

Energeetika trilemma

Teaduste Akadeemia energeetikakonverents

30.05.2022

1. Mis on energiectika trilemma?;
2. Globaalse trilemma metoodikast ja raportist;
3. Trilemma süvauuringu projektist;

1. Energeetika trilemma mõõdikud

VARUSTUSKINDLUS

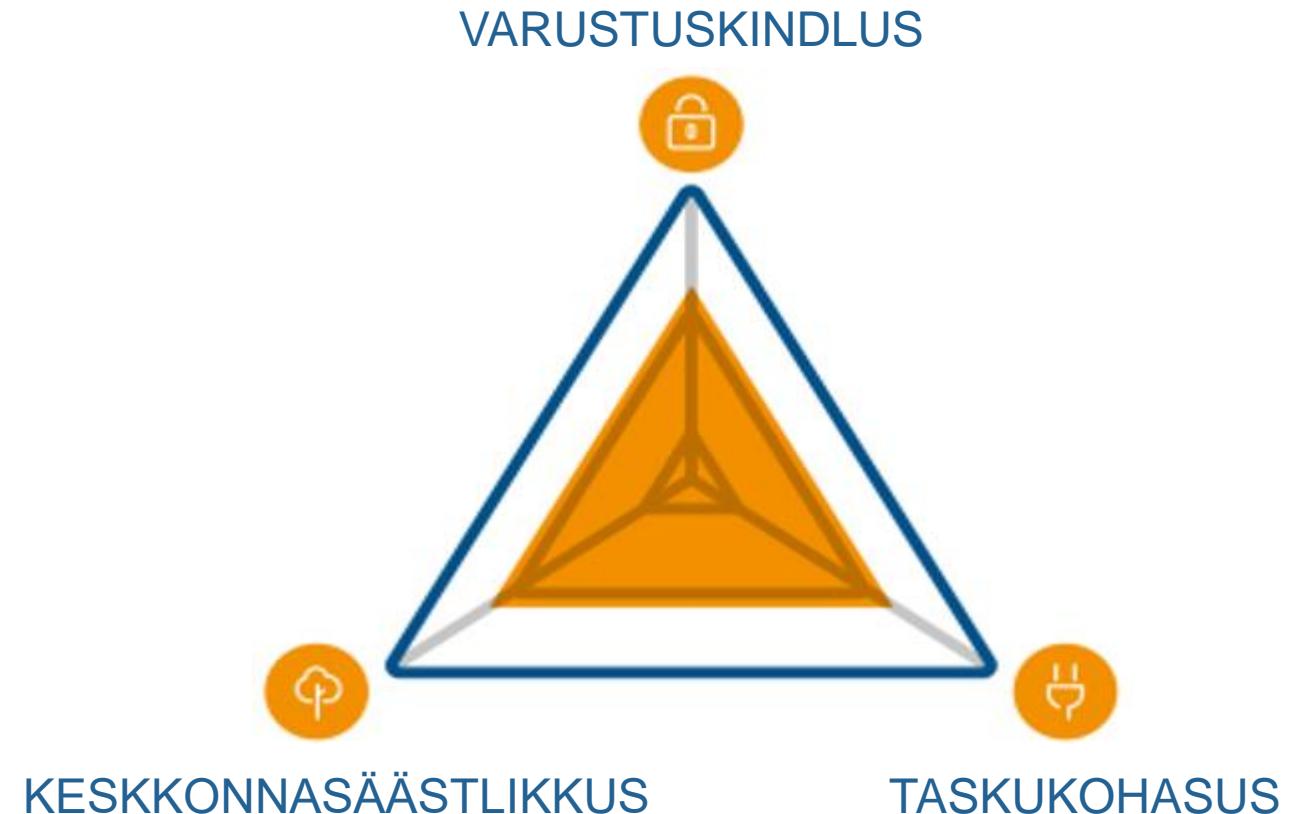
Näitab riigi võimekust tagada katkematu energiavarustus praegu ja tulevikus, ning saada hakkama süsteemi häiringutega minimaalse mõjuga energiatarnetele

TASKUKOHASUS

Hindab riigi võimekust pakkuda kõigile kodu- ja äritarbijatele piiramatu ligipääsu mõistlikult ja õiglaselt hinnastatud energiale

