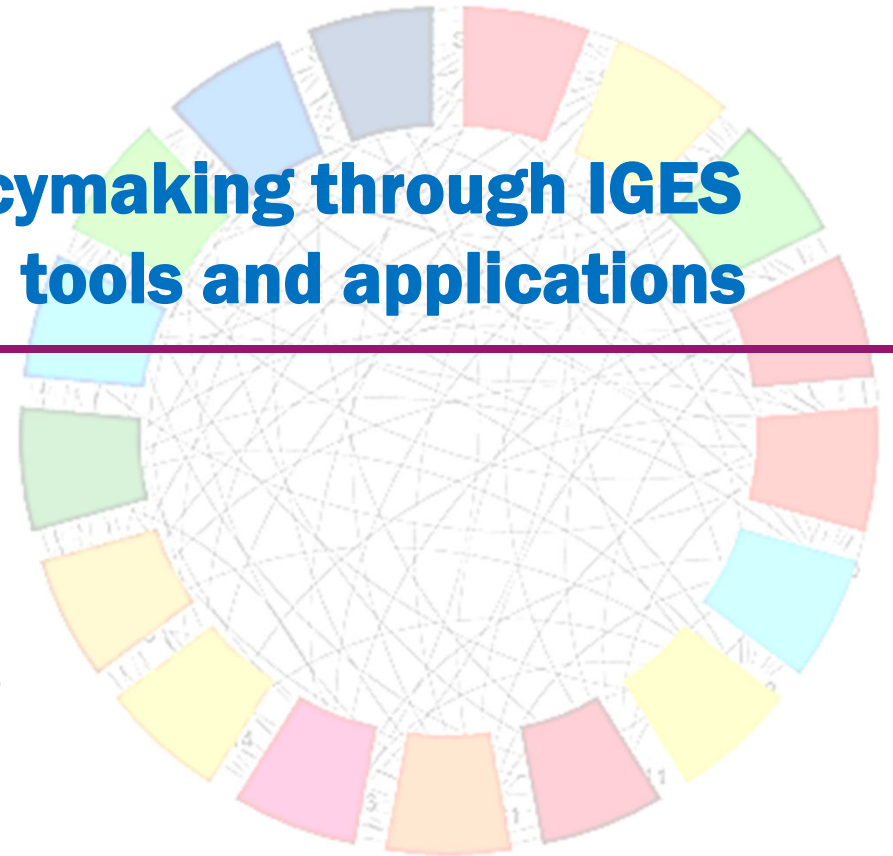


Integration of SDGs into climate policymaking through IGES SDG interlinkages tool: Methodology, tools and applications

Dr. Xin Zhou

Research Leader of Integrated Sustainability Centre
Institute for Global Environmental Strategies (IGES)

JICA Training for Long-term Low-Carbon Strategies
17 February 2023, JICA Yokohama



Outline of the lecture

- 🌍 Integrated policymaking: *Importance and existing practices*
- 🌍 SDG interlinkages analysis: *Knowledge gap and existing methods*
- 🌍 IGES SDG Interlinkages Analysis & Visualisation Tool: The four-step methodology
- 🌍 Applications of the SDG interlinkage tool and recent development
- 🌍 Q&A

The United Nations' Sustainable Development Goals (SDG) form an interacted and indivisible system

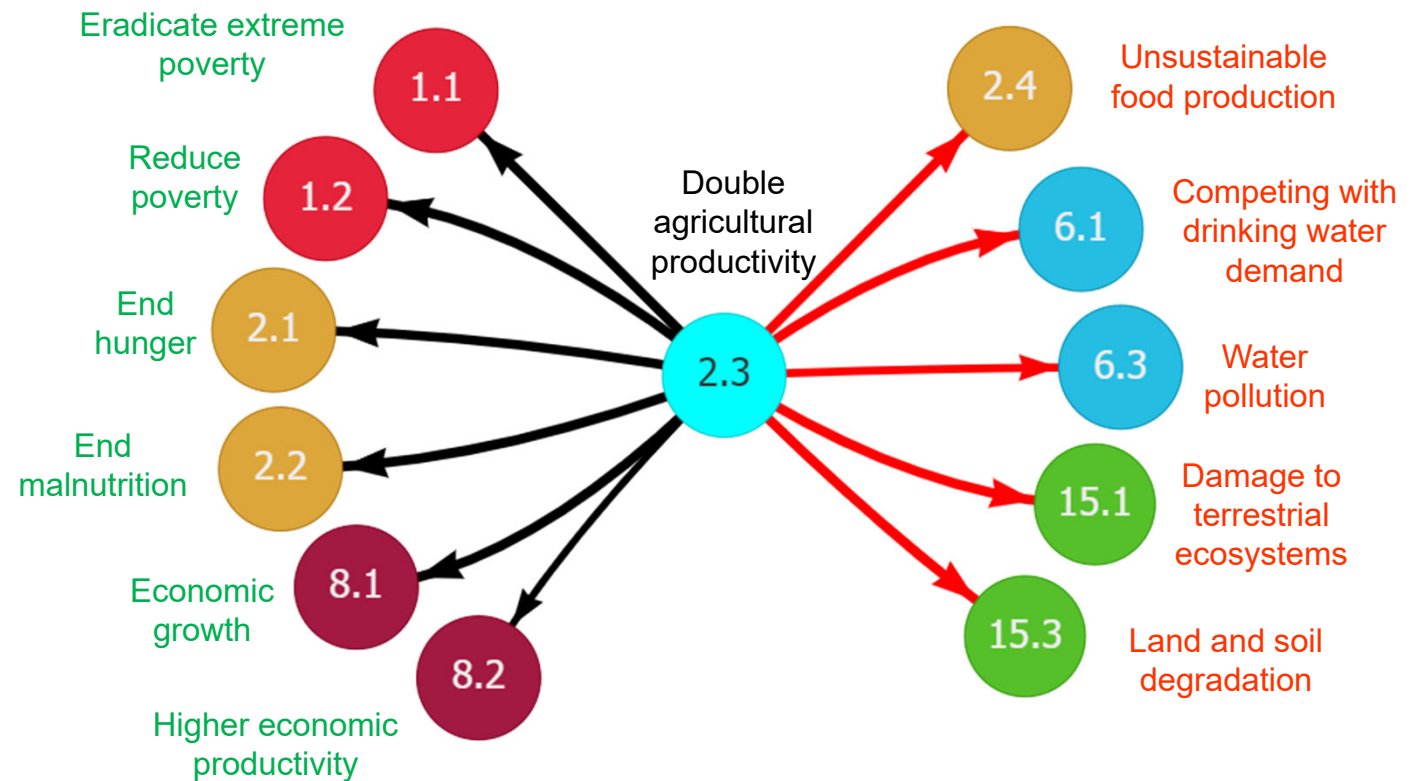


Complex interactions involving both synergies and trade-offs



Examples of the synergies and trade-offs of Target 2.3

- **Synergies:**
Poverty reduction, ending hunger, and economic growth
- **Trade-offs:**
Competition for water use, water pollution, and environmental degradation



Source: Based on the SDG Interlinkages Tool. <https://sdginterlinkages.iges.jp/visualisationtool.html>

Policy needs and knowledge gaps in understanding the SDG interlinkages

- Goal 13 on climate action cross-cutting almost all SDGs requires an integration of SDGs into climate policy.
- Such an integrated approach is new and challenging.
 - Broad coverage of social, economic and environmental dimensions;
 - Complicated interactions among 169 targets.
- Scientific knowledge on the interlinkages between climate action and the SDGs is limited which inhibits the implementation of integrated policy making.



Importance of taking an integrated approach for SDG achievement

- ☉ Intrinsic SDG interlinkages require a shift from a siloed approach to an integrated approach.
- ☉ Understanding the interlinkages is important for taking an integrated approach which helps address issues such as:
 - *How will achieving one target impact on achieving others and how strong are the impacts?*
 - *Where are the synergies and trade-offs between the SDG targets?*
 - How countries are different in terms of the SDG interlinkages?
 - What are the policy implications for priority setting and institutional and financial arrangement, etc.



A siloed approach cuts off the interlinkages



An integrated approach takes account of the interlinkages

Integrated SDG planning: Existing practices in Asia and challenges

Existing practices of SDG integrated planning and implementation in Asia

- Set up a SDG Secretariat or Committee as an inter-agency institution for integrated coordination, with line ministries responsible for the implementation: e.g. Indonesia established a “SDG National Coordination Team” for SDG planning and implementation.
- The Prime Minister and his/her Office takes the lead: e.g. Malaysia has a National SDG Council chaired by the Prime Minister for SDG implementation.
- A lead ministry is in charge of SDG planning and implementation through collaborations with other ministries: e.g. In Cambodia, the Ministry of Planning leads the delivery of the. In Viet Nam, the Ministry of Planning and Investment is the lead agency for SDG implementation.

