilience. Proxies can be either direct or composite indicators. For example, the IRI uses “Number of IXPs” and “Number of data centers”, together to quantify the robustness of the local infrastructure.

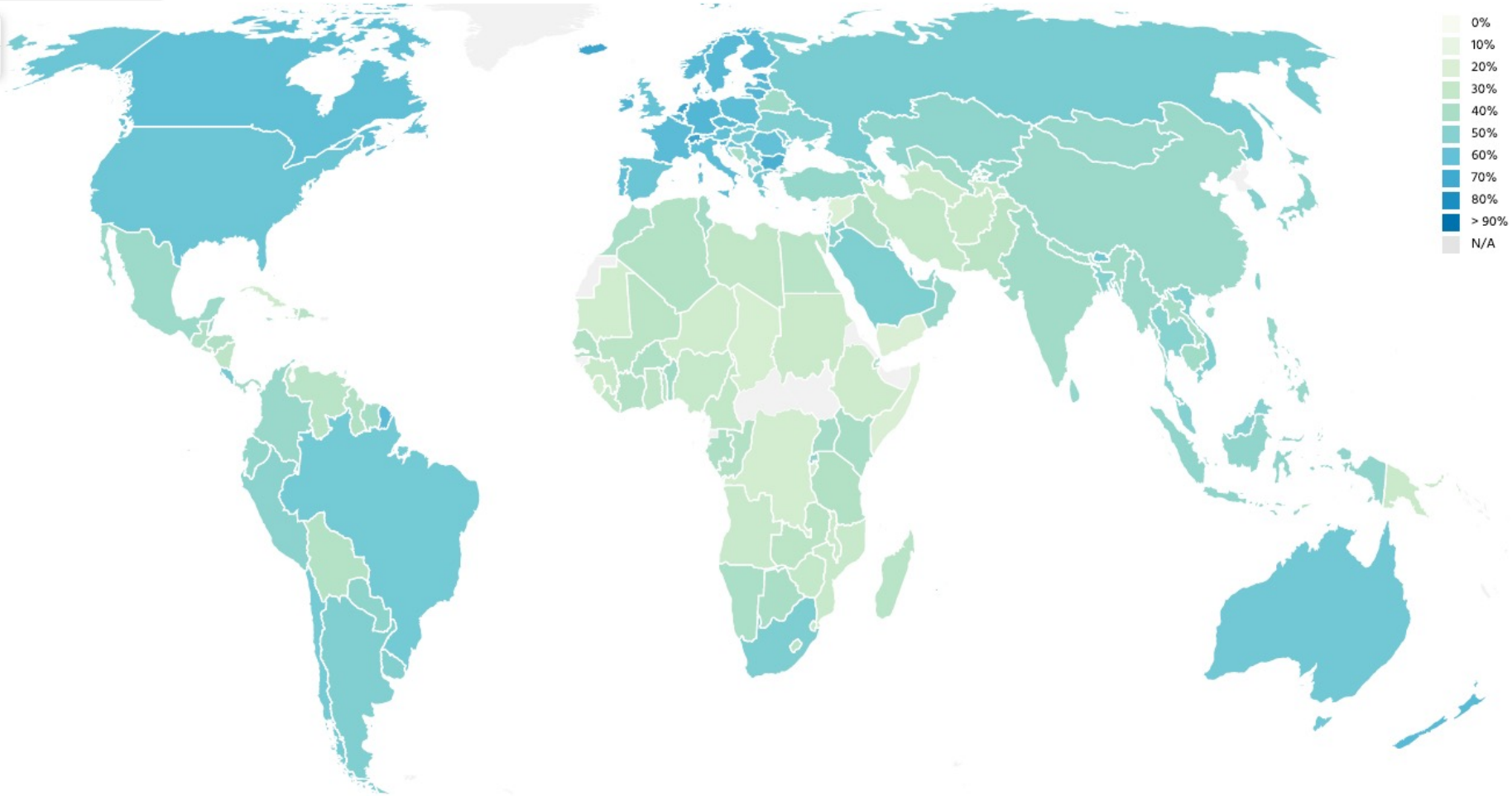




# Internet Resilience — Globally

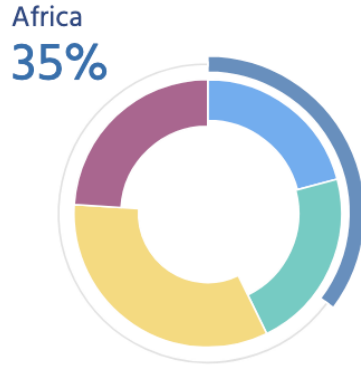
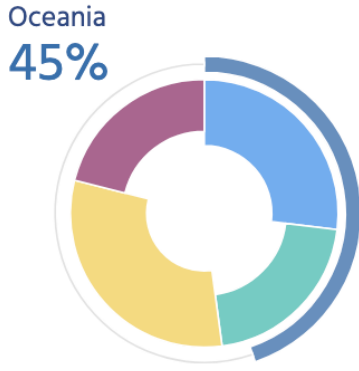
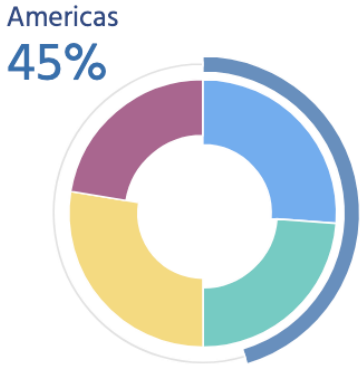
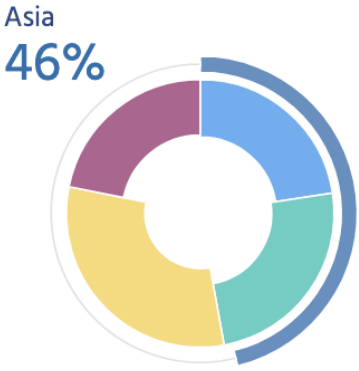
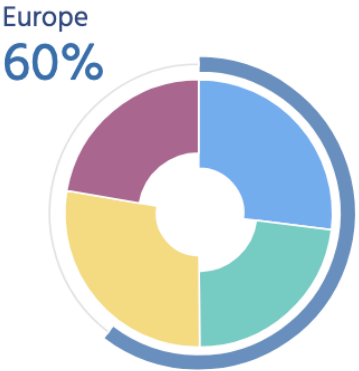
[pulse.internetsociety.org/resilience](https://pulse.internetsociety.org/resilience)

● Overall Resilience ● Infrastructure ● Performance ● Security ● Market Readiness



# Overall Internet Resilience — By Region

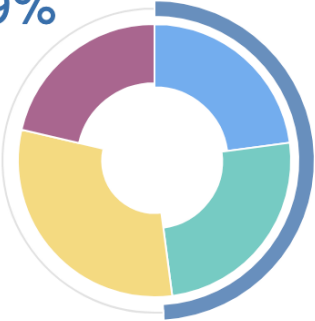
● Overall Resilience ● Infrastructure ● Performance ● Security ● Market Readiness



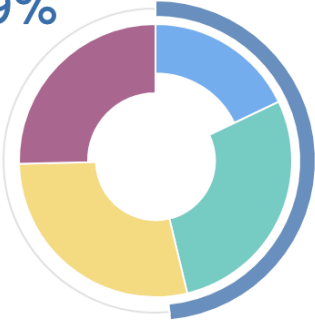
# Overall Internet Resilience — Asia

● Overall Resilience ● Infrastructure ● Performance ● Security ● Market Readiness