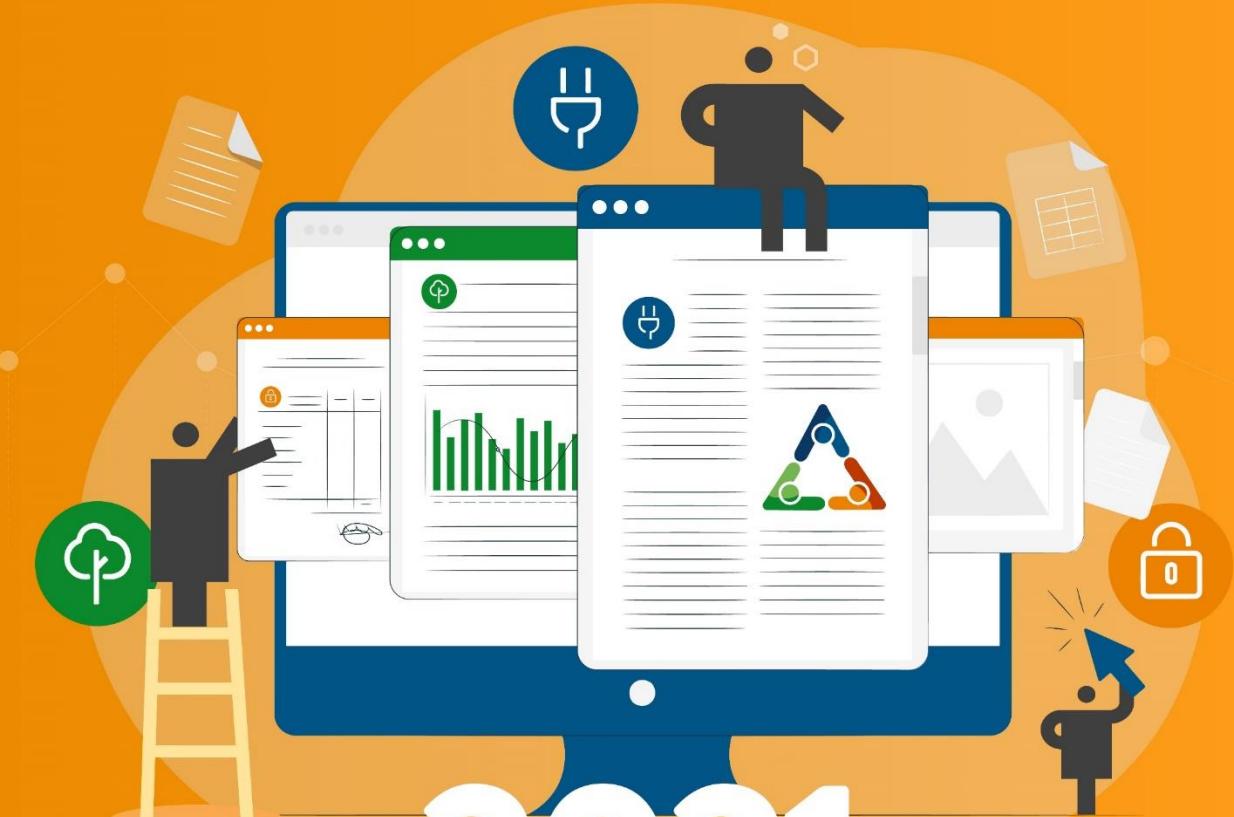
KESKKONNASÄÄSTLIKUS

Väljendab riigi energiasüsteemi suutlikkust leevendada ja vältida keskkonna ning kliimamuutusi tekitavaid mõjusid



World Energy Trilemma Index

In partnership with Oliver Wyman



2021

2. Globaalse raporti metoodikast

A. Varustuskindlus

- **A1. Security of supply and energy demand** refers to the ability of a country to meet current and future energy demand. It involves a country's capacity to access the necessary energy resources and its ability to deliver the energy required by its population and economy.
 - **A1a. Diversity of primary energy supply**
 - **A1b. Import dependence**
- **A2. Resilience of energy systems** measures the resilience of infrastructure in terms of its robustness and ability to recover operations and minimise interruptions to service. Resilience also implies the ability to withstand extraordinary events and disturbances to supply, which implies a diversity of plentiful resources and sources.
 - **A2a. Diversity of electricity generation**
 - **A2b. Energy storage**
 - **A2c. System stability and recovery capacity**