Challenges for practicing an integrated approach

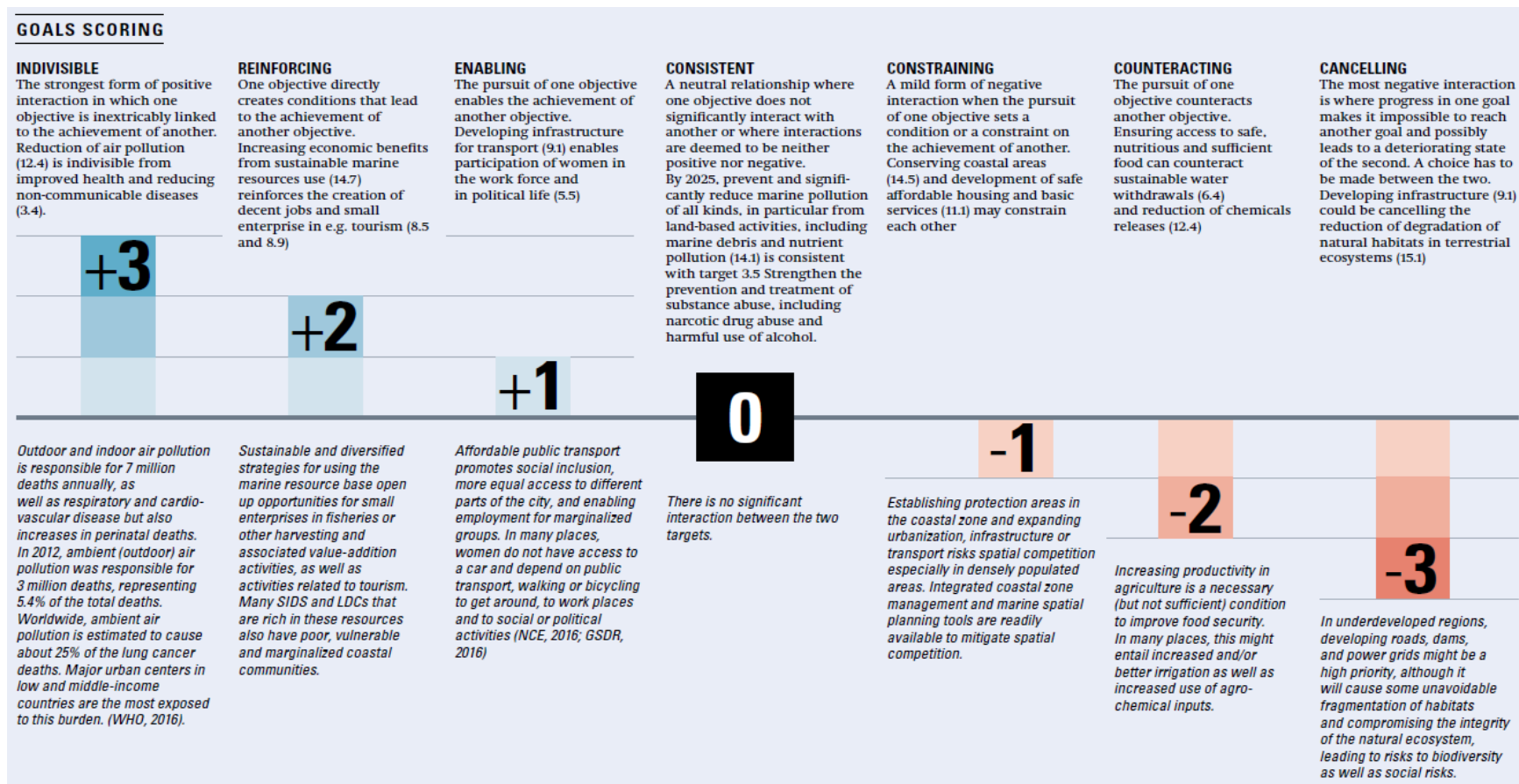
- Broad coverage of social, economic and environmental dimensions;
- Complex interactions among the 169 targets;
- Gaps in scientific knowledge about how the SDGs are interlinked;
- Lack of tools to support integrated policymaking.

Existing methodologies and tools for analysing SDG interlinkages

Methodology	Scope	SDG coverage	Level of interlinkages	Nature of interlinkages analysis
Le Blanc, 2015	General	All	Goal level, target level	Linguistic approach, network visualisation
Nilsson et al., 2016	General	-	Target level	Analytical framework on seven-point typology
ICSU, 2017	General	Goals 2, 3, 7, 14	Goal level, target level	Literature review, expert judgement, seven-point typology
UNESCAP, 2017	General, app. in three countries	Goal 6	Target level	Qualitative analysis, leverage point identification, visualisation
IGES, 2017, 2018, 2019.	National, 27 countries	All	Target level	Literature review, expert judgement, statistical analysis, network analysis
OECD, 2018	General	Goals 6, 7, 11, 12, 15	Goal level, target level	Policy Coherence for Sustainable Development (PCSD)
Millennium Institute, 2017	National, a few countries	All	Goal level, target level	System Dynamics model
Weitz et al., 2018	Sweden	34 selected targets	Target level	Expert judgement, seven-point typology, cross-impact matrix, network analysis
Allen et al., 2019	Arab regional	Environment-related SDGs	Target level	Cross-impact matrix, network analysis, multi-criteria analysis
Jaramillo et al., 2019	45 wet landscapes	33 relevant targets	Target level	Questionnaire survey, seven-point typology, network analysis

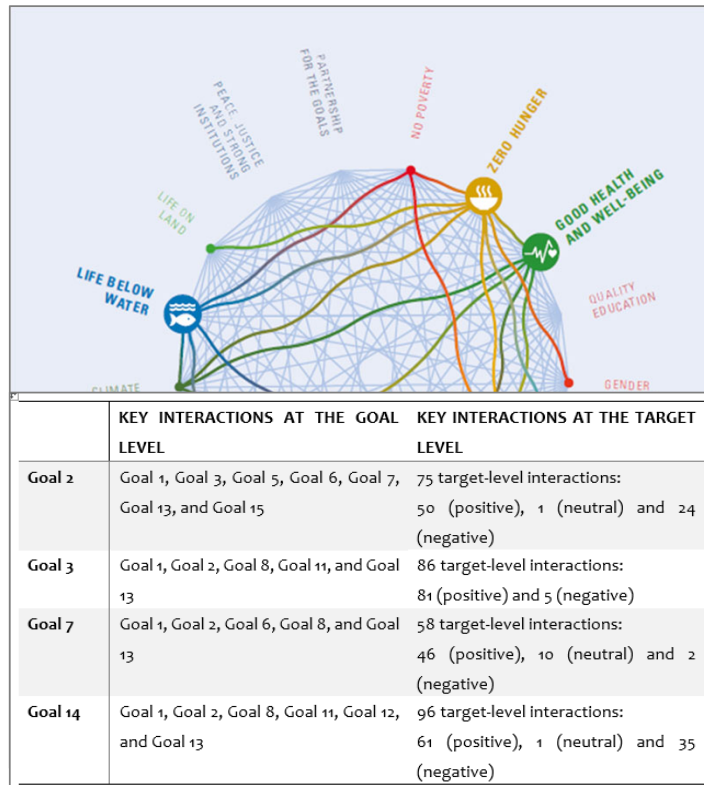
Source: Zhou and Moinuddin, 2017

Typology approach: Mapping SDG interactions based on a seven-scale framework

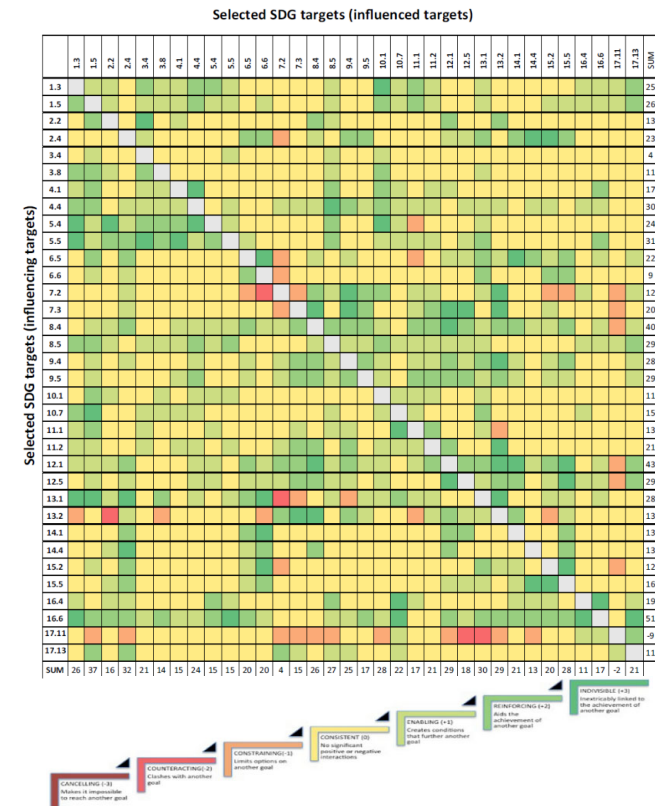


Source: Nilsson, et al., 2016

Applications of the seven-scale typology approach and expert opinions



Source: ICSU, 2017

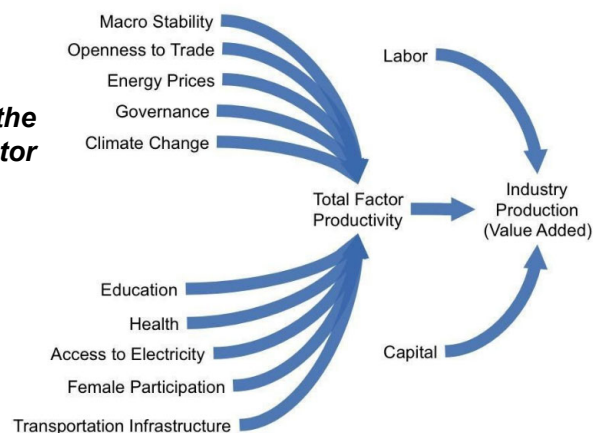


Source: Weitz, et al. (2018)