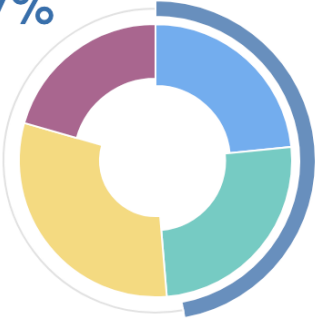
South-Eastern Asia  
49%



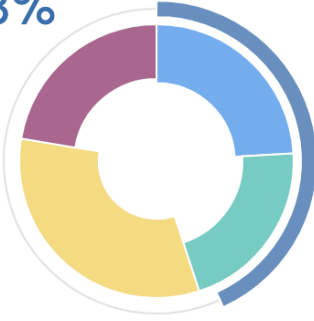
Eastern Asia  
49%



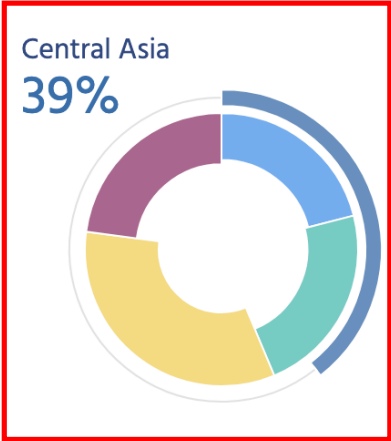
Western Asia  
47%



Southern Asia  
43%



Central Asia  
39%





# Overall Internet Resilience — Central Asia

● Overall Resilience ● Infrastructure ● Performance ● Security ● Market Readiness