ENERGY SECURITY		A1 SECURITY OF SUPPLY AND DEMAND		A2 RESILIENCE OF ENERGY SYSTEMS		COUNTRY CONTEXT	
A1a	6%	A2a	6%	A2c	6%	D1a	
Diversity of primary energy supply		Diversity of electricity generation				D1 MACROECONOMIC ENVIRONMENT	
A1b	6%	A2b	6%			D1a	Macroeconomic stability
Import independence		Energy storage		System stability and recovery capacity		D2a	Effectiveness of government
B1 ENERGY ACCESS	B2 QUALITY ENERGY ACCESS		B3 ENERGY AFFORDABILITY			D2b	
B1a	6%	B2a	6%	B3a	3%	D2a	Political stability
Access to electricity				Electricity prices	Natural gas prices	D2c	Rule of law
B1b	6%			B3b	3%	D2b	Regulatory quality
				B3d	3%	D2c	Foreign direct investment net inflows
Access to clean cooking		Access to "modern" energy		Gasoline and diesel prices	Affordability of electricity for residents	D2d	
C1 RESOURCE PRODUCTIVITY	C2 DECARBONISATION		C3 EMISSIONS AND POLLUTION			D2d	
C1a	5%	C2b	5%	C3a	2%	D2e	
Final energy intensity		Trend of GHG emissions from energy		CO ₂ intensity		D2e	Efficiency of legal framework in challenging regulation
				C3b	2%	D3a	Intellectual property protection
				CO ₂ per capita		D3a	Innovation capacity
				C3c	1%	D3b	
				CH ₄ emissions from energy per ktoe		D3b	
C1b	5%	C2a	5%	C3d	5%	D3c	
Efficiency of power generation and T&D		Low carbon electricity generation		PM _{2.5} mean annual exposure		D3c	
						D3d	
						D3d	
						D3e	
						D3e	
						D3f	
						D3f	

2. Globaalse raporti metoodikast

B. Taskukohasus ja kättesaadavus

- **B1. Energy access** captures a country's ability to provide access to modern energy services in terms of access to electricity and clean cooking facilities as defined by the UN Sustainable Development Goal 7: Sustainable Energy for All.
 - **B1a. Access to electricity**
 - **B1b. Access to clean cooking**
- **B2. Quality energy access** reflects the availability of prosperity-enabling levels of energy to population, an abundance of supply which can enable prosperous modern livelihoods.
 - **B2a. Access to “modern” energy**
- **B3. Affordability** quantifies the affordability and cost competitiveness of energy and energy services for domestic and industrial uses in terms of unit prices, and in the context of total income per capita.
 - **B3a. Electricity prices**
 - **B3b. Gasoline and Diesel prices**
 - **B3c. Natural gas prices**
 - **B3d. Affordability of electricity for residents**

	AND DEMAND		ENERGY SYSTEMS						
	A1a	6%	A2a	6%	A2c	6%			
	Diversity of primary energy supply		Diversity of electricity generation						
	A1b	6%	A2b	6%					
	Import independence		Energy storage		System stability and recovery capacity				
	B1 ENERGY ACCESS		B2 QUALITY ENERGY ACCESS		B3 ENERGY AFFORDABILITY				
	B1a	6%	B2a	6%	B3a	3%	B3c	3%	
	Access to electricity				Electricity prices		Natural gas prices		
	B1b	6%			B3b	3%	B3d	3%	
	Access to clean cooking		Access to “modern” energy		Gasoline and diesel prices		Affordability of electricity for residents		
	C1 RESOURCE PRODUCTIVITY		C2 DECARBONISATION		C3 EMISSIONS AND POLLUTION				
	C1a	5%	C2b	5%	C3a	2%	CO ₂ intensity		
	Final energy intensity		Trend of GHG emissions from energy		C3b	2%	CO ₂ per capita		
					C3c	1%	CH ₄ emissions from energy per ktoe		
	C1b	5%	C2a	5%	C3d	5%			
	Efficiency of power generation and T&D		Low carbon electricity generation		PM _{2.5} mean annual exposure				
	D1 MACROECONOMIC ENVIRONMENT		D2 GOVERNANCE		D3 STABILITY FOR INVESTMENT AND INNOVATION				
	D1a	2%	D2a	1%	D2b	1%	D2c	D3a	
	Macroeconomic stability		Effectiveness of government		Political stability		Rule of law		
	D1b	1%	D2d	1%	D2e	1%	D2f	D3b	
	Regulatory quality		Foreign direct investment net inflows		Ease of doing business		Perception of corruption		
	D1c	.5%	D2g	.5%	D2h	.5%	D2i	D3c	
	Efficiency of legal framework in challenging regulation		Intellectual property protection		Innovation capacity				
	D1d	.5%	D2j	.5%	D2k	.5%	D2l	D3d	
	Integrity of political institutions		Stability of political institutions		Stability of economic institutions		Stability of legal framework		
	D1e	.5%	D2m	.5%	D2n	.5%	D2o	D3e	
	Stability of economic system		Stability of financial system		Stability of foreign exchange system		Stability of legal framework		
	D1f	.5%	D2p	.5%	D2q	.5%	D2r	D3f	
	Innovation capacity		Stability of political institutions		Stability of economic institutions		Stability of legal framework		