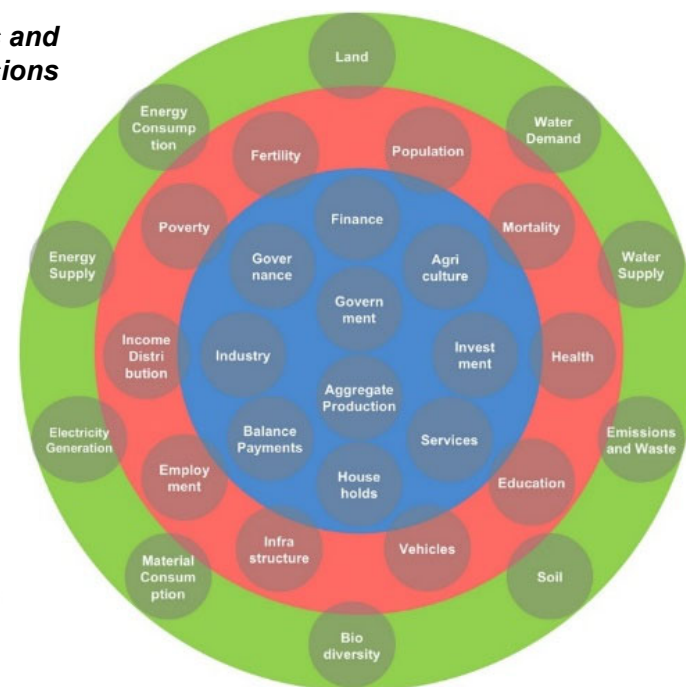
A System Dynamics model: Integrated Sustainable Development Goals Planning Model (iSDG)

- 🌐 All SDGs and 78 SDG indicators
- 🌐 Three dimensions and 30 sectors
- 🌐 Calibrated with country data and the context for the interactions
- 🌐 Medium to long-term scenario analysis (2030)
- 🌐 Policy simulations

An example of the industrial sector

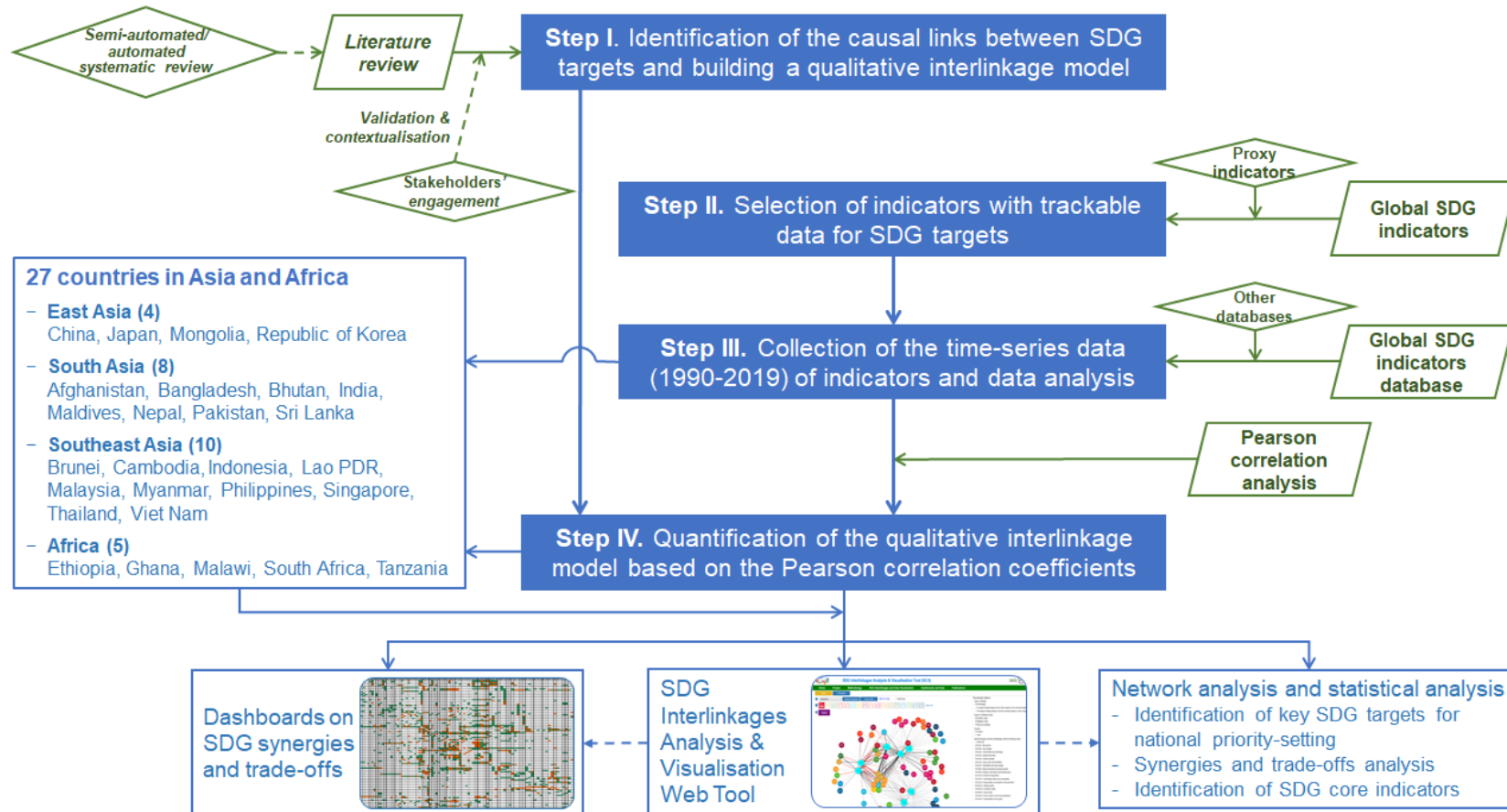


iSDG sectors and three dimensions



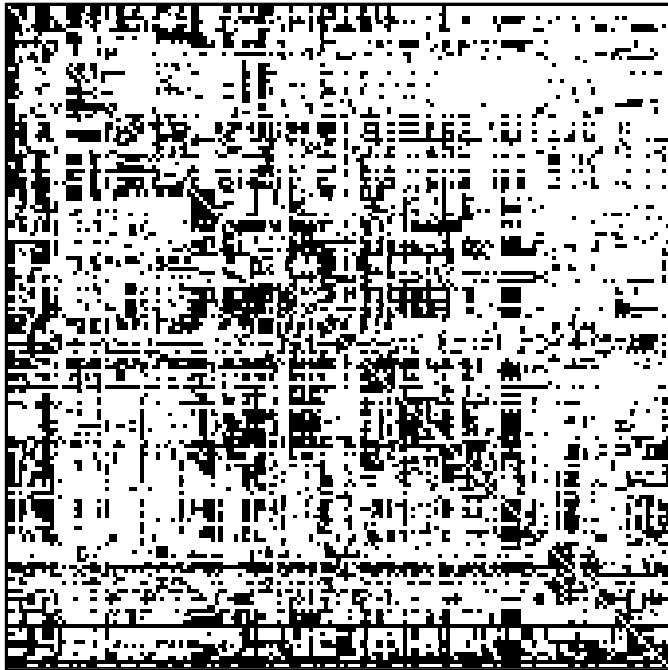
Source: Millennium Institute, 2017. <https://www.millennium-institute.org/documentation.org/documentation>

SDG Interlinkages Analysis & Visualisation Tool and Methodology



Source: Zhou, et al., 2021 (<https://sdginterlinkages.iges.jp/methodology.html>)

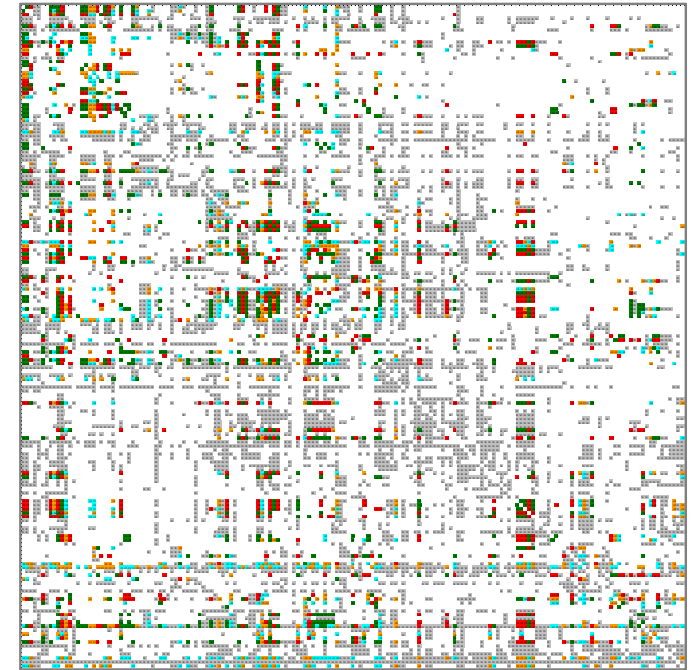
Step I Qualitative SDG interlinkage model



