Imperial College London

A data-driven methodology to analyze interlinkages among SDGs (and climate change)

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HLPF 2022 SIDE EVENT: Leveraging interlinkages among the SDGs to realize the 2030 Agenda
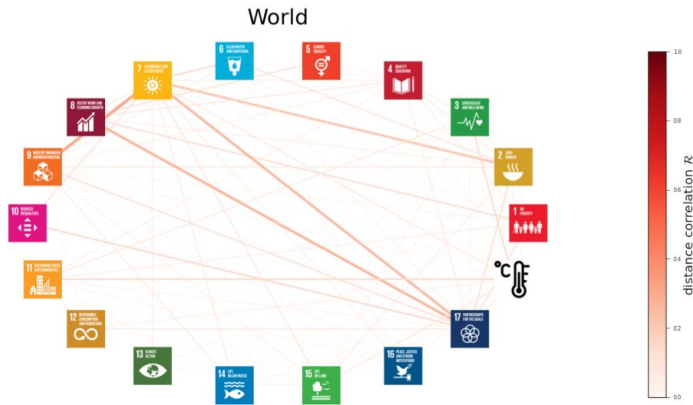
11 July 2022

Complex interlinkages, key objectives, and nexuses among the Sustainable Development Goals and climate change: a network analysis

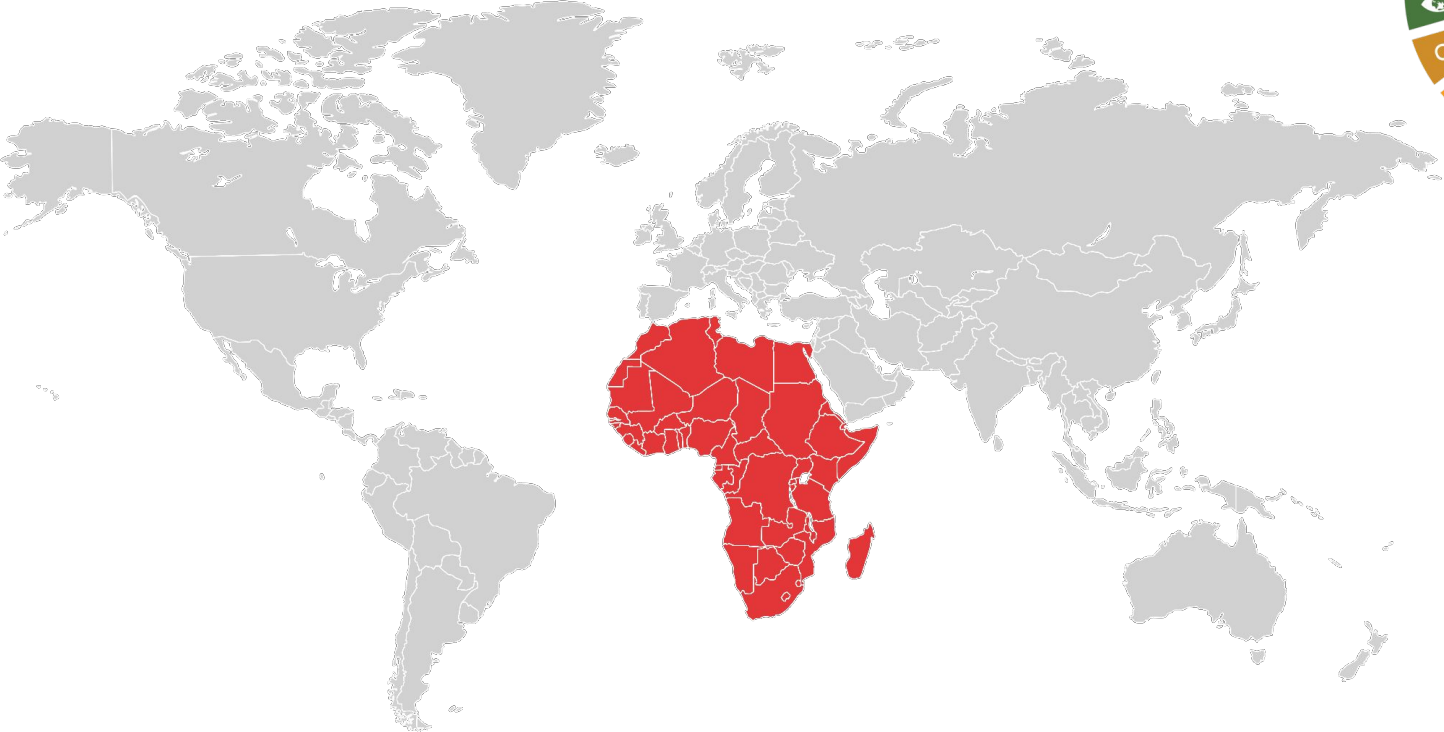Felix Laumann, MSc • Julius von Kügelgen, MSc • Thiago Hector Kanashiro Uehara, PhD • Prof Mauricio Barahona, PhD