2. Globaalse raporti metoodikast

C. Keskkonnasäästlikkus

- **C1. Energy resource productivity** measures the efficient use of energy and energy resources across sectors as well as the efficacy of energy infrastructure in avoiding wasted energy.
 - **C1a. Final energy intensity**
 - **C1b. Efficiency of power generation and T&D**
- **C2. Decarbonisation** describes a country's capacity to generate electricity from low-carbon sources and manage its greenhouse gas emissions.
 - **C2a. Low carbon electricity generation**
 - **C2b. Greenhouse gas emissions trend**
- **C3. Emissions and pollution** measures CO₂ and methane emissions related to countries' energy production and use, as well as the exposure to harmful pollutants.
 - **C3a. CO₂ intensity**
 - **C3b. CO₂ emissions per capita**
 - **C3c. CH₄ emissions from energy (hydrocarbons in supply)**
 - **C3d. PM_{2.5} mean annual exposure**

AND DEMAND		ENERGY SYSTEMS				COUNTRY CONTEXT
A1a	6%	A2a	6%	A2c	6%	
Diversity of primary energy supply		Diversity of electricity generation				
A1b	6%	A2b	6%			
Import independence		Energy storage		System stability and recovery capacity		
B1 ENERGY ACCESS		B2 QUALITY ENERGY ACCESS	B3 ENERGY AFFORDABILITY			
B1a	6%	B2a	6%	B3a	3%	
Access to electricity		Electricity prices		Natural gas prices		
B1b	6%	B3b	3%	B3d	3%	
Access to clean cooking		Access to "modern" energy		Affordability of electricity for residents		
C1 RESOURCE PRODUCTIVITY		C2 DECARBONISATION		C3 EMISSIONS AND POLLUTION		
C1a	5%	C2b	5%	C3a	2%	CO ₂ intensity
Final energy intensity		Trend of GHG emissions from energy		C3b	2%	CO ₂ per capita
C1b	5%	C2a	5%	C3c	1%	CH ₄ emissions from energy per ktoe
Efficiency of power generation and T&D		Low carbon electricity generation		PM _{2.5} mean annual exposure		