A generic SDG interlinkage model



An interlinkage model for Bangladesh



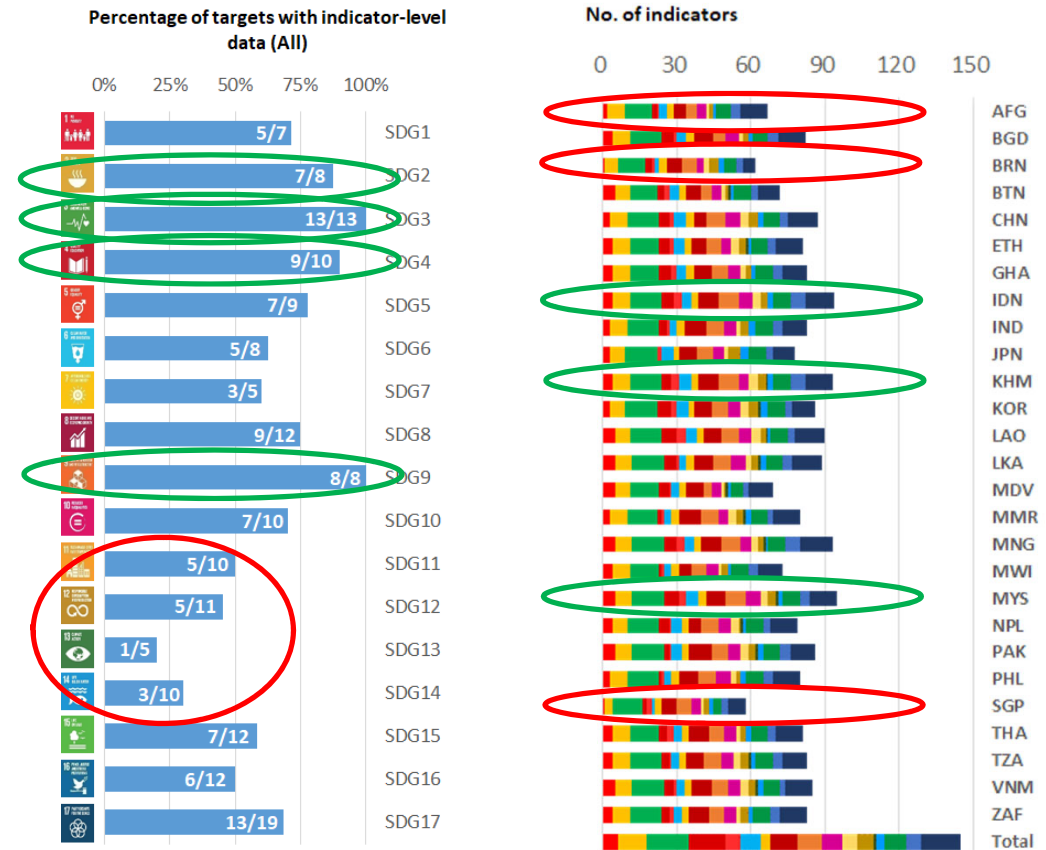
An interlinkage model for Indonesia

Source: SDG Interlinkages Analysis & Visualisation Tool (Zhou, et al., 2021)

Step II SDG indicators and data availability

Indicators and data availability

- Indicators: 231 global SDG indicators and data from UNSD Global SDG Indicators Database;
- Other proxy indicators: World Bank Indicators Database, etc.;
- 145 indicators with trackable data corresponding to 113 SDG targets were selected;
- Uneven data availability across Goals (20%-100%) and countries;
- Time series data (1990 – 2019) collected for 27 countries.



Source: Compiled based on the SDG Interlinkages Analysis & Visualisation Tool (Zhou, et al., 2021)

Step III Pearson correlation analysis based on the time-series data (1990-2019) for 27 countries

- A full time series is generated for each indicator using linear regression to estimate the missing data;
- Pearson correlation coefficients are calculated [-1, 1], indicating the linear relationship between relevant pair targets;
- Positive coefficients (positive linear relations) vs. negative coefficients (negative linear relations);
- Strong linkages vs. weak linkages;

	Strong positive : Correlation value (0.7, 1]
	Weak positive: Correlation value (0, 0.7]
	Weak negative: Correlation value [-0.7, 0)
	Strong negative: Correlation value [-1, -0.7)
	Data not available for quantification.
	No linkage.

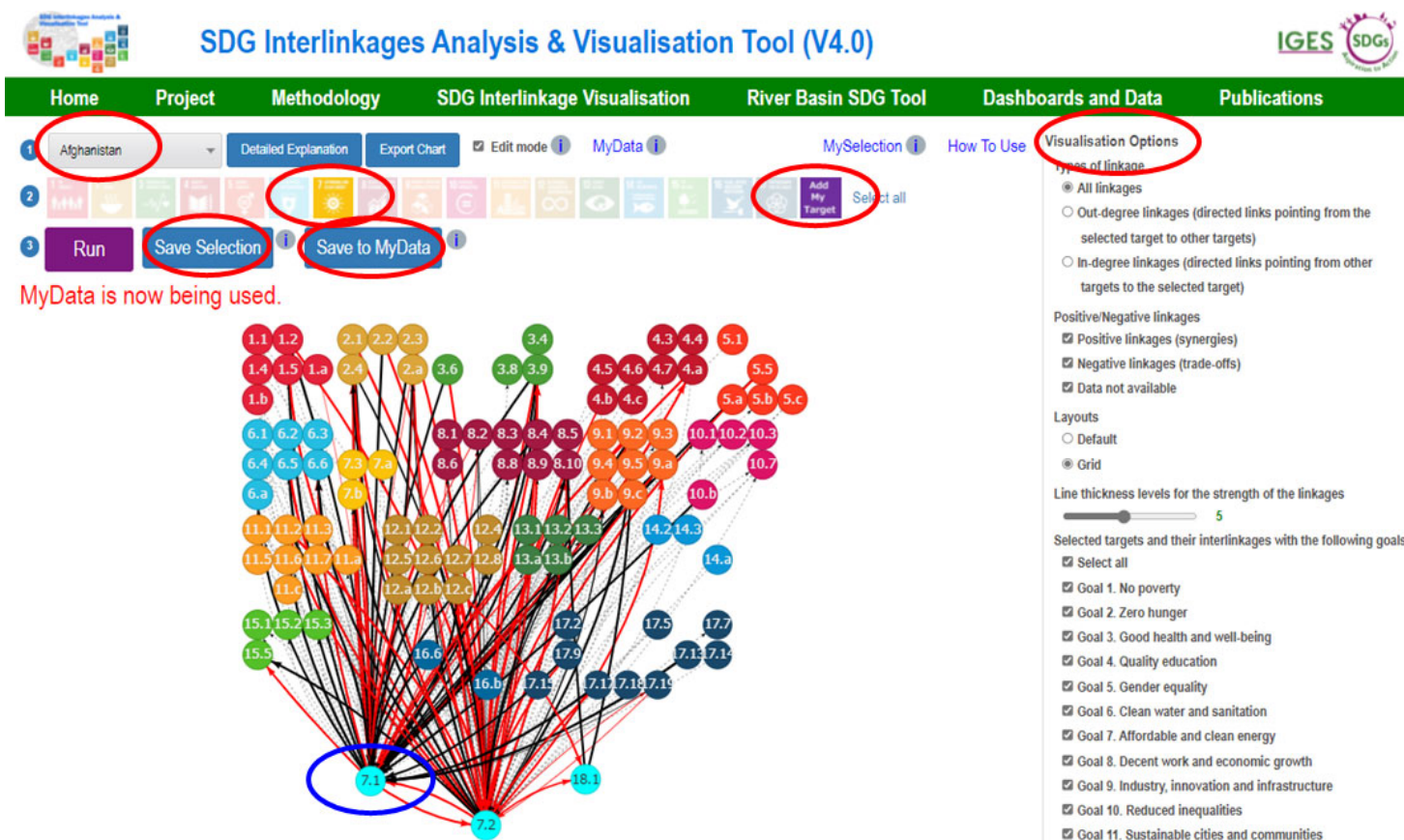
- Interlinkage matrix model for 27 countries.

	1.1	1.2	1.3	1.4	1.5	1.a	1.b	2.1	2.2	2.3	2.4	2.5	2.a	2.b	2.c
1.1		0.99	N/A	N/A	0.95			0.99	0.99	0.84	-0.93				
1.2	0.99			N/A	0.95			1.00	1.00	0.87	-0.94				
1.3	N/A	N/A		N/A	N/A			N/A	N/A	N/A	N/A				
1.4	N/A	N/A	N/A		N/A			N/A	N/A	N/A	N/A	N/A			
1.5	0.95	0.95	N/A					0.95	0.95	0.74	-0.87		0.28		
1.a	0.98	0.98	N/A	N/A			N/A	0.98	0.98	0.84	-0.93		0.37	N/A	
1.b	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2.1	0.99	1.00		N/A					1.00						
2.2	0.99	1.00						1.00							
2.3	0.84	0.87	N/A	N/A	0.74	0.84	N/A	0.86	0.86		-0.87	-0.90	0.20		
2.4	-0.93	-0.94	N/A		-0.87			-0.93		-0.87			-0.27		
2.5	-0.84	-0.87								-0.90	0.88		-0.11		
2.a	0.25	0.28					N/A			0.20	-0.27	-0.11			
2.b	N/A	N/A		N/A		N/A	N/A	N/A		N/A	N/A				
2.c	-0.99	-1.00	N/A					-1.00		-0.86	0.94				
3.1	0.99	1.00	N/A												
3.2			N/A					1.00	1.00						
3.3	0.95	0.95	N/A							0.78					
3.4	0.99	1.00	N/A												
3.5	-0.95	-0.96													
3.6	-0.93	-0.93	N/A							-0.82	0.91				
3.7	0.98	0.99	N/A					0.99	0.99						

Source: A snapshot of the correlation coefficient matrix for Ethiopia (Zhou, et al., 2021)

SDG Interlinkages Analysis & Visualisation Tool (4.0)

(<https://sdginterlinkages.iges.jp/visualisationtool.html>)



<https://sdginterlinkages.iges.jp/visualisationtool.html>

- The Tool covers 27 countries including 22 countries in Asia and 5 countries in Africa.
- Users can select a country and targets and visualise the interlinkages of selected targets with other targets.
- Using the Edit Mode, users can save their selections and results or add new linkages or new targets of their own.
- Using Visualisation Options, users can show the interactions from one or both directions, and positive or negative linkages, etc.