Kazakhstan  
49%



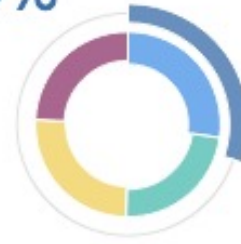
Kyrgyzstan  
46%



Uzbekistan  
43%



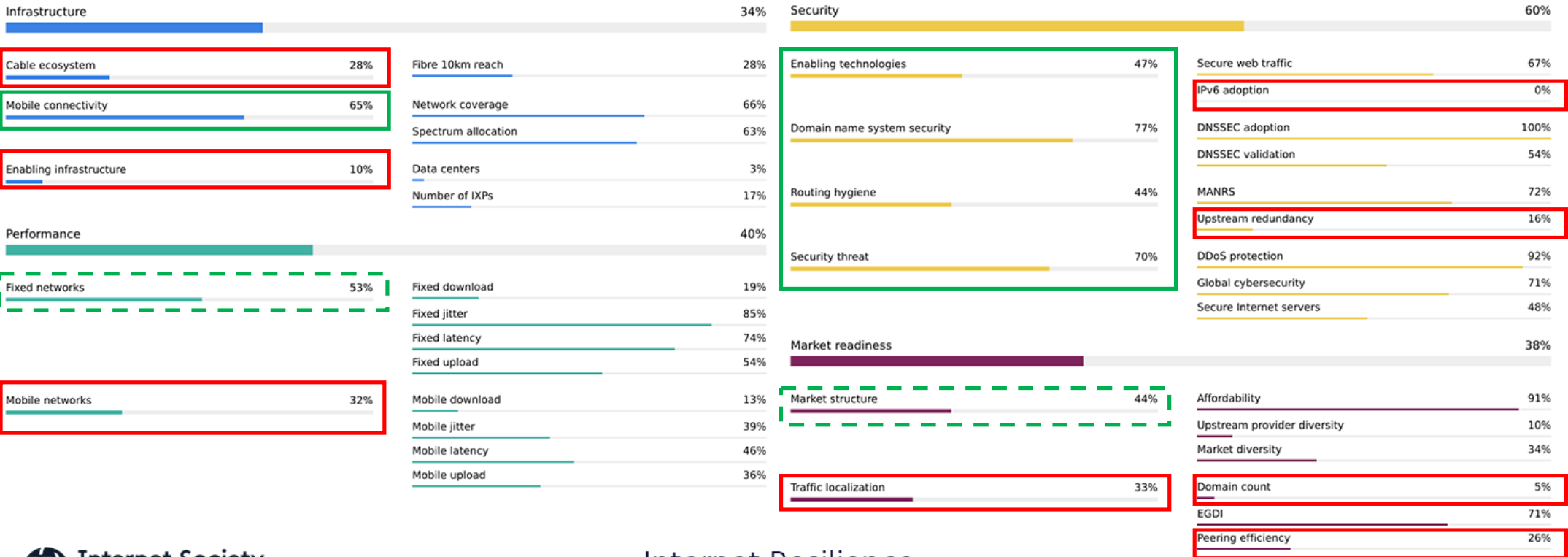
Tajikistan  
30%



Turkmenistan  
29%



# Uzbekistan – Internet Resilience Index

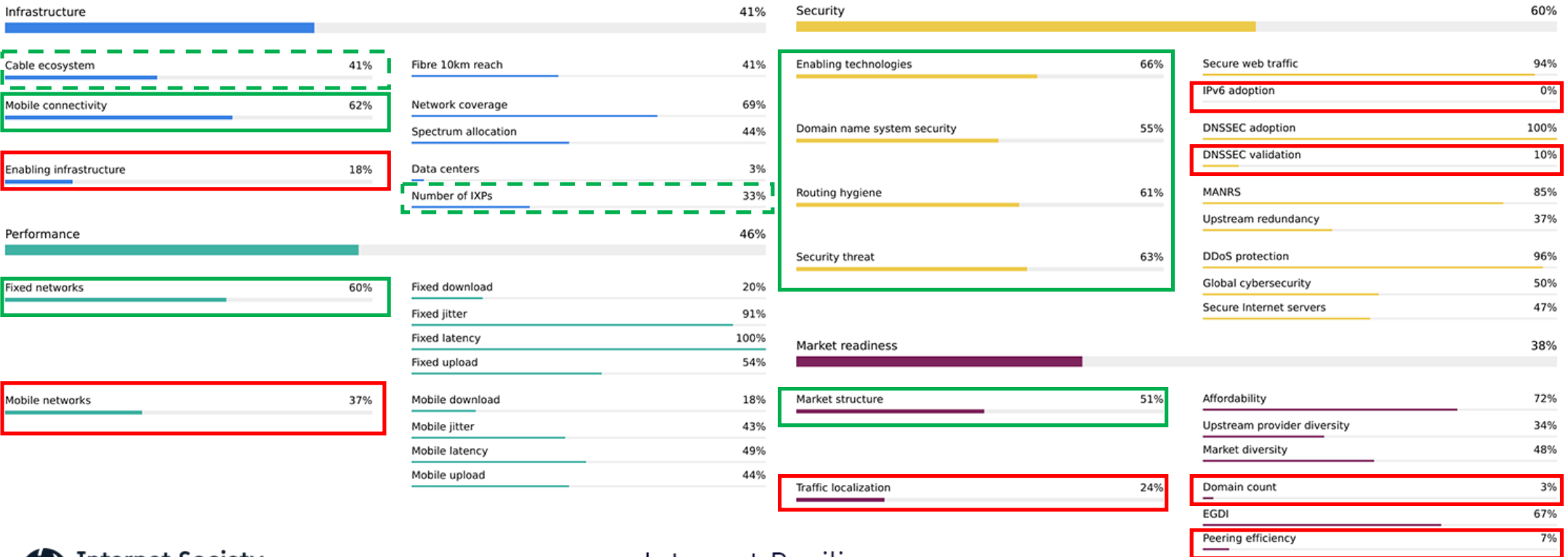


Internet Resilience  
pulse.internetsociety.org

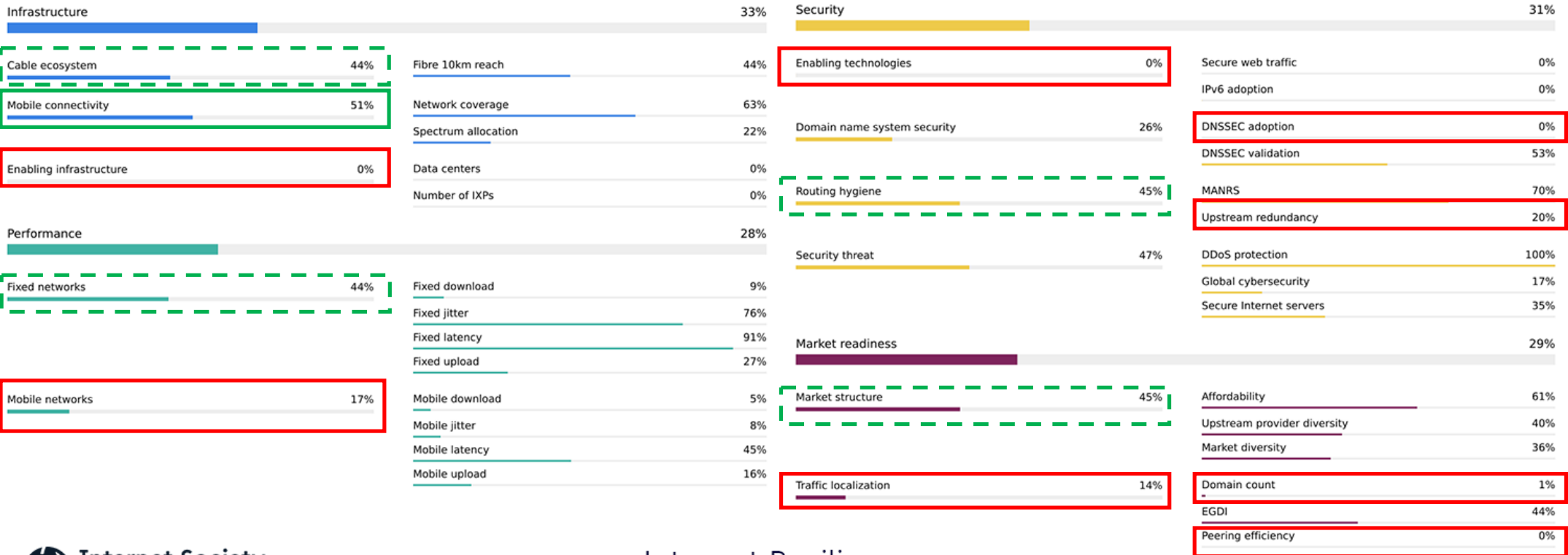
data source: Pulse Internet Resilience Index

# Kyrgyzstan – Internet Resilience Index

 Kyrgyzstan



# Tajikistan – Internet Resilience Index

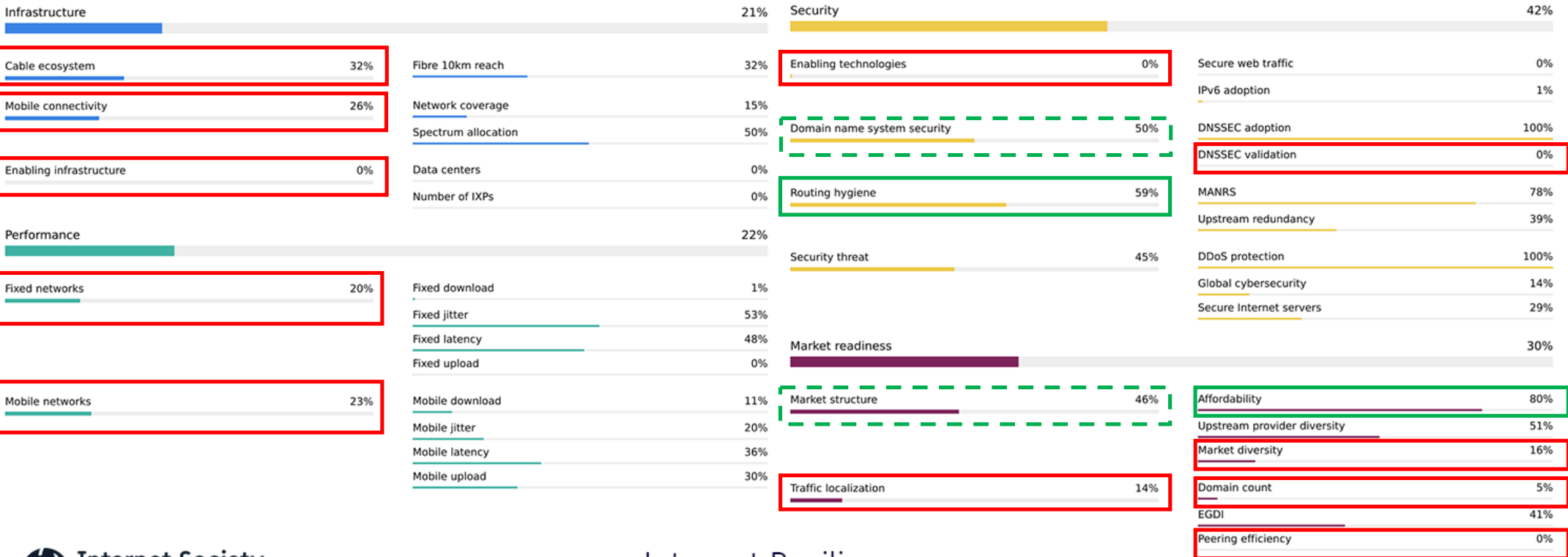


Internet Resilience  
pulse.internetsociety.org

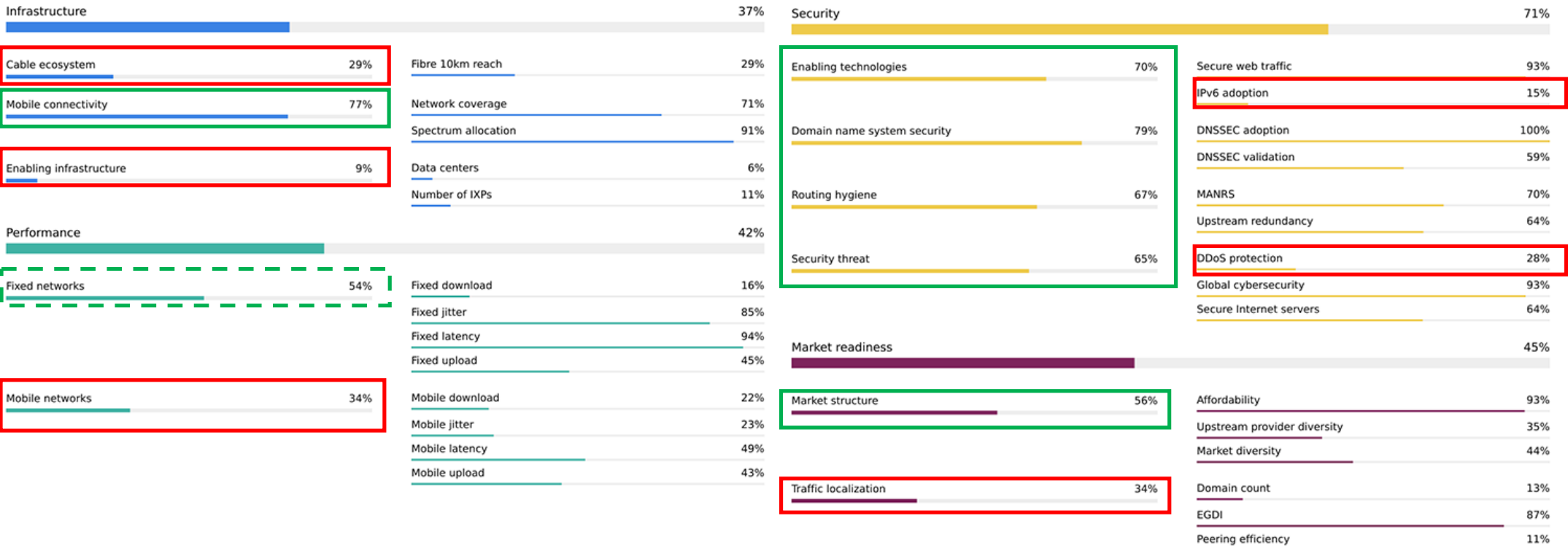
data source: Pulse Internet Resilience Index