2. Globaalse raporti metoodikast

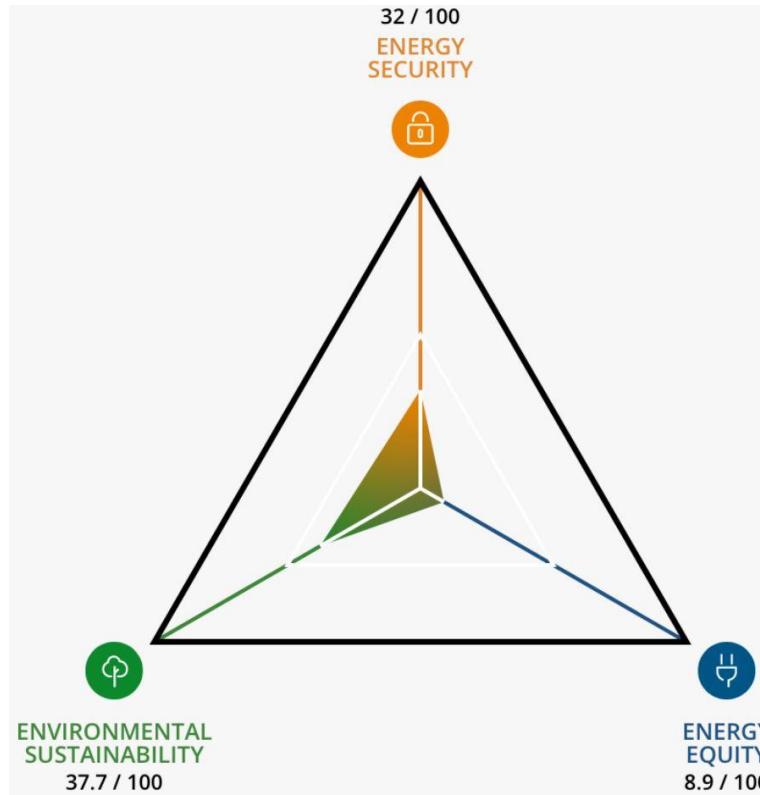
D. Riigi ülevaade

- **D1. Macroeconomic environment** describes the capacity of a country to sustain an enabling environment for proactive delivery of energy policy goals.
 - **D1a. Macroeconomic stability**
- **D2. Governance** reflects the effectiveness of government, political stability, rule of law and regulatory quality of a country.
 - **D2a. Effectiveness of government**
 - **D2b. Political stability**
 - **D2c. Rule of law**
- **D3. Stability for investment and innovation** measures the capacity of a country to attract investments and stimulate R&D and innovation.
 - **D3a. Foreign direct investment, net inflows**
 - **D3b. Ease of doing business**
 - **D3c. Perception of corruption**
 - **D3d. Efficiency of legal framework in challenging regulations**
 - **D3e. Intellectual property protection**
 - **D3f. Innovation capability**

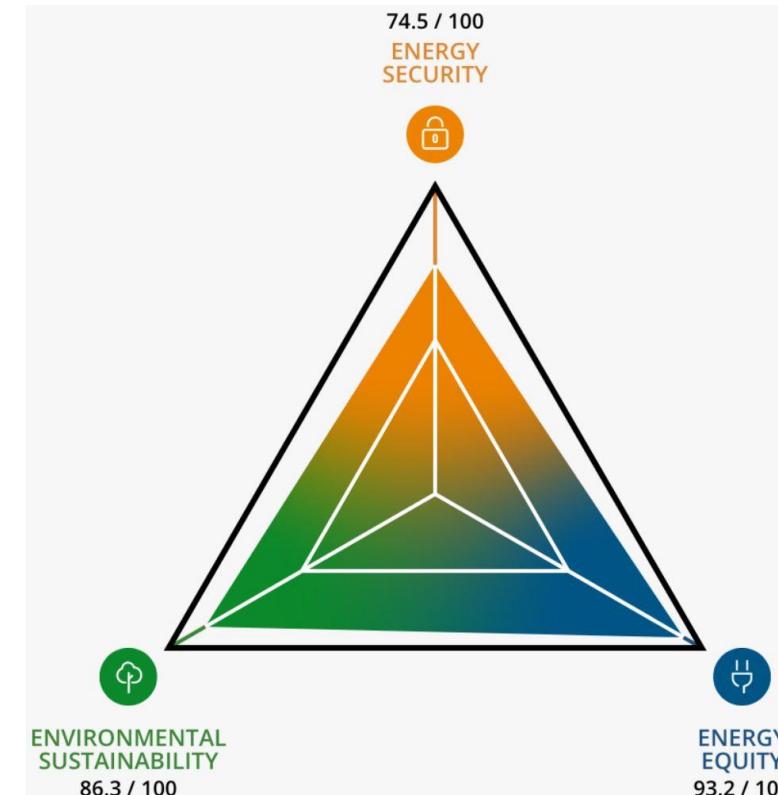
COUNTRY CONTEXT		AND DEMAND			ENERGY SYSTEMS			ENVIRONMENTAL SUSTAINABILITY			ENERGY SECURITY																		
D1 MACROECONOMIC ENVIRONMENT		A1a		6%		A2a		6%		A2c		6%		B1 ENERGY ACCESS		B2 QUALITY ENERGY ACCESS		B3 ENERGY AFFORDABILITY		C1 RESOURCE PRODUCTIVITY		C2 DECARBONISATION		C3 EMISSIONS AND POLLUTION					
D1a	Macroeconomic stability	Diversity of primary energy supply		6%		Diversity of electricity generation		6%		6%		6%		Import independence		Energy storage		System stability and recovery capacity		Access to electricity		Electricity prices		Natural gas prices					