Dashboards on SDG synergies and trade-offs for 27 countries



SDG Interlinkages Analysis & Visualisation Tool (V3.0)



Home	Project	Methodology	SDG Interlinkages and Data Visualisation	Dashboards and Data	Publications
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East Asia:



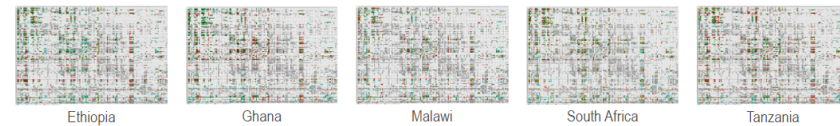
South Asia:



Southeast Asia:



Africa:



Source: Available from <https://sdginterlinkages.iges.jp/Dashboards%20and%20Data.html> (Zhou, et al., 2021).

SDG Interlinkages Analysis & Visualisation Tool: Usage analysis as of 11 November 2022

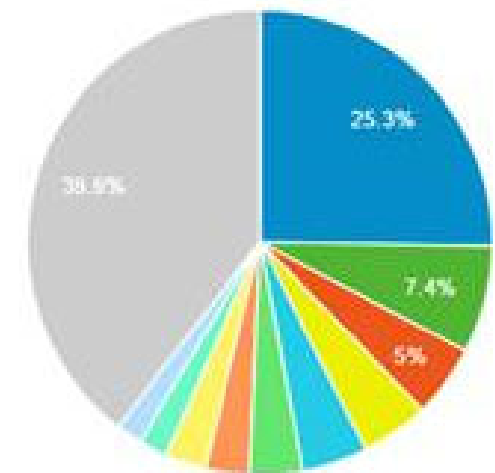
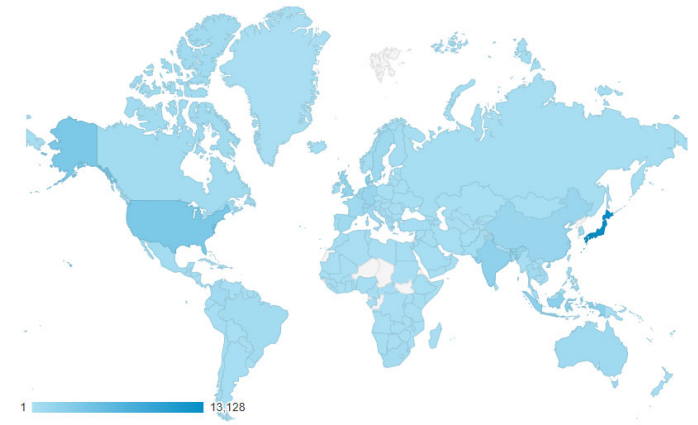
Overall usage of the SDG Interlinkages Tool

- Since its launch, accessed from **192 countries** around the world
- Total sessions: **130,000**

Top 10 countries

- Increased access worldwide
- More than three-fourth accesses are from outside Japan

1.		Japan
2.		United States
3.		Indonesia
4.		Denmark
5.		India
6.		United Kingdom
7.		China
8.		Germany
9.		Italy
10.		Netherlands



Recognition of the SDG Interlinkages Tool from UN organisations and applications by the national government in several countries

- UN 2020 HLPF on Sustainable Development Exhibition (as one of ten selected good practices and cases) <https://sustainabledevelopment.un.org/hlpf/2020#exhibit>
- UN DESA 2020 Handbook for VNR (p.25, Ghana as an example for the basic template of SDG interlinkages) https://sustainabledevelopment.un.org/content/documents/25245_Handbook_2020_EN.pdf
- UN ESCAP SDG Helpdesk Toolboxes https://sdghelpdesk.unescap.org/toolboxes?field_sdgs_target_id=All&title=&page=2 .
- United Nations Interagency Task Team on STI for the SDGs (IATT), Reference List for STI Roadmaps <https://sustainabledevelopment.un.org/TFM>
- Ghana VNR 2019 (p.87-88 on synergies and trade-offs) https://sustainabledevelopment.un.org/content/documents/23420VNR_Report_Ghana_Final_print.pdf
- Indonesia VNR 2019, VNR 2021 and national SDG roadmap https://sustainabledevelopment.un.org/content/documents/2380320190708_Final_VNR_2019_Indonesia_Rev3.pdf
- Vietnam National Action Plan on Sustainable Consumption and Production 2020–2030, approved by Vietnam's Prime Minister in June 2020 (an SDG interlinkage analysis of the draft version informing potential synergies and trade-offs) https://www.switch-asia.eu/site/assets/files/2533/national_action_plan_on_scp_vietnam_pdf_pdf.pdf.

Application of an SDG interlinkages analysis at the river basin scale

Sustainability Science
<https://doi.org/10.1007/s11625-021-01065-z>



SPECIAL FEATURE: ORIGINAL ARTICLE

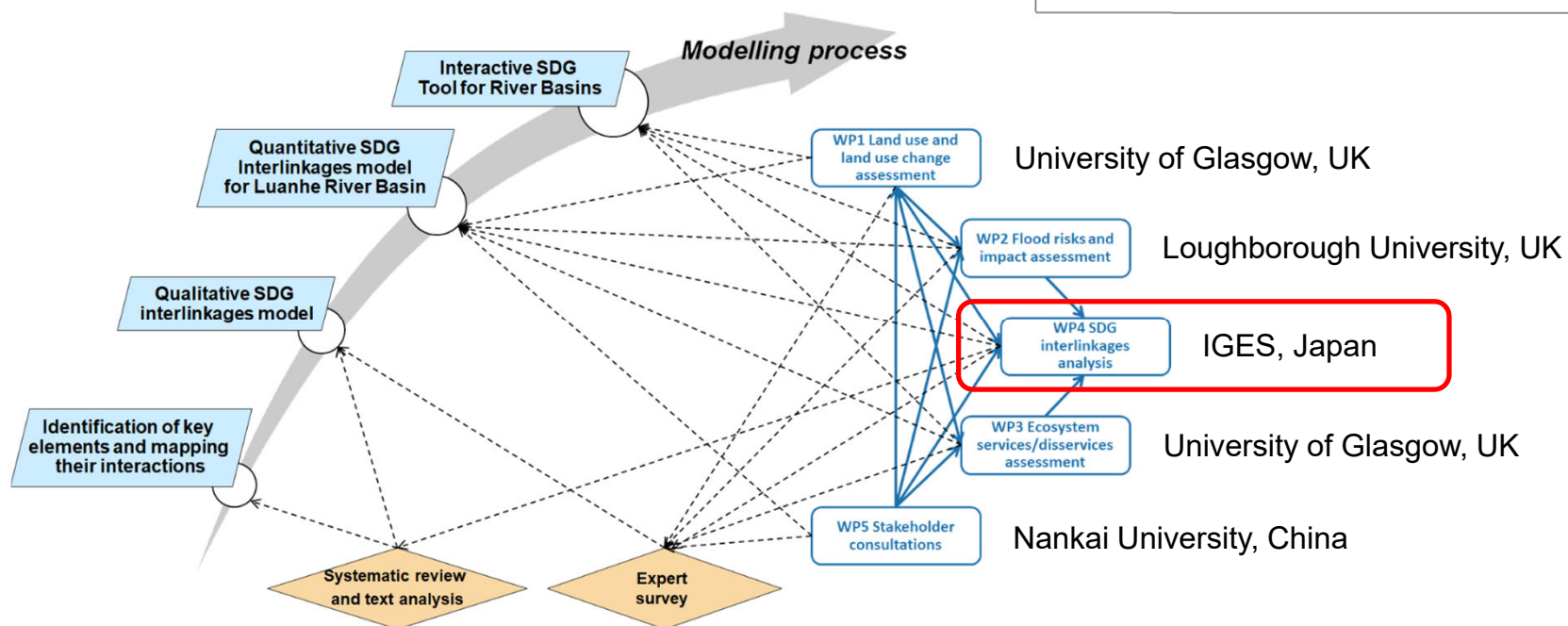
Synergies and Trade-offs between Sustainable Development Goals and Targets