PDF [1 MB]

Check for updates

World

SDGs (and climate) as a complex system of highly interconnected objectives, variables and indicators

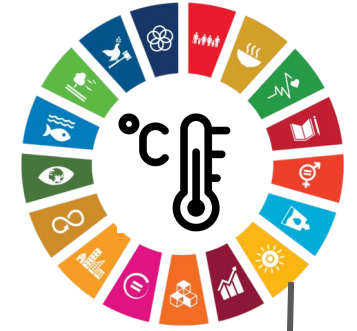*Laumann et al, The Lancet Planetary Health, e422-e430 (May 2022)*
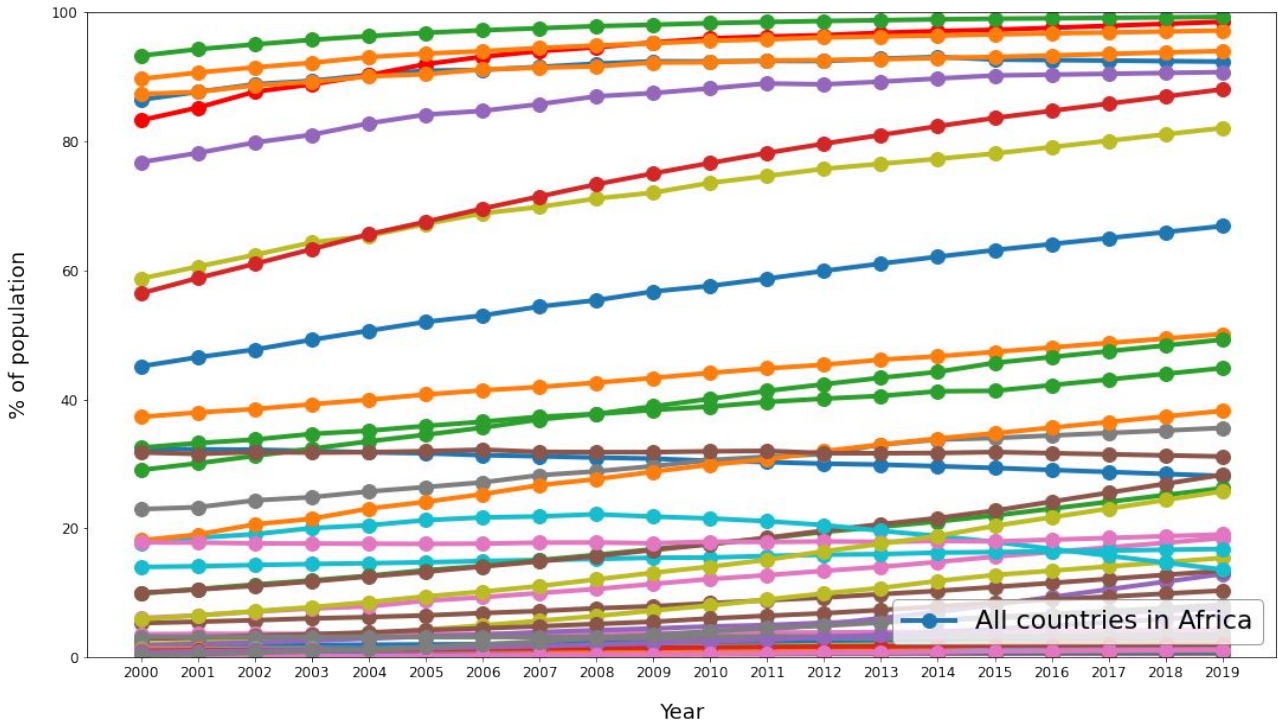
Data