D2a	Effectiveness of government	A1b		6%		A2b		6%		B2a		6%		B3a		3%		B3c		3%		B1a		6%		B2b		6%	
D2b	Political stability	Access to clean cooking		6%		Access to "modern" energy		6%		B3b		3%		B3d		3%		Gasoline and diesel prices		Affordability of electricity for residents		Final energy intensity		5%		C2b		5%	
D2c	Rule of law	C1a		5%		C3a		2%		CO ₂ intensity		C3b		2%		CO ₂ per capita		C3c		1%		C1b		5%		C2a		5%	
D2d	Regulatory quality	Efficiency of power generation and T&D		5%		Low carbon electricity generation		5%		C3d		5%		PM _{2.5} mean annual exposure		C3e		1%		C3f		5%		C3g		5%			
D3a	Foreign direct investment net inflows	CO ₂ emissions from energy per ktoe		C3b		C3c		C3d		C3e		C3f		C3g		C3h		C3i		C3j		C3k		C3l		C3m			
D3b	Ease of doing business	C3a		CO ₂ intensity		C3b		CO ₂ per capita		C3c		CH ₄ emissions from energy per ktoe		C3d		5%		C3e		1%		C3f		5%		C3g		5%	
D3c	Perception of corruption	C3a		CO ₂ per capita		C3b		CH ₄ emissions from energy per ktoe		C3c		5%		C3d		5%		C3e		1%		C3f		5%		C3g		5%	
D3d	Efficiency of legal framework in challenging regulation	C3a		CH ₄ emissions from energy per ktoe		C3b		5%		C3c		5%		C3d		5%		C3e		1%		C3f		5%		C3g		5%	
D3e	Intellectual property protection	C3a		5%		C3b		5%		C3c		5%		C3d		5%		C3e		1%		C3f		5%		C3g		5%	
D3f	Innovation capacity	C3a		5%		C3b		5%		C3c		5%		C3d		5%		C3e		1%		C3f		5%		C3g		5%	