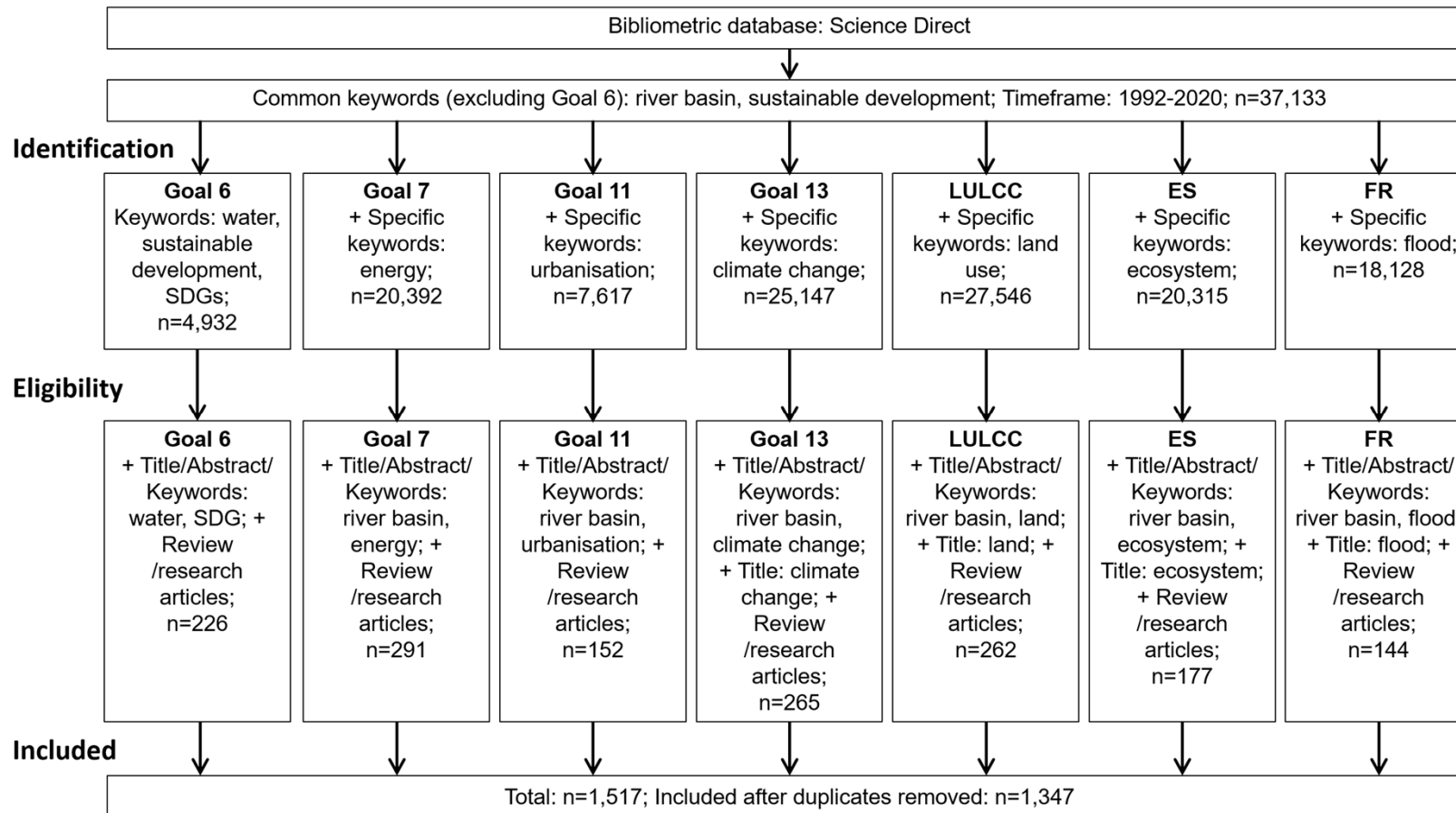
Development of an SDG interlinkages analysis model at the river basin scale: a case study in the Luanhe River Basin, China

Xin Zhou¹ · Mustafa Moinuddin¹ · Fabrice Renaud² · Brian Barrett³ · Jiren Xu² · Qiuhua Liang⁴ · Jiaheng Zhao⁴ · Xilin Xia⁴ · Lee Boshier⁴ · Suiliang Huang⁵ · Trevor Hoey⁶

Received: 7 May 2021 / Accepted: 7 November 2021
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A systematic review of the SDG interlinkages at the basin scale

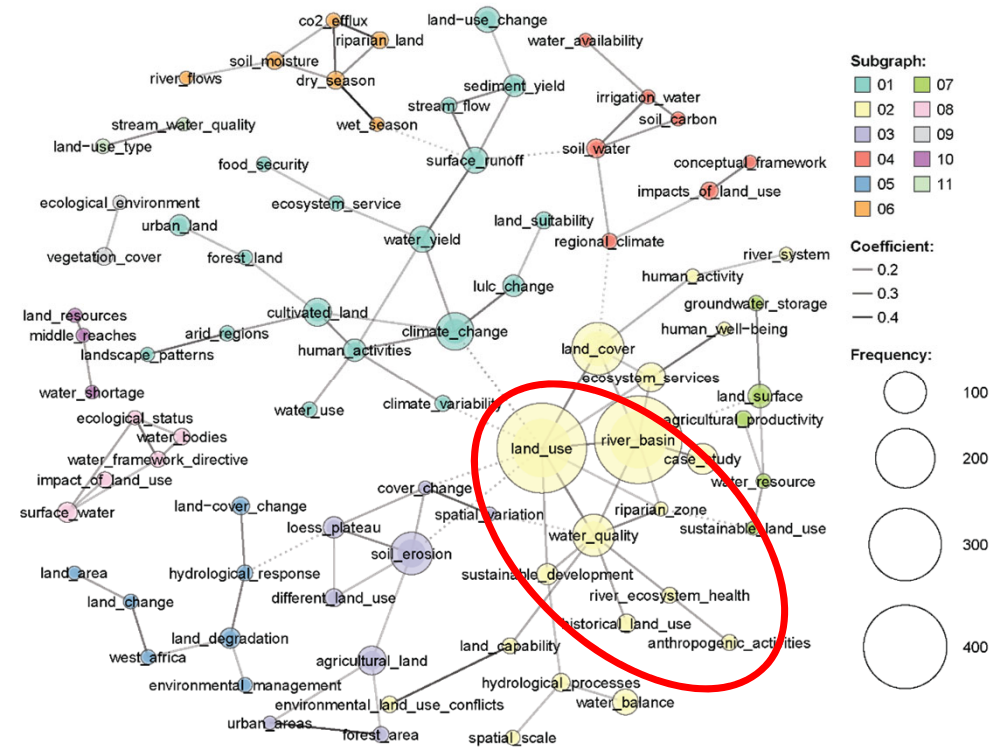


Source: Zhou, et al., 2021.

A systematic review through text mining and text analysis to identify key elements and mapping their linkages



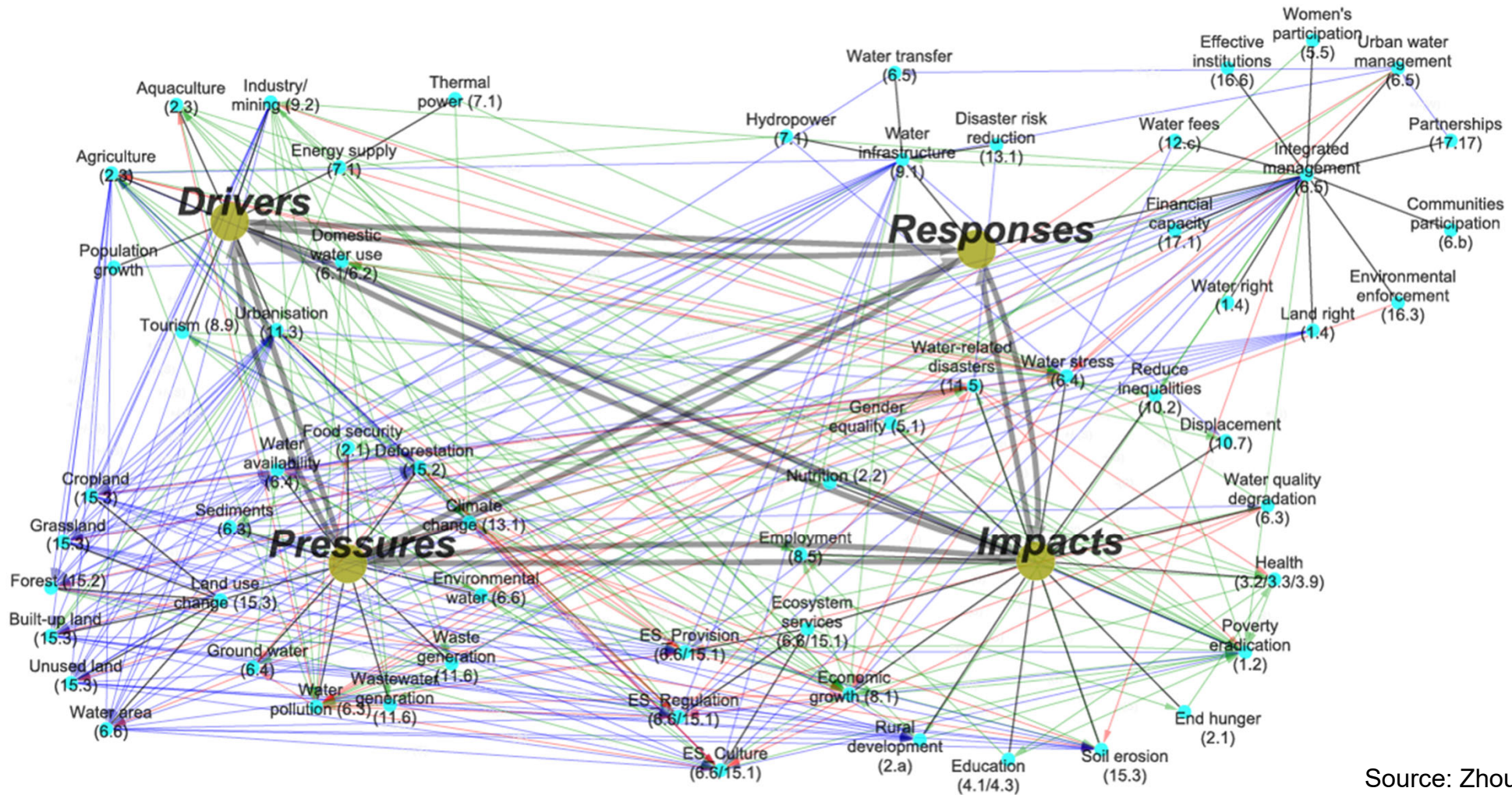
Text analysis on top words and top terms



Text analysis to map the linkages between top words/terms

Source: Zhou, et al., 2021.

An SDG interlinkage model for river basins



Source: Zhou, et al., 2021.