7 AFFORDABLE AND CLEAN ENERGY

6 Indicators

- **181 countries overall** (and 35 country groupings studied)
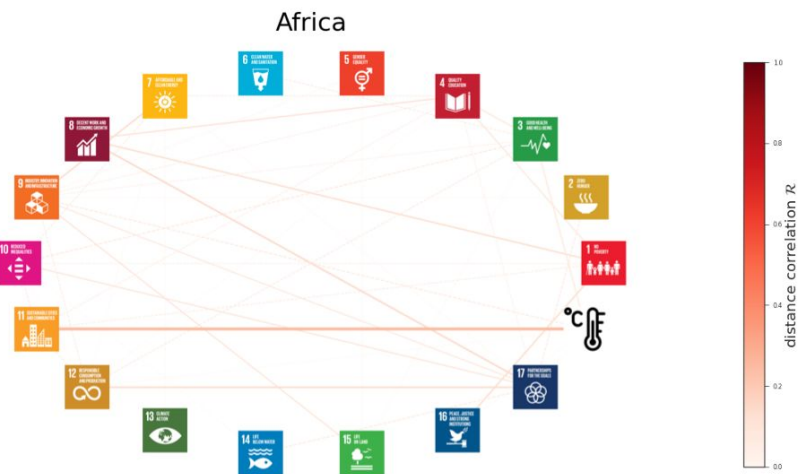- **400 indicators** (such as 7.1.2) over **20 years (2000-19)**
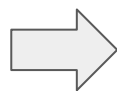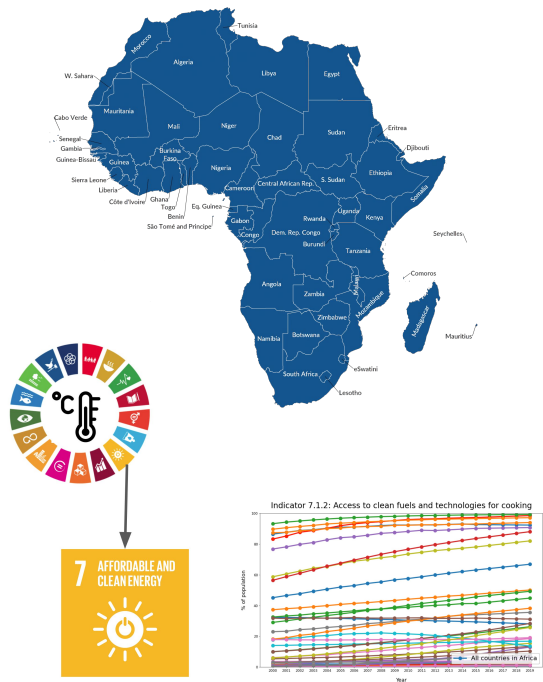

Indicator 7.1.2: Access to clean fuels and technologies for cooking

6 Indicators

From data to a network representation

400 indicators over 20 years (2000-19)

Capturing complex relationships between indicators: **Tipping points**

Latin America and the Caribbean
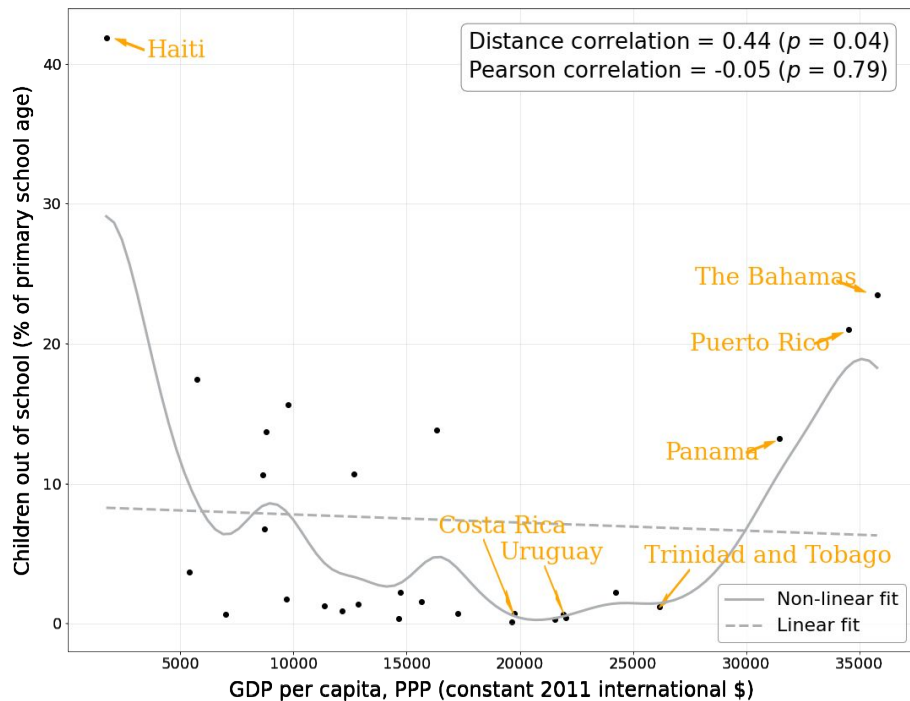
Taking away the effect of **confounders** consistently