2. Halb vs hea

Trilemma 2021, Niger



Trilemma 2021, Rootsi

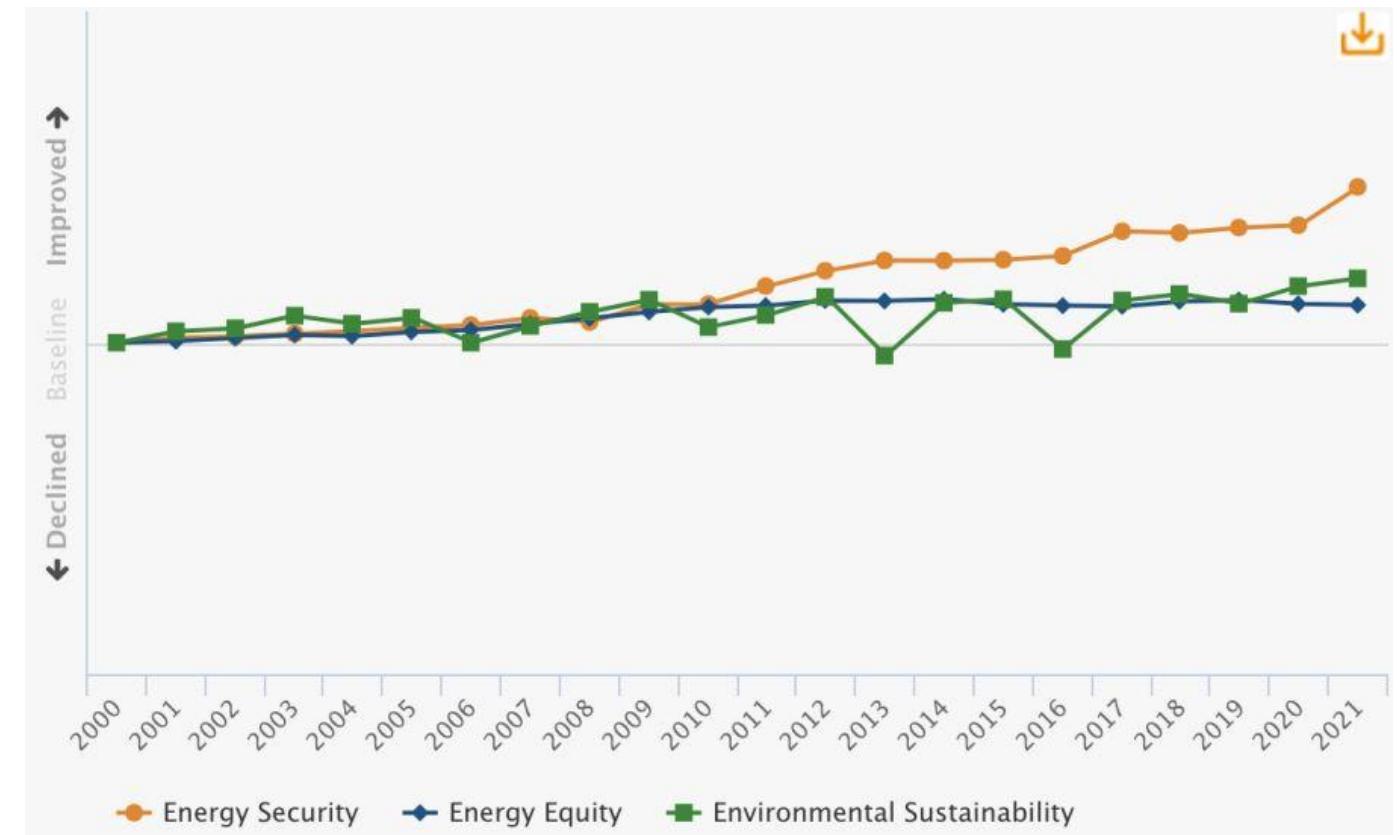
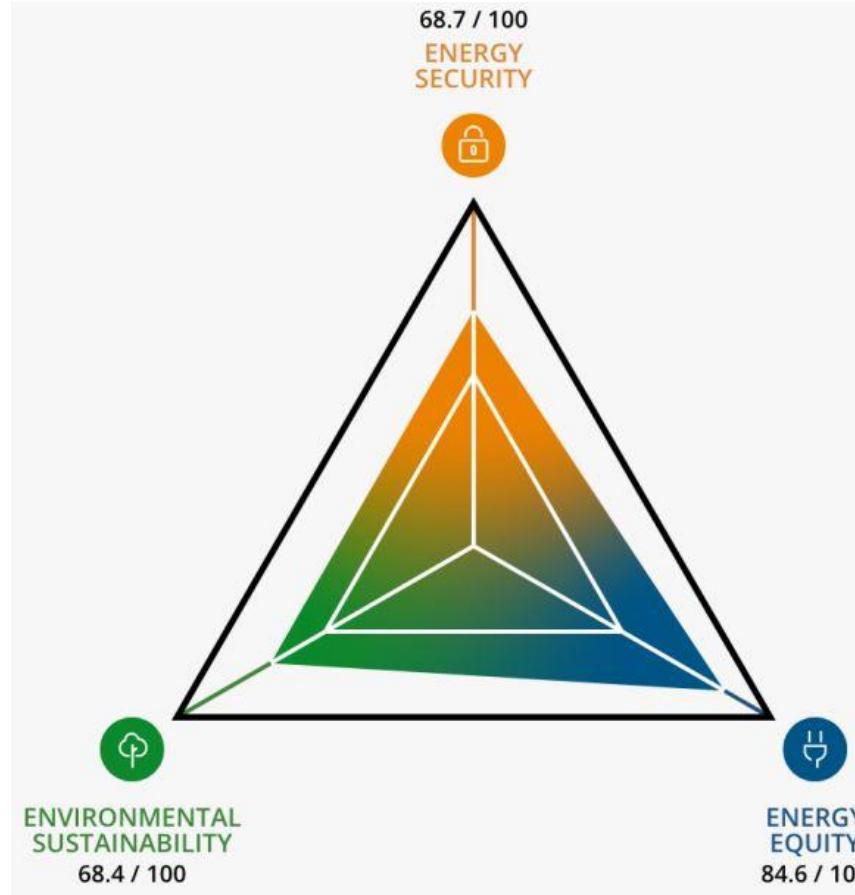