Validation and tailoring the model to China's Luanhe River Basin

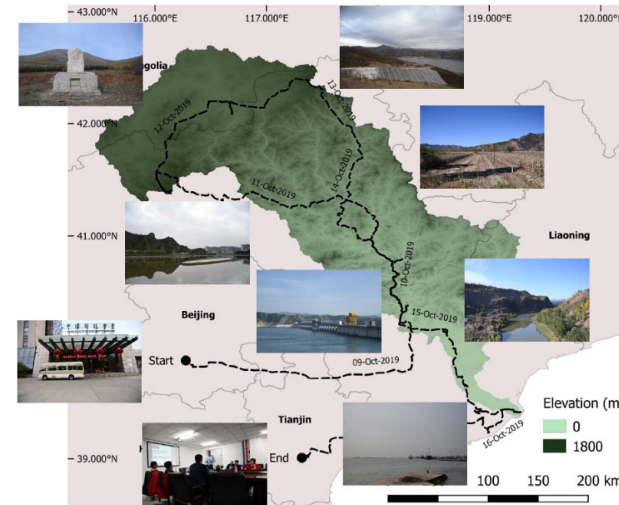


Luanhe field survey with local officials, 9-17 October 2019.



Stakeholder workshop jointly developing future land use and policy scenarios (18 October 2019).

Source: Luanhe Living Lab (<https://luanhelivinglab.home.blog/>)

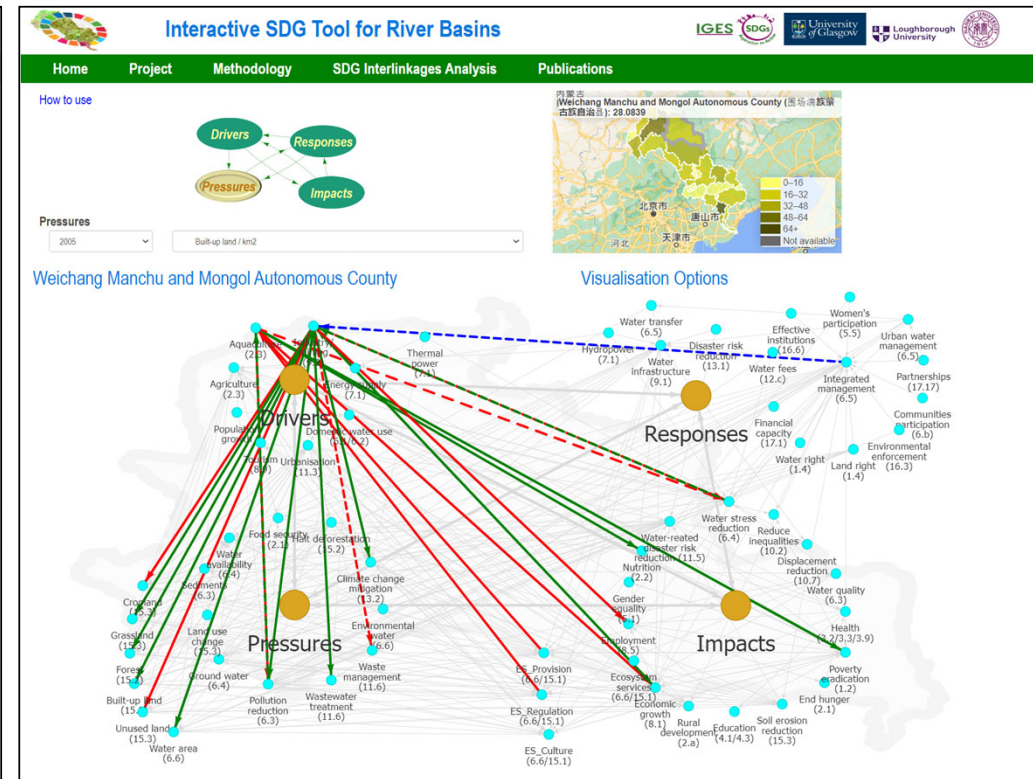
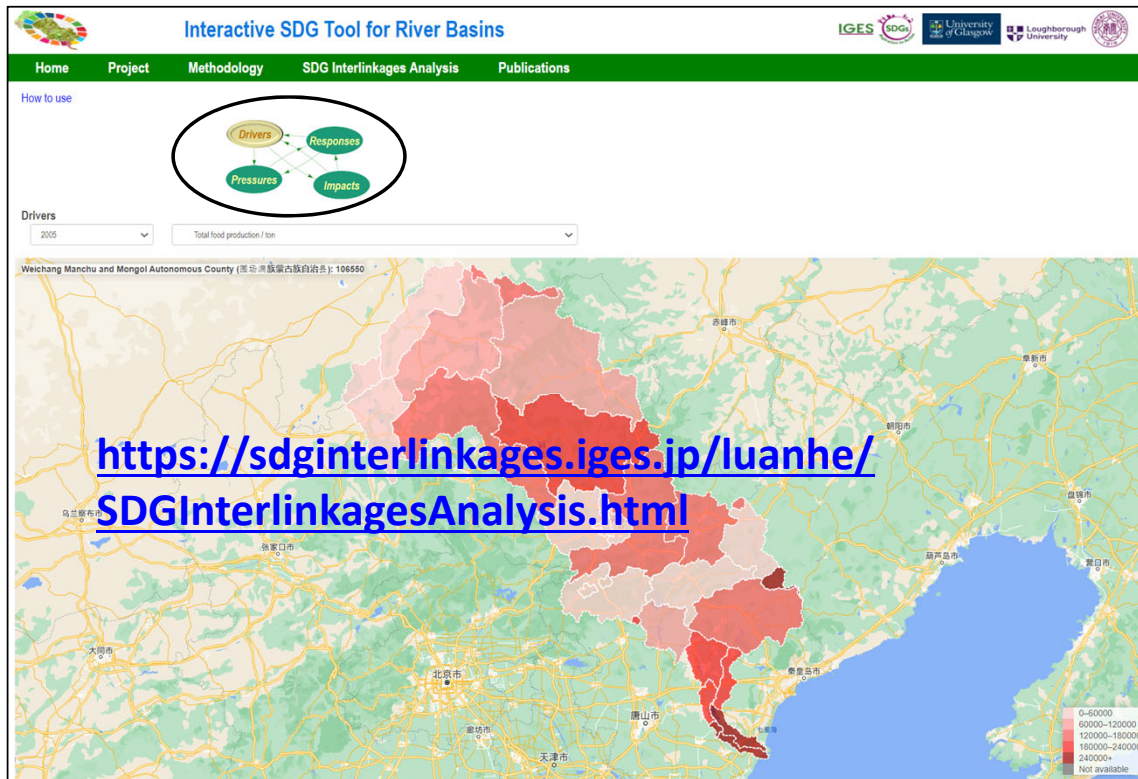


Source: Renaud, et al. 2020.

Identification of SDG interlinkages for Luanhe River Basin

- Literature review (UN flagship reports, etc.);
- Expert judgement (11 experts);
- Field trips along the river basin (1,800 km) and meetings with local officials and experts;
- Stakeholder consultation workshop and the following-up questionnaire survey through email.

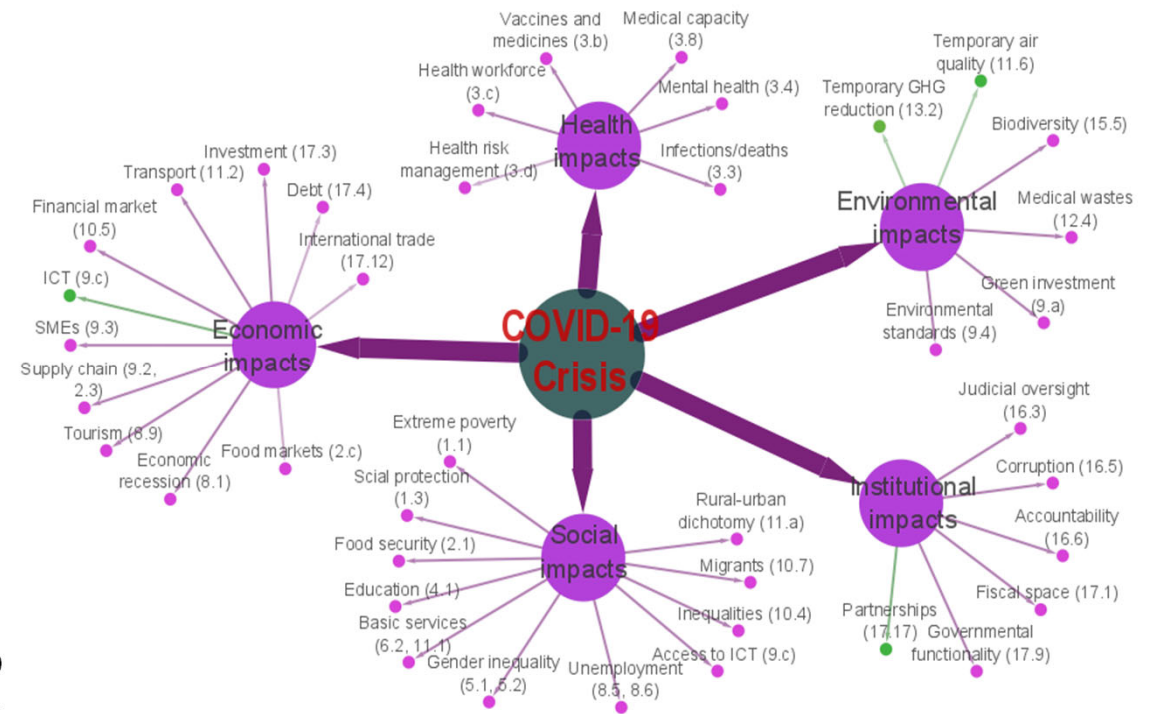
Interactive SDG Tool for River Basins



<https://sdginterlinkages.iges.jp/luanhe/SDGInterlinkagesAnalysis.html>

Source: Zhou, et al. (2022). <https://sdginterlinkages.iges.jp/luanhe/SDGInterlinkagesAnalysis.html>