Example: Sub-Saharan Africa

Swain & Ranganathan (2021)
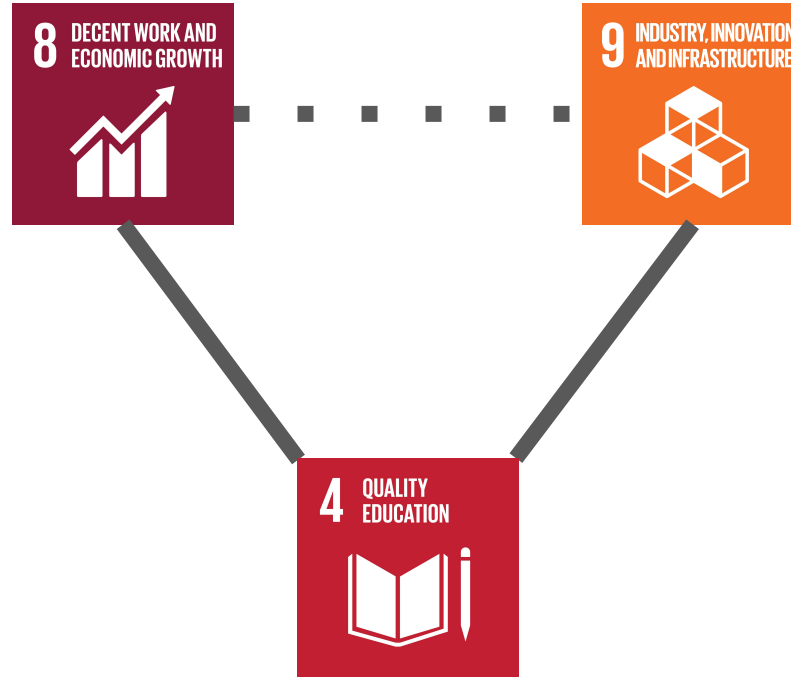
Laumann et al. (2022)

We construct **networks of SDG interlinkages for 35 country groupings**
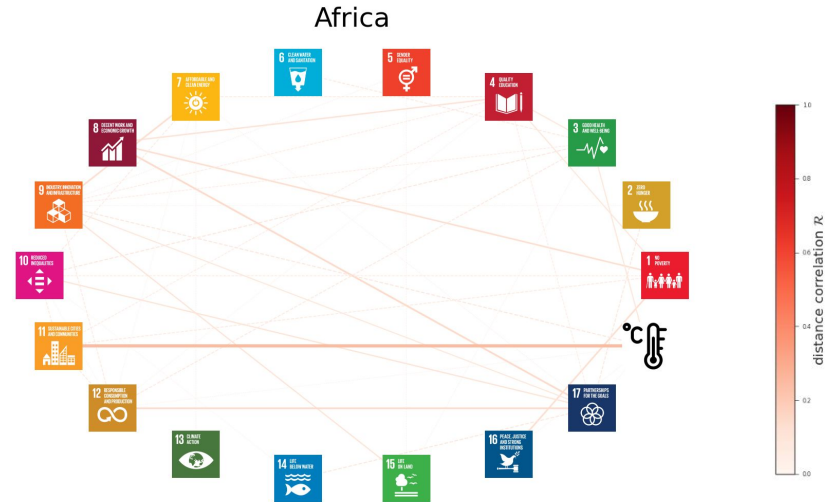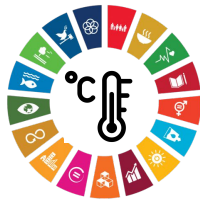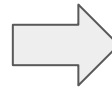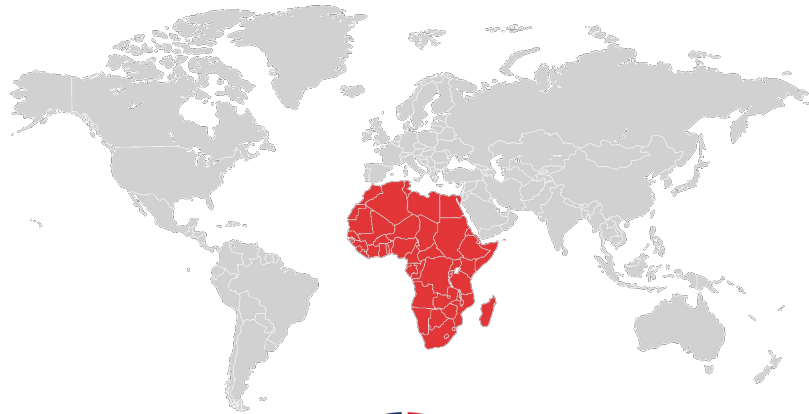
We find significant **regional differences** in the structure of the interlinkages