# Turkmenistan – Internet Resilience Index

Turkmenistan



# Kazakhstan – Internet Resilience Index



Internet Resilience  
pulse.internetsociety.org

data source: Pulse Internet Resilience Index

# Comparison of Overall/Pillar scores



# Open Internet Environment, Kazakhstan

An open Internet is an accessible Internet – it is easy to connect to the open Internet and use its services.

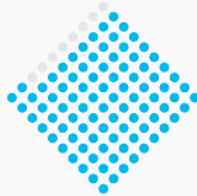
## Internet Use

Individuals using the Internet as a percentage of the total population

92%

Regional Rank: 12

71% Asia avg.



## Internet Resilience Score

A resilient Internet connection is one that maintains an acceptable level of service in the face of faults and challenges to normal operation

49%

Regional Rank: 20

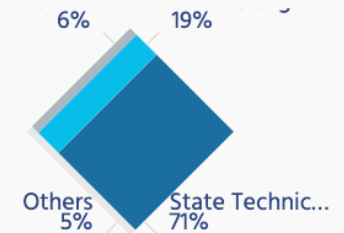
46% Asia avg.



[See details](#)

## IXP Operator Market

A measure of the diversity and concentration of the local market for Internet Exchange Point operations



## Retail ISP Diversity

Diversity of retail Internet providers improves resilience and user choice

Very Good



## Transit Provider Diversity

More diversity in routes to the global Internet improves connection resilience

Fair



## Internet Freedom

Freedom on the Net measures Internet freedom in 70 countries

Not Free



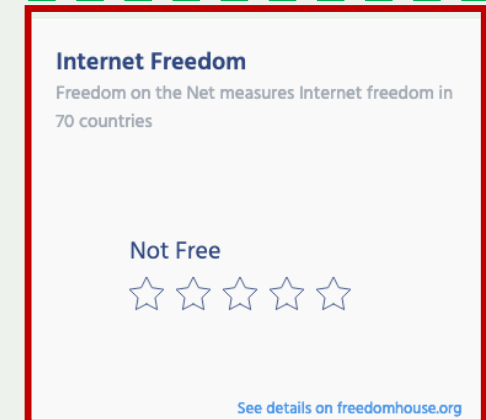
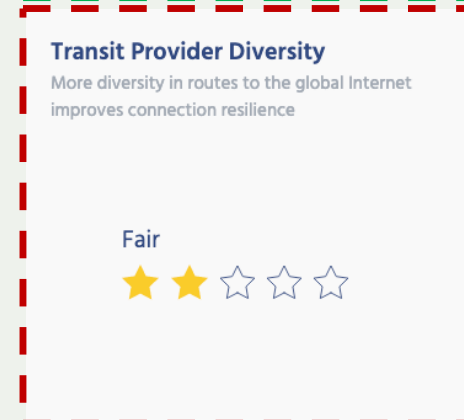
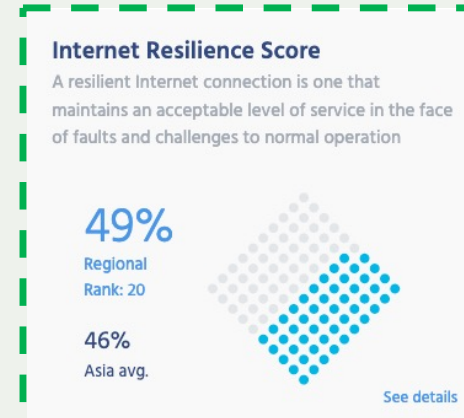
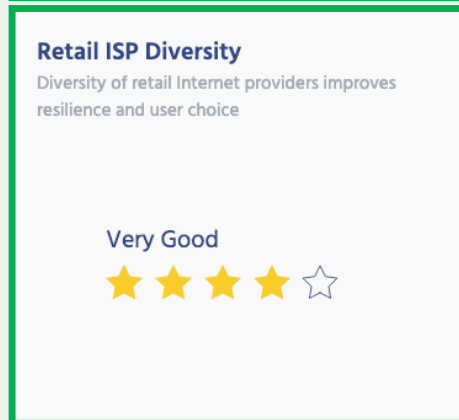
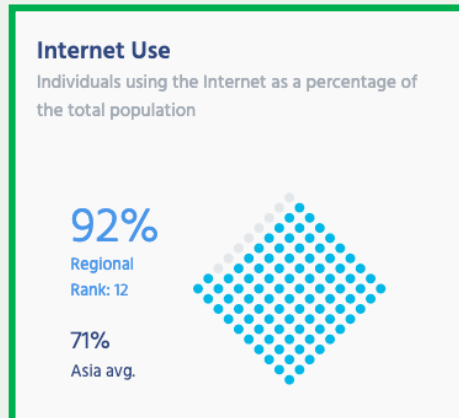
[See details on freedomhouse.org](https://freedomhouse.org)



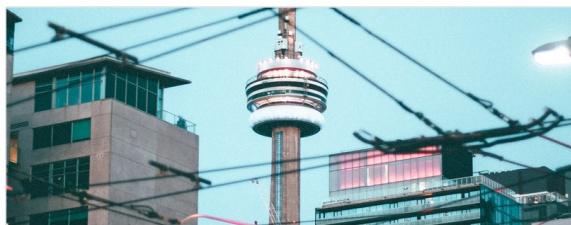


# Open Internet Environment, Kazakhstan

An open Internet is an accessible Internet – it is easy to connect to the open Internet and use its services.



# Not if, but when



9 September 2022

## Rogers Outage: What do we Know After Two Months?



**Jim Cowie**  
Former Resident  
Advisor, Internet  
Society

Categories:  
Concentration,  
Resilience

Hiding operational failures in darkness helps nobody.



15 November 2023

## Optus Outage Exposes Australia's Internet Resilience



**Aftab Siddiqui**  
Senior Manager, Internet  
Technology - Asia-Pacific,  
Internet Society

Categories:  
Resilience

A minor technical slip-up by Australia's second-largest operator causes one-third of Australians to lose Internet and mobile connectivity.



Who's next?



Canada, July 2022

Australia, November 2023

# Globally Connected Infrastructure

## Networks Assigned

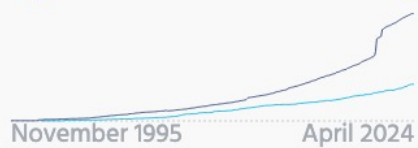
A measure of how many Internet networks are active here

203

Regional Rank: 18

598

Asia avg.



## Addresses Assigned IPv6

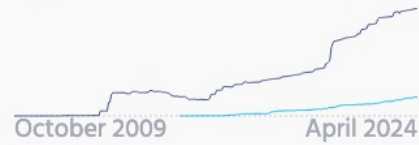
A measure of how many Internet addresses are assigned here

26.4M

Regional Rank: 18

153.3M

Asia avg.