2. Eesti trilemma 2021

Koht: #20

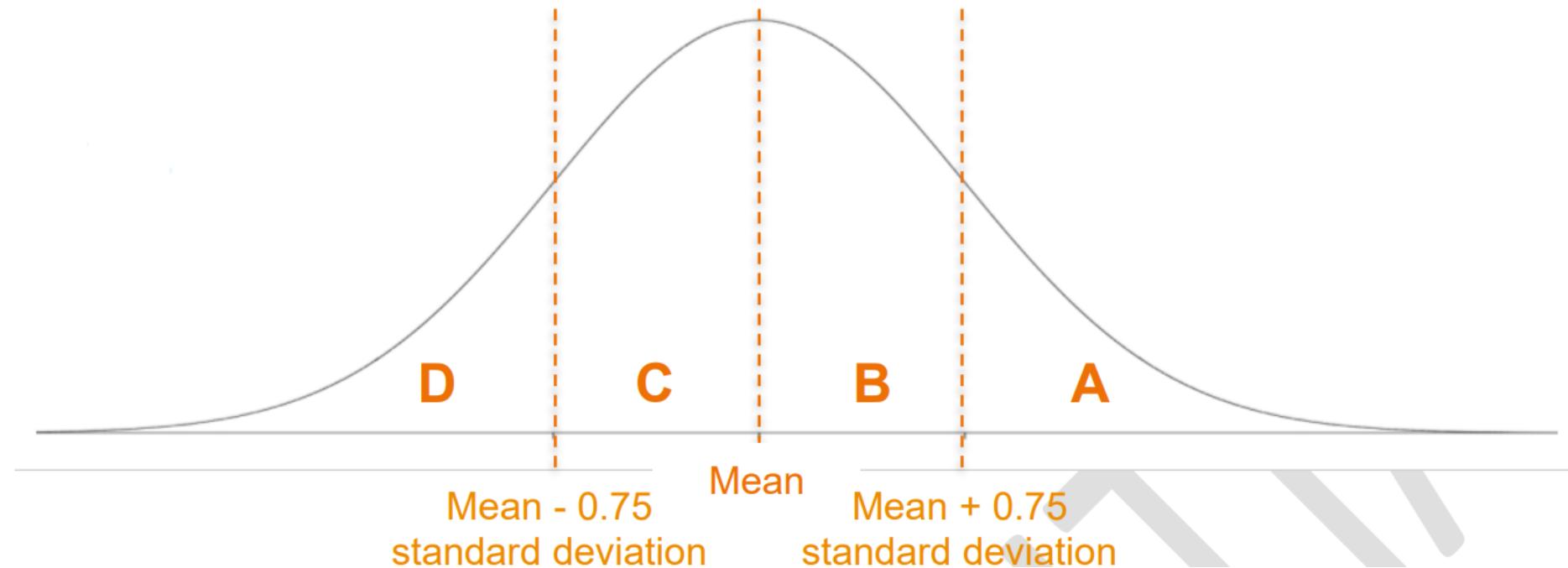
Trilemma tulemus: 73,9

Hinne: ABB



2. Hinde kalkuleerimine

- **Grade A:** countries with a dimension score in top 25th percentile;
- **Grade B:** countries with a score between 75th and 50th percentile;
- **Grade C:** countries with a score between 50th and 25th percentile;
- **Grade D:** countries with a score in bottom 25th percentile.



3. Trilemma süvauuringu projektist

- Luua ja viia läbi Eesti trilemma süvaanalüüs;
- Võtta arvesse Eesti energeetika keskkonna eripärasid ning kajastada detailsemaid andmeid.
- Juhtkomisjonis esindaja Keskkonnaministeeriumist, Majandus- ja kommunikatsiooniministeeriumist, Riigikantseleist, Statistikaametist, Eesti Pangast, Eesti Energiast, Tallinna Tehnikaülikoolist;
- Süvauuringut teostavad ka Läti ja Leedu;

3. Trilemma süvauuringu projektist jätk.

- Struktuur:
 - Eesti energeetikasektori koond trilemma ning võrdlus Läti ja Leeduga;
 - Energia tarbimise põhine trilemma (elekter, gaas, transpordikütus, soojus) + tuleviku vaade;
- Valmib: sügis-talv 2022

Aitäh!