Europe
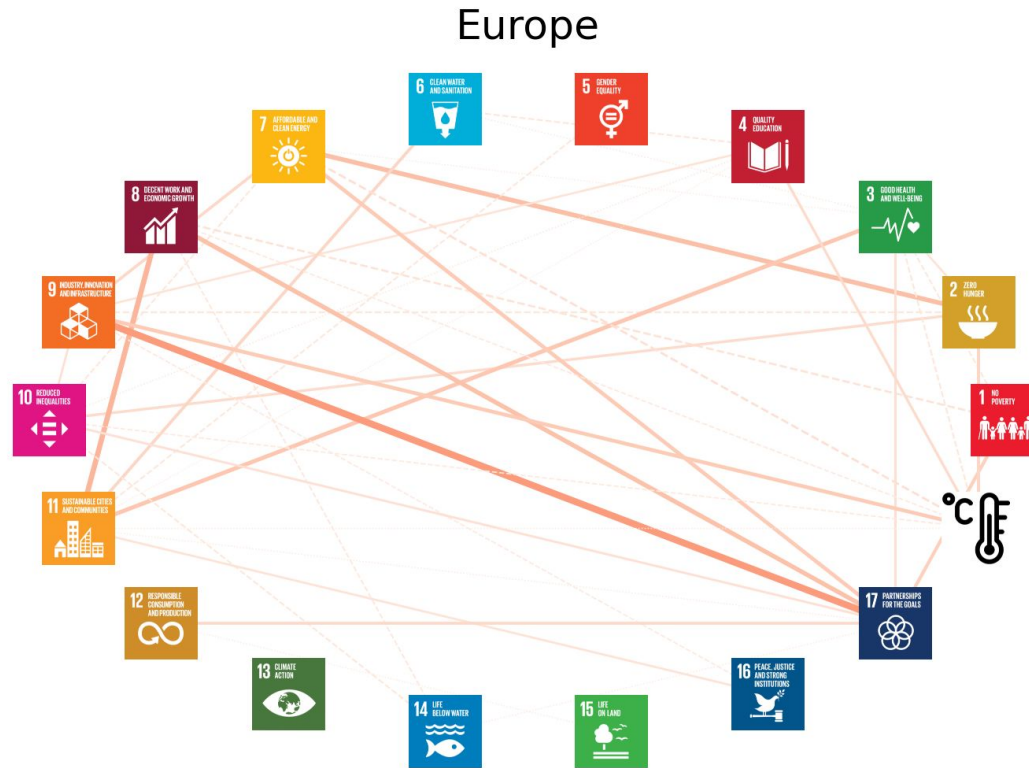
We find significant **regional differences** in the structure of the interlinkages