## IPv6 Adoption

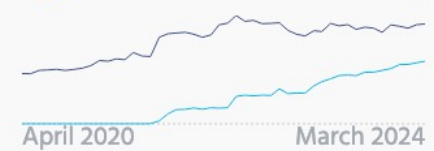
Enabling the Internet to support more users and more uses

13%

Regional Rank: 26

19%

Asia avg.



## Internet Exchange Points

IXPs help strengthen local Internet connectivity, develop local Internet industry, improve competitiveness, and serve as a hub for technical activity

4

Regional Rank: 15

7

Asia avg.



## Addresses Assigned IPv4

A measure of how many legacy addresses are assigned here

3.3M

Regional Rank: 18

17.6M

Asia avg.



## Peering Networks

Peering networks help to keep Internet traffic local, provide faster connections, and improve the experience of the people relying on them

23

Regional Rank: 22

122

Asia avg.



# Globally Connected Infrastructure

## Networks Assigned

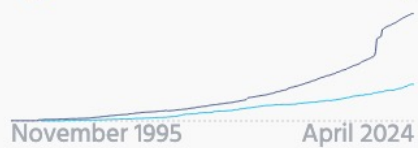
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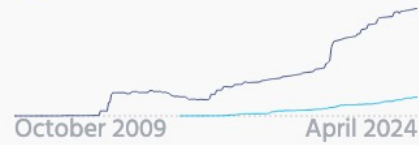
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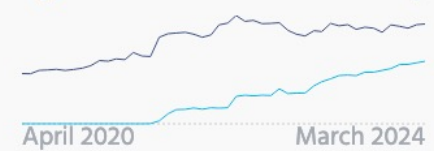
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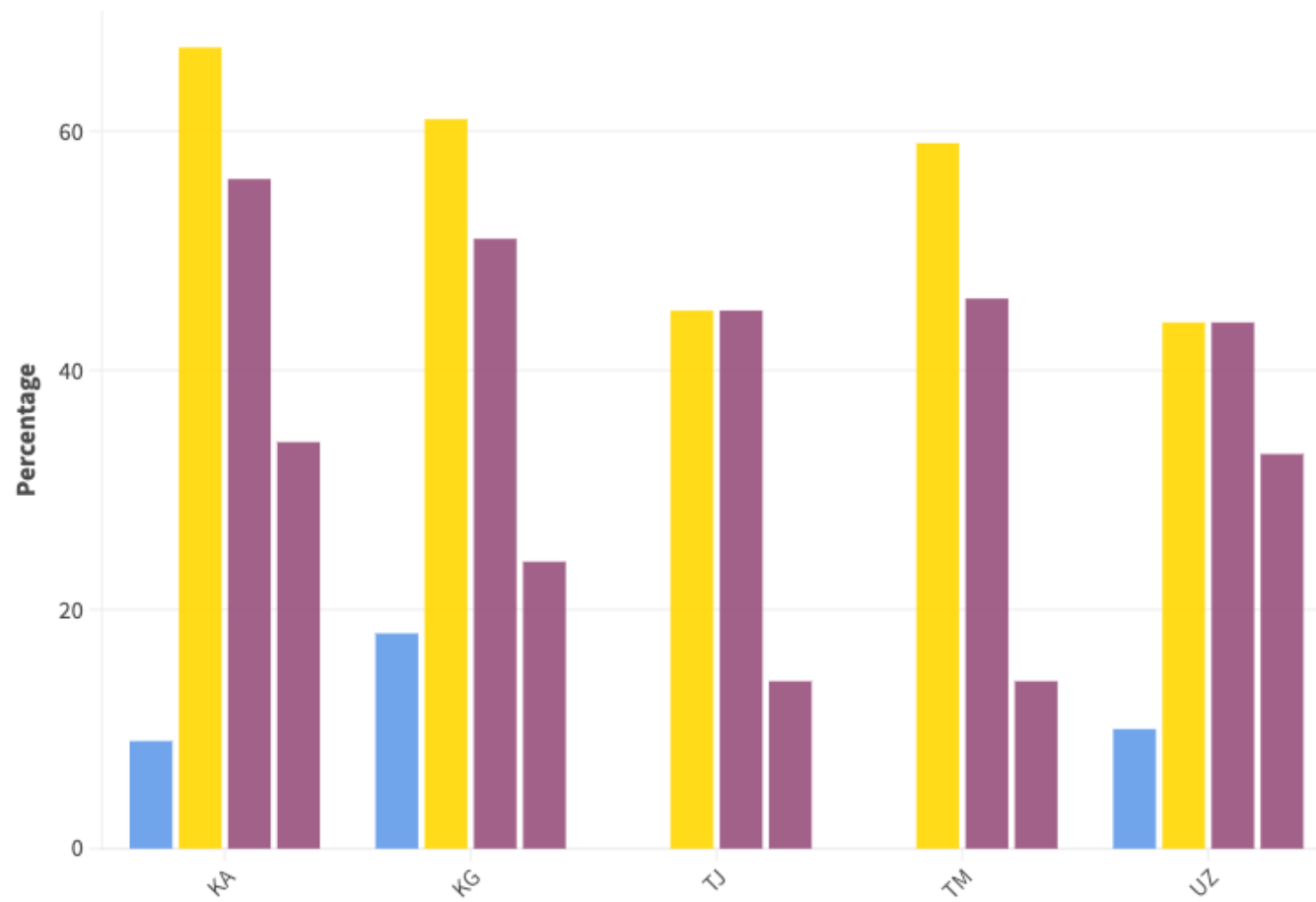
Asia avg.