Sub-Saharan Africa

There are regional differences in the **centrality (importance)** of the SDGs
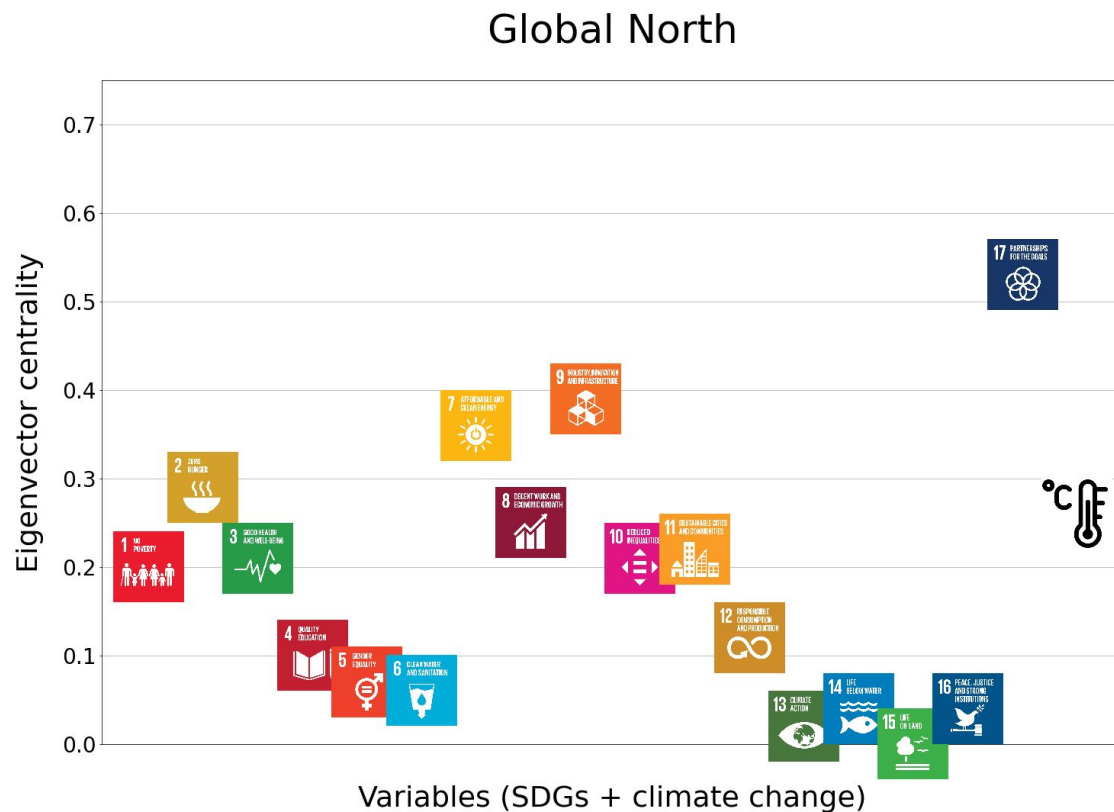
Global North

There are regional differences in the **centrality (importance)** of the SDGs

Global South

Variables (SDGs + climate change) vs Eigenvector centrality
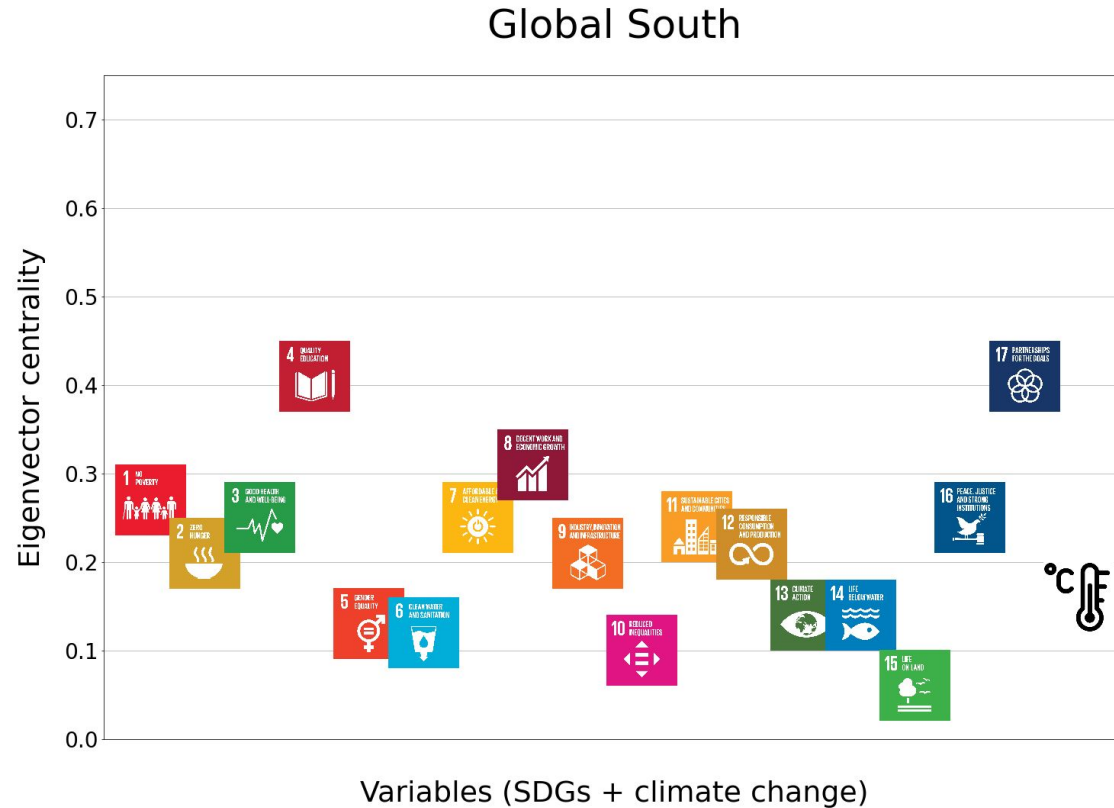
Three most central SDGs vary strongly across groupings

World	7 (0·46)	17* (0·43)	9 (0·34)
Global North	17* (0·53)	9 (0·39)	7 (0·36)
Global South	4 (0·41)	17* (0·41)	8 (0·31)
Caribbean	11* (0·71)	T* (0·64)	15 (0·30)

Three most central SDGs vary strongly across groupings

	First most central variable	Second most central variable	Third most central variable
World	7 (0·46)	17* (0·43)	9 (0·34)
Global North	17* (0·53)	9 (0·39)	7 (0·36)
Global South	4 (0·41)	17* (0·41)	8 (0·31)
Africa	17* (0·38)	T* (0·34)	9 (0·33)
Northern and Western Africa	17* (0·62)	12 (0·55)	8 (0·33)
Middle Africa	T* (0·66)	11* (0·55)	10 (0·44)
Southern and Eastern Africa	T* (0·54)	11* (0·48)	3 (0·39)
Sub-Saharan Africa	11* (0·35)	4 (0·33)	10 (0·33)
Americas	17* (0·43)	7 (0·39)	1 (0·37)
North and Central America	6 (0·66)	16 (0·55)	7 (0·43)
Caribbean	11* (0·71)	T* (0·64)	15 (0·30)
South America	11* (0·58)	12 (0·57)	3 (0·44)
Latin America and the Caribbean	17* (0·46)	1 (0·40)	11* (0·37)
Asia	17* (0·48)	8 (0·34)	7 (0·32)
Central and Eastern Asia	T* (0·58)	3 (0·56)	11* (0·43)
Southeastern Asia	11* (0·58)	17* (0·56)	T* (0·41)
Southern Asia	3 (0·60)	T* (0·57)	2 (0·42)
Western Asia	T* (0·58)	12 (0·41)	1 (0·39)

Europe	17* (0·47)	9 (0·42)	7 (0·35)
Northern Europe	11* (0·68)	10 (0·39)	17* (0·37)
Eastern Europe	17* (0·71)	9 (0·56)	T* (0·43)
Southern Europe	7 (0·64)	5 (0·35)	4 (0·33)
Western Europe	T* (0·71)	13 (0·71)	(all others)
Oceania	1 (0·57)	7 (0·57)	9 (0·36)
Oceania (excluding Australia and New Zealand)	2 (0·71)	1 (0·59)	13 (0·39)
High Income	17* (0·47)	7 (0·43)	9 (0·38)
Upper-Middle Income	T* (0·45)	17* (0·41)	8 (0·30)
Lower-Middle Income	11* (0·41)	17* (0·38)	T* (0·36)
Low Income	17* (0·55)	12 (0·40)	9 (0·33)
Least Developed Countries	8 (0·48)	4 (0·46)	1 (0·43)
Land-locked Developing Countries	3 (0·53)	T* (0·42)	11* (0·38)
Small Island Developing States	8 (0·48)	17* (0·42)	4 (0·35)
G20	7 (0·48)	17* (0·40)	2 (0·36)
Emerging Markets†	16 (0·70)	3 (0·52)	6 (0·31)
OPEC	1 (0·52)	17* (0·51)	4 (0·44)

Three most central SDGs vary strongly across groupings

Overall, 17, 11, T appear most amongst the top three variables

How does the network representation help us understand particular aspects of interlinkages?

Data driven approach: integrates many factors but these need to be interpreted through expert analysis to lead to policy

- Causal inference is our current research focus (currently our work only highlights complex associations) but even then it is only an indication for in-depth work by experts

Regional differences necessitate diverse approaches: expertise adapted to local knowledge is crucial (given the differences observed)

- It is key to have data collection, curation and interpretation across the world

Method can be used to examine the effect of scenarios where certain associations are weakened or strengthened