<https://pulse.internetsociety.org/reports/kz>

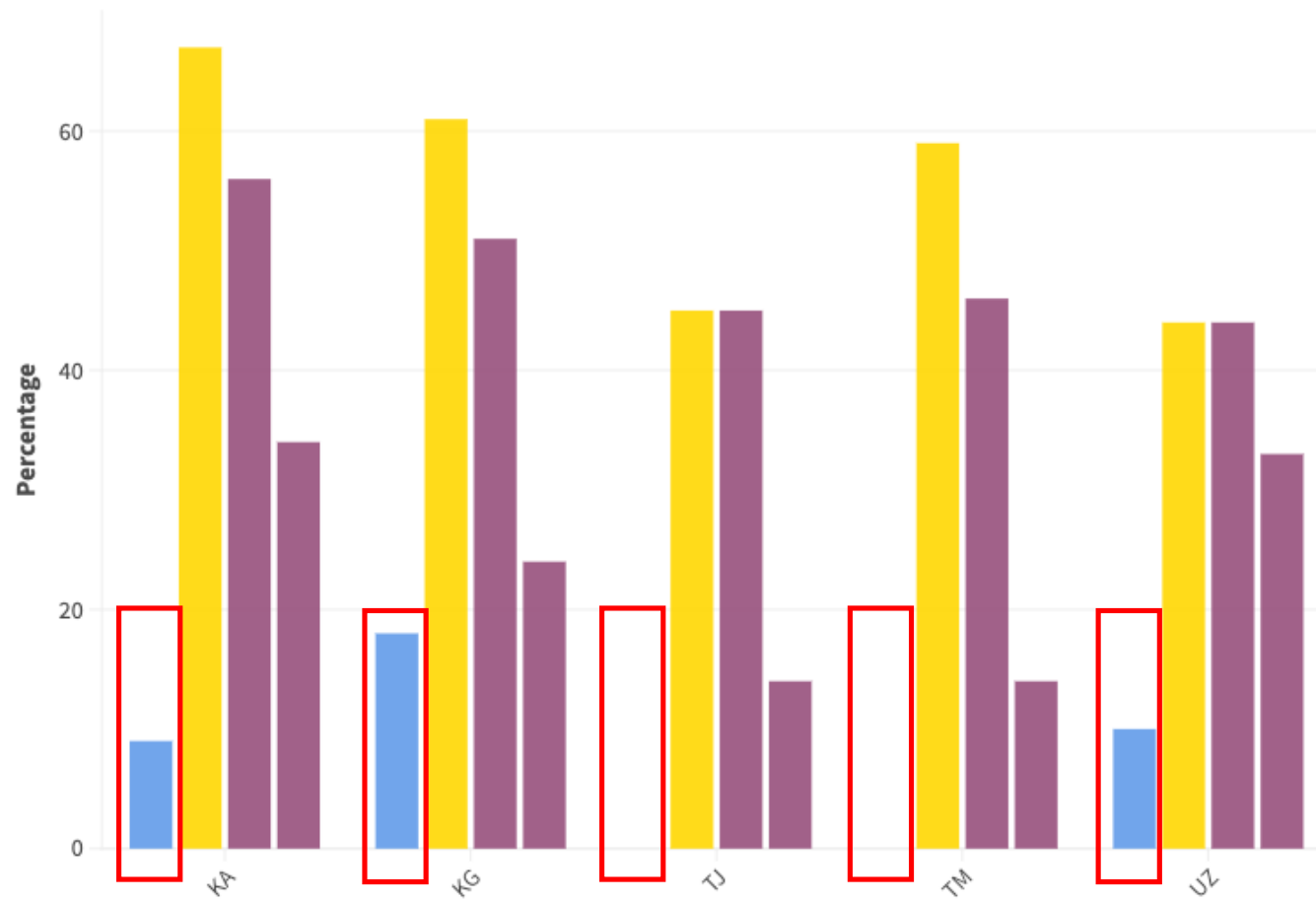
# Traffic localization

■ Enabling infrastructure ■ Routing hygiene ■ Market structure ■ Traffic localization



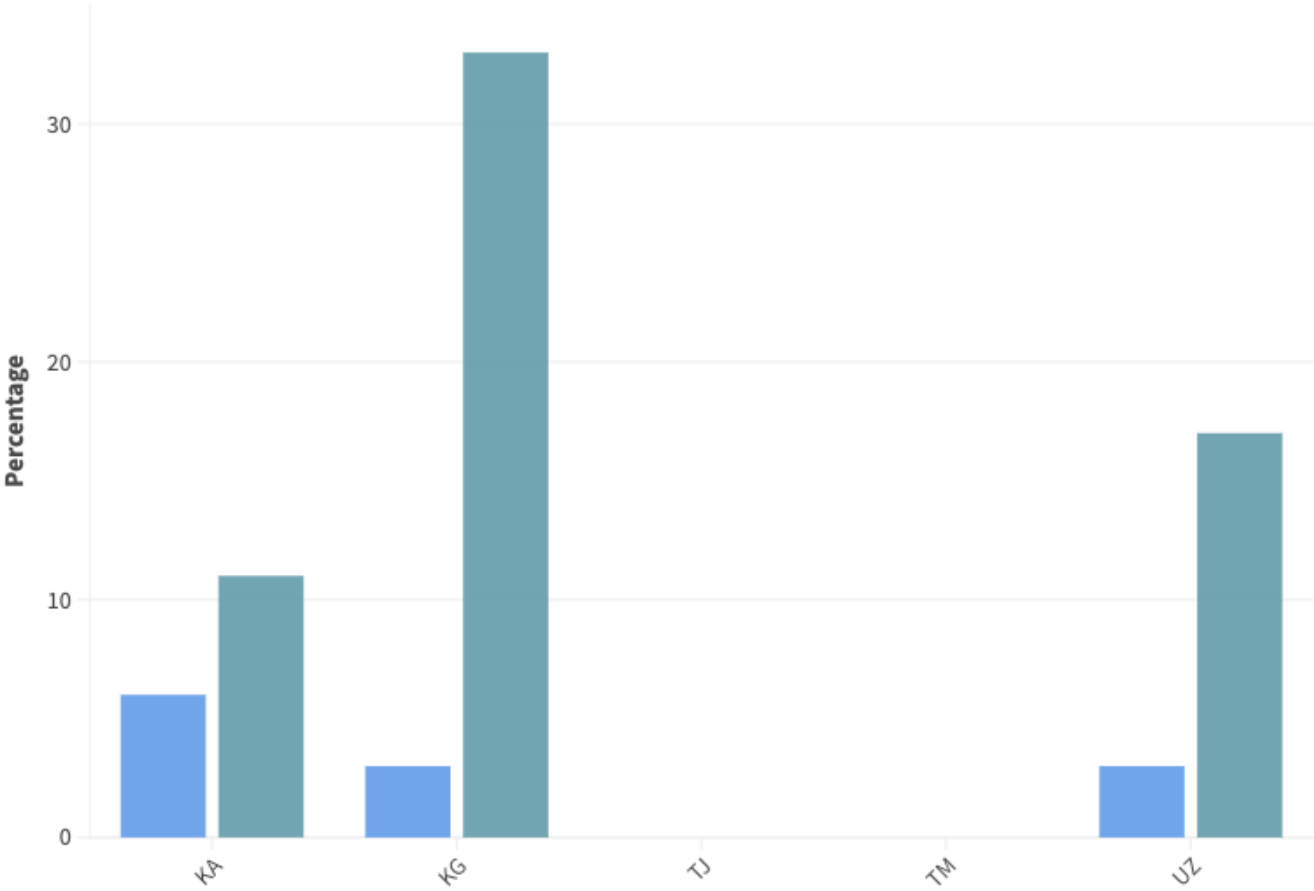
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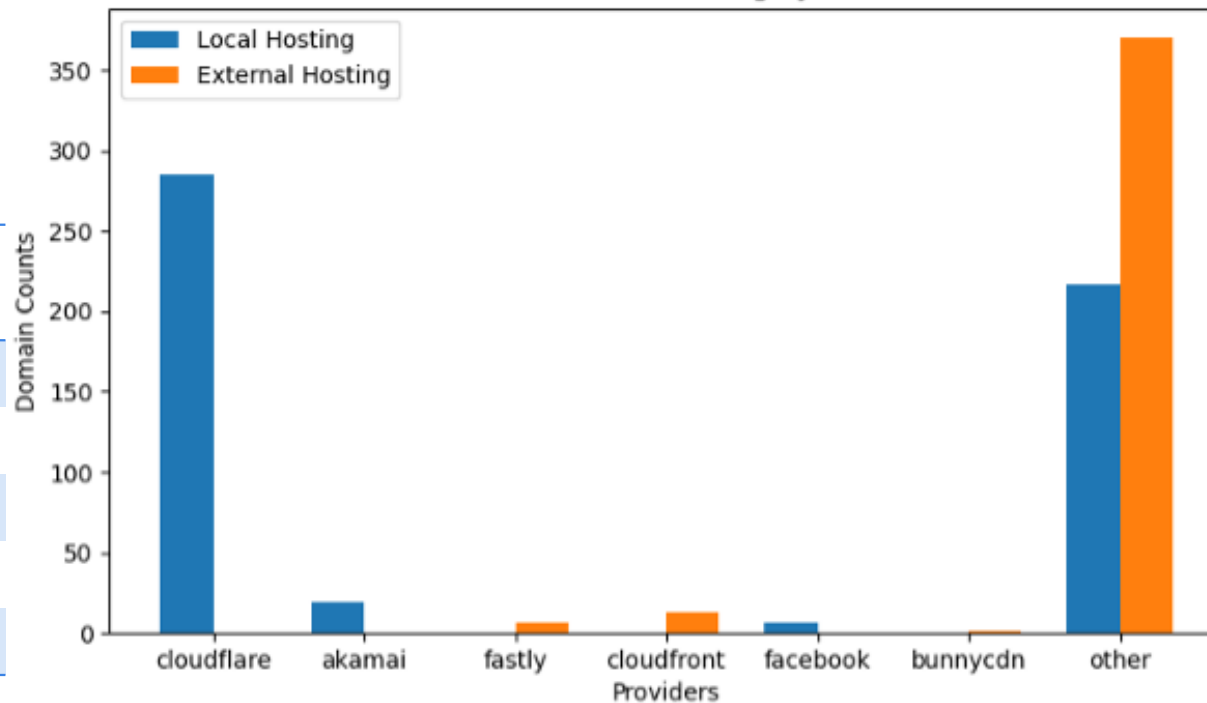
# Enabling Technologies