- This can be done at the level of target or indicators, which are more connected to policy decisions, prioritisation of resources, and evaluation of cost and technologies targeted at particular outcomes
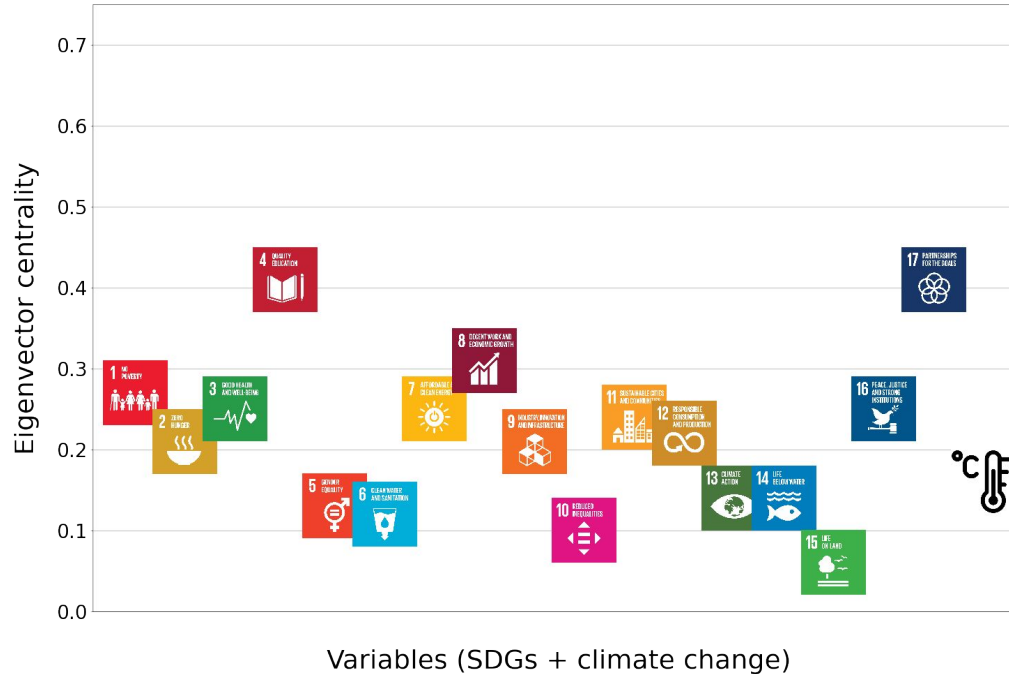
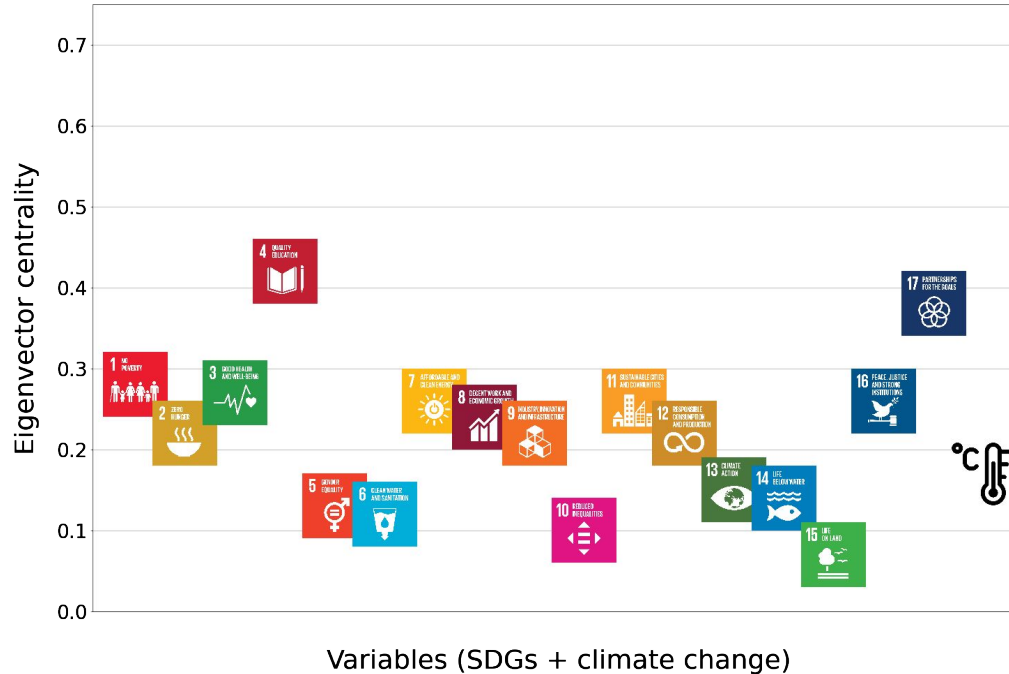# Scenario modelling: **removing edge 8 – 17**

Global South

Scenario modelling: **removing edge 8 – 17**

Global South

Eigenvector centrality vs. Variables (SDGs + climate change)

Scenario modelling: **removing edge 8 – 17**

Global South

Variables (SDGs + climate change)

Thank you

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Code available:
https://github.com/felix-laumann
/SDG-networks

Appendix: Nexuses

Sub-Saharan Africa