■ Data centers ■ Number of IXPs



# Local vs External Content

Kazakhstan  
Local and External Hosting by Provider



% of top 1,000 domains hosted locally

KZ	>50%
KG	<20%
TJ	<10%
TM	<10%
UZ	<25%



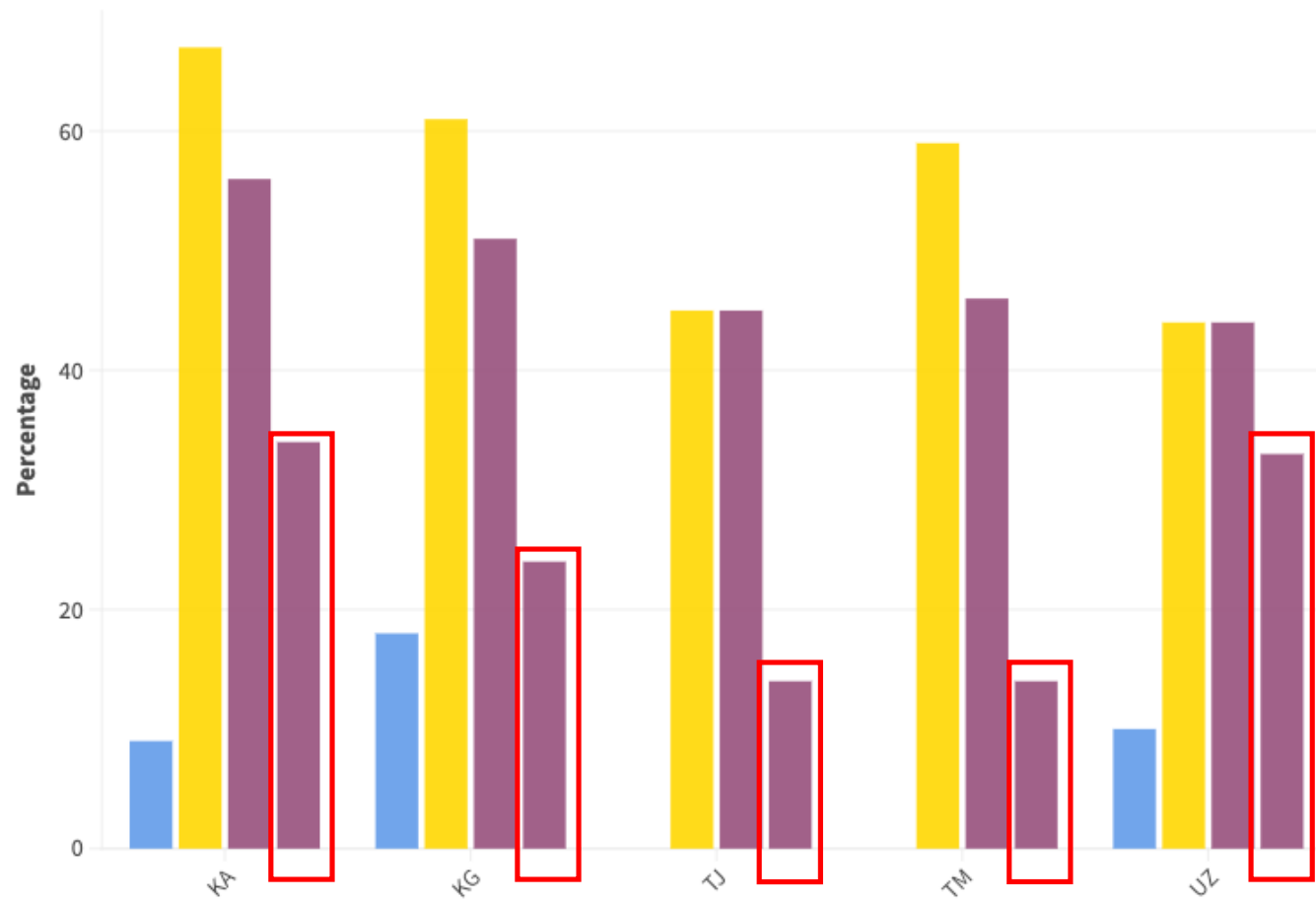
Read report: <https://pulse.internetsociety.org/blog/reviewing-internet-resilience-and-efficiency-in-central-asia>





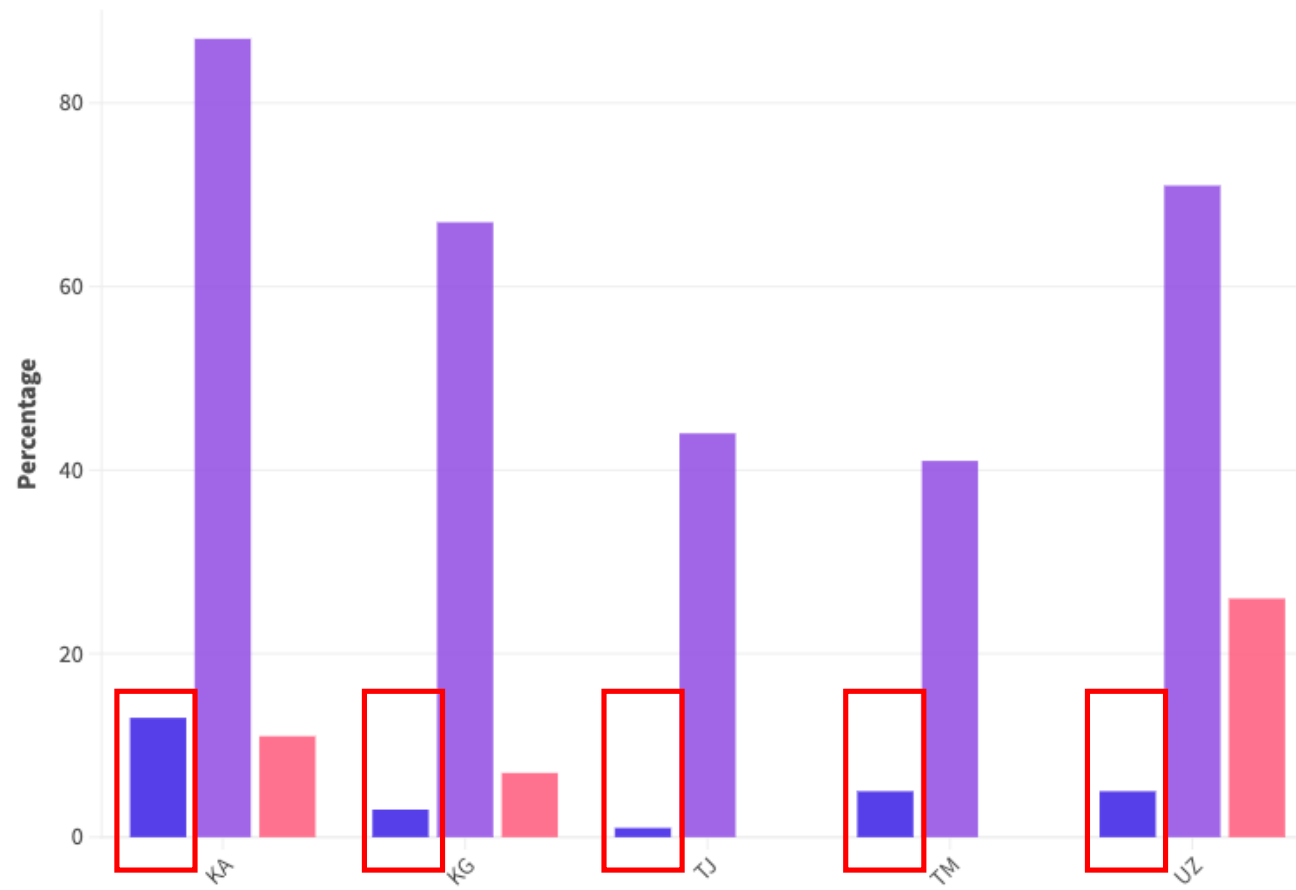
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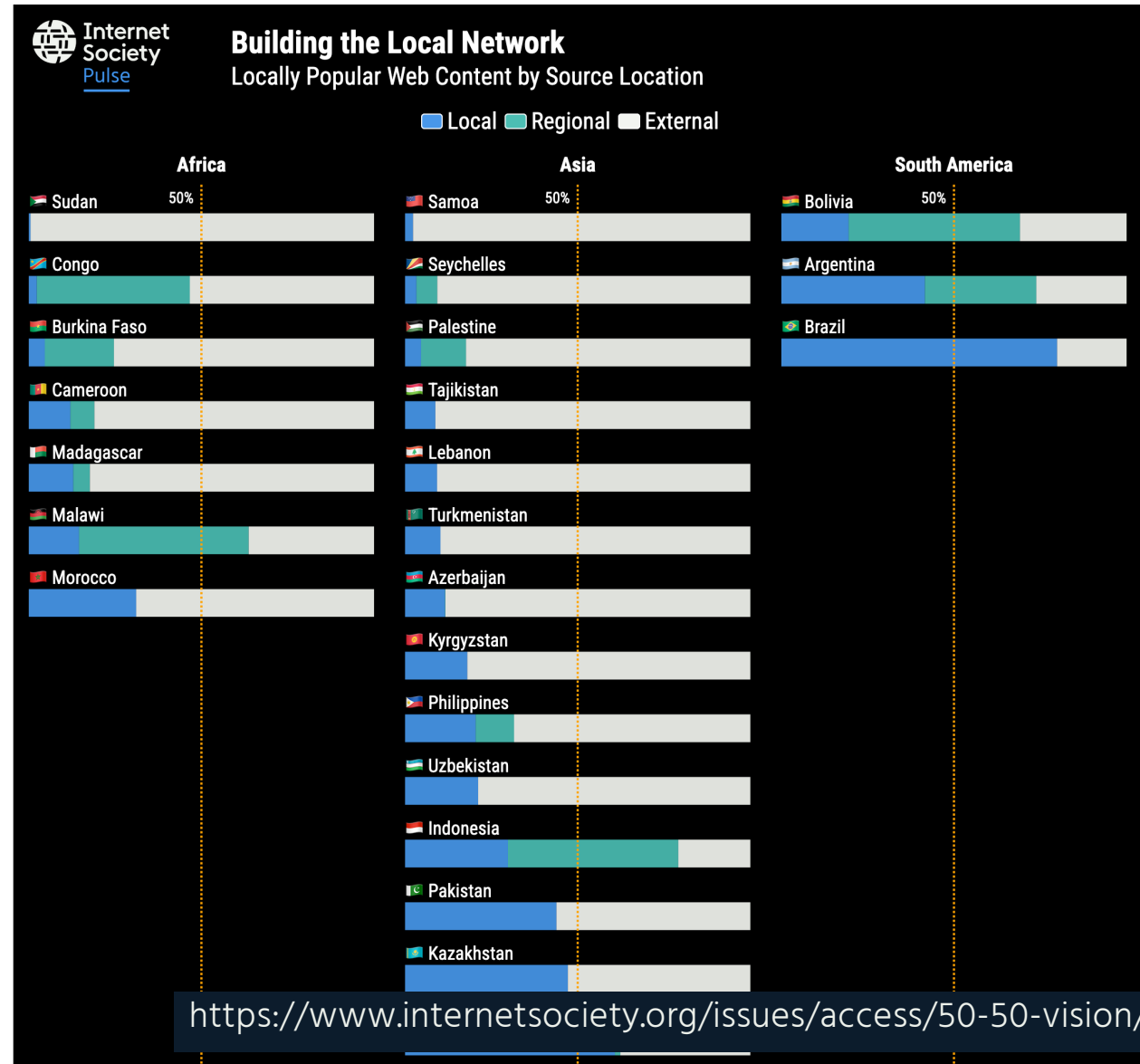
# Traffic localization – domain count

■ Domain count ■ E-Government Development Index ■ Peering efficiency



## 50/50 Vision

1. Top 1000 websites (Google CrUX)
2. Categorize websites CDN or "Native"
3. IP geolocation local, regional or external



# Secure and Trustworthy Internet

## Routing Security Coverage IPv4

One measure of how much local Internet network providers are securing their infrastructure

13%

Regional Rank: 49

73%

Asia avg.



## Routing Security Coverage IPv6

One measure of how much local Internet network providers are securing their infrastructure

63%

Regional Rank: 37

73%

Asia avg.



## Routing Security Adoption

A measure of how much local Internet providers are checking validity of connectivity information they receive from other networks

2%

Regional Rank: 31

15%

Asia avg.



## Naming Security Status

Adopting DNSSEC improves trustworthiness of Internet communications

.kz



Active

## Naming Security Coverage

A measure of how much local web content supports DNSSEC for improved trustworthiness

0%

Regional Rank: 14

1%

Asia avg.



## Naming Security Adoption

A measure of how much local Internet users are protected by DNSSEC

32%

Regional Rank: 24

36%

Asia avg.



# Secure and Trustworthy Internet

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Asia avg.



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36%  
Asia avg.



# Limitations



## Limitations

- The data is pulled from external public sources, not always up-to-date.
  - An indicator is not included if data is missing on more than 25% of countries in the Index.
  - Regional shutdown and outage data difficult to source/validate
- Without in-country measurements, it's difficult to validate the data.
  - RIPE Atlas and OONI are doing great work in this area, but more is needed.
- Some of the data undergoes processing, normalization, and weighing, we use a methodology that is reproducible.
  - You can see raw numbers via API. Email us for access [pulse@isoc.org](mailto:pulse@isoc.org)
- Ultimately, the Index benchmarks countries with one another and helps decision makers recognize gaps and weaknesses to conduct further study into validating these and work towards addressing them.



We all have a role to play





## Advocating for a healthy Internet

- What data are you collecting and sharing?
- What data can help you in your research/advocacy/decision making efforts?
- How can we collaborate to improve the health of the Internet in your countries and as a region?



## Subscribe, Review, Contribute

Subscribe to the Pulse  
newsletter



Contribute to Pulse  
[pulse@isoc.org](mailto:pulse@isoc.org)

Review the Pulse IRI  
methodology



# Thank you



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phokeer@isoc.org