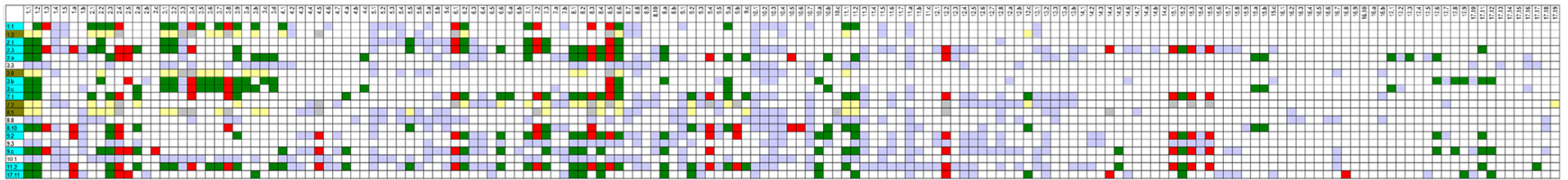
Application of the SDG Interlinkage Tool for assessing the impacts of COVID-19 in Bangladesh and the Republic of Korea



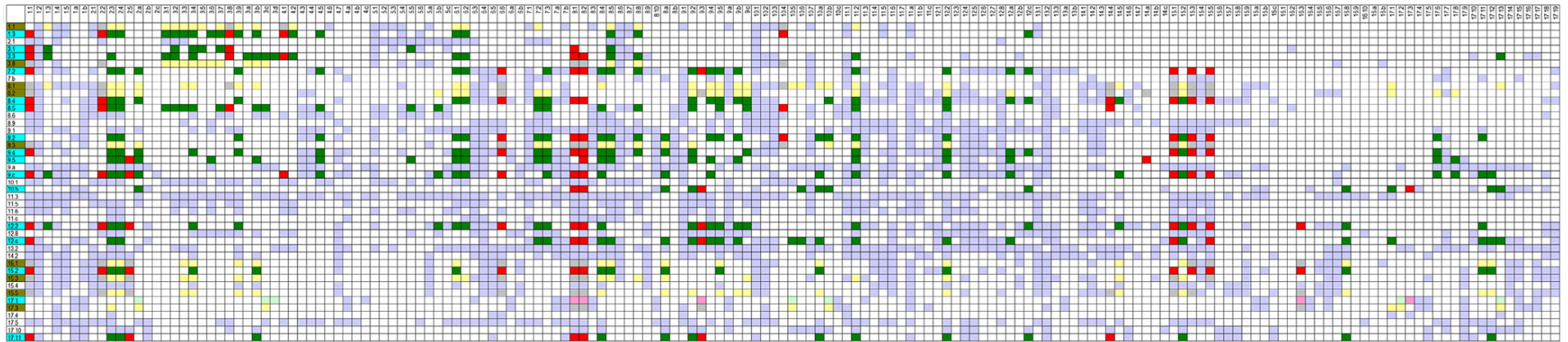
Zhou, X. and Moimuddin, M. (2021) 'Impacts and implications of the COVID-19 crisis and its recovery for achieving Sustainable Development Goals in Asia: A review from an SDG interlinkage perspective', in A.L. Ramanathan et al. (eds) *Scenarios of Environmental Resilience and Transformation in Times of Climate Change: Effects and Lessons from the COVID-19*. Elsevier.

Application of the SDG Interlinkage Tool for assessing the impacts of COVID-19 recovery measures in Bangladesh and the Republic of Korea

AIII. Dashboard on the impacts of COVID-19 measures on achieving SDGs in Bangladesh



AIV. Dashboard on the impacts of COVID-19 measures on achieving SDGs in the Republic of Korea



Colors: ■ Strengthen synergies ■ Weaken synergies ■ Intensify trade-offs ■ Mitigate trade-offs ■ Intensify development drag ■ Mitigate development drag ■ Intensify coupled deterioration ■ Mitigate coupled deterioration ■ Data not available for quantification ■ No linkage
■ Targets with a progressive trend ■ Targets with a regressive trend

Source: Zhou, X. and Moinuddin, M. (2021)

Application of the SDG Interlinkage Tool for assessing the interlinkages of sustainable infrastructure in Ghana

Sustainability Science
<https://doi.org/10.1007/s11625-021-00929-8>

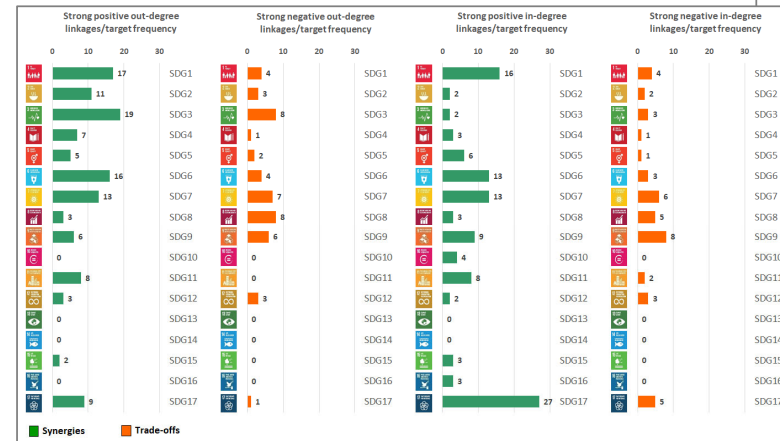
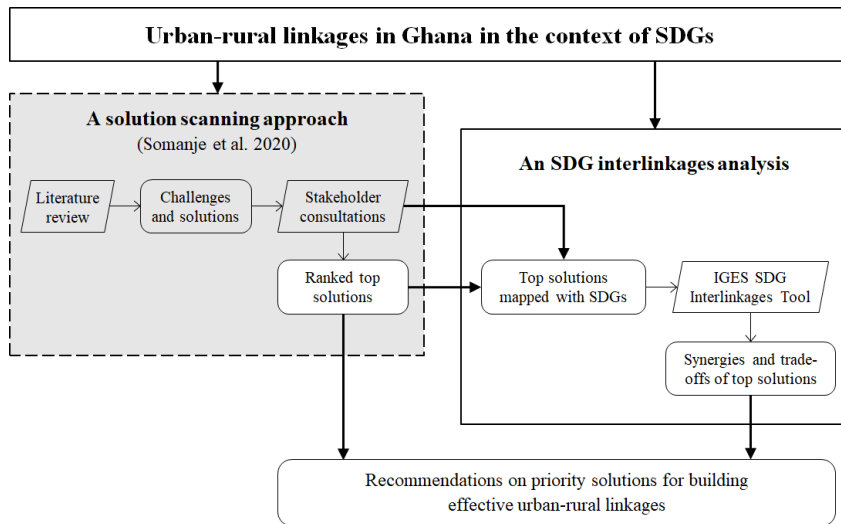
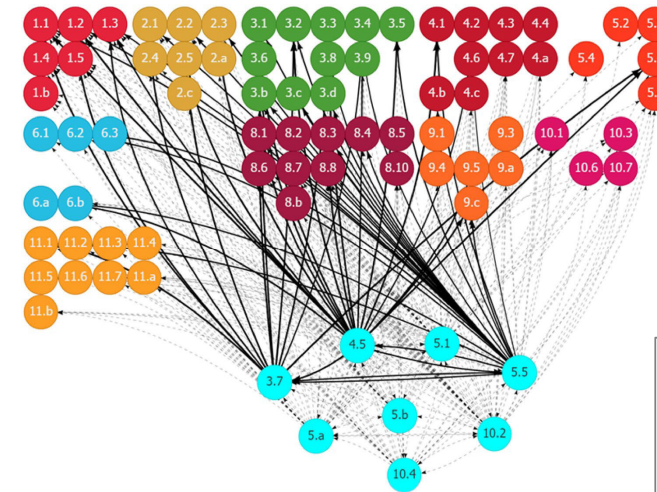
TECHNICAL REPORT

IR3S / **IGES**
 Integrated Research System for Sustainability Science / Institute for Global Environmental Studies

Urban-rural linkages: effective solutions for achieving sustainable development in Ghana from an SDG interlinkage perspective

Gideon Baffoe¹ · Xin Zhou² · Mustafa Moinneddin² · Albert Novas Somanje³ · Akihisa Kuriyama² · Geetha Mohan^{3,4} · Osamu Salto^{2,4} · Kazuhiko Takeuchi^{2,4}

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Department of Economic and Social Affairs (DESA)
United Nations

Application for Goal 13 (climate actions) by using AI-based Natural Language Processing to systematically extract key climate-SDG linkages



AAAI 2022 Fall Symposium: The Role of AI in Responding to Climate Challenges

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Using Natural Language Processing for Automating the Identification of Climate Action Interlinkages within the Sustainable Development Goals

Xin Zhou¹, Kshitij Jain², Mustafa Moinuddin¹, Patrick McSharry^{3,4,5}

¹Institute for Global Environmental Strategies, 2108-11 Kamiyamaguchi, Hayama, Kanagawa, 240-0115 Japan; ²Google Inc.; ³Carnegie Mellon University Africa, Kigali, Rwanda; ⁴African Centre of Excellence in Data Science, University of Rwanda, Kigali, Rwanda; ⁵Oxford Man Institute of Quantitative Finance, Oxford University, Oxford, UK.
zhou@iges.or.jp, kshitijj@google.com, moinuddin@iges.or.jp, patrick@mcsharry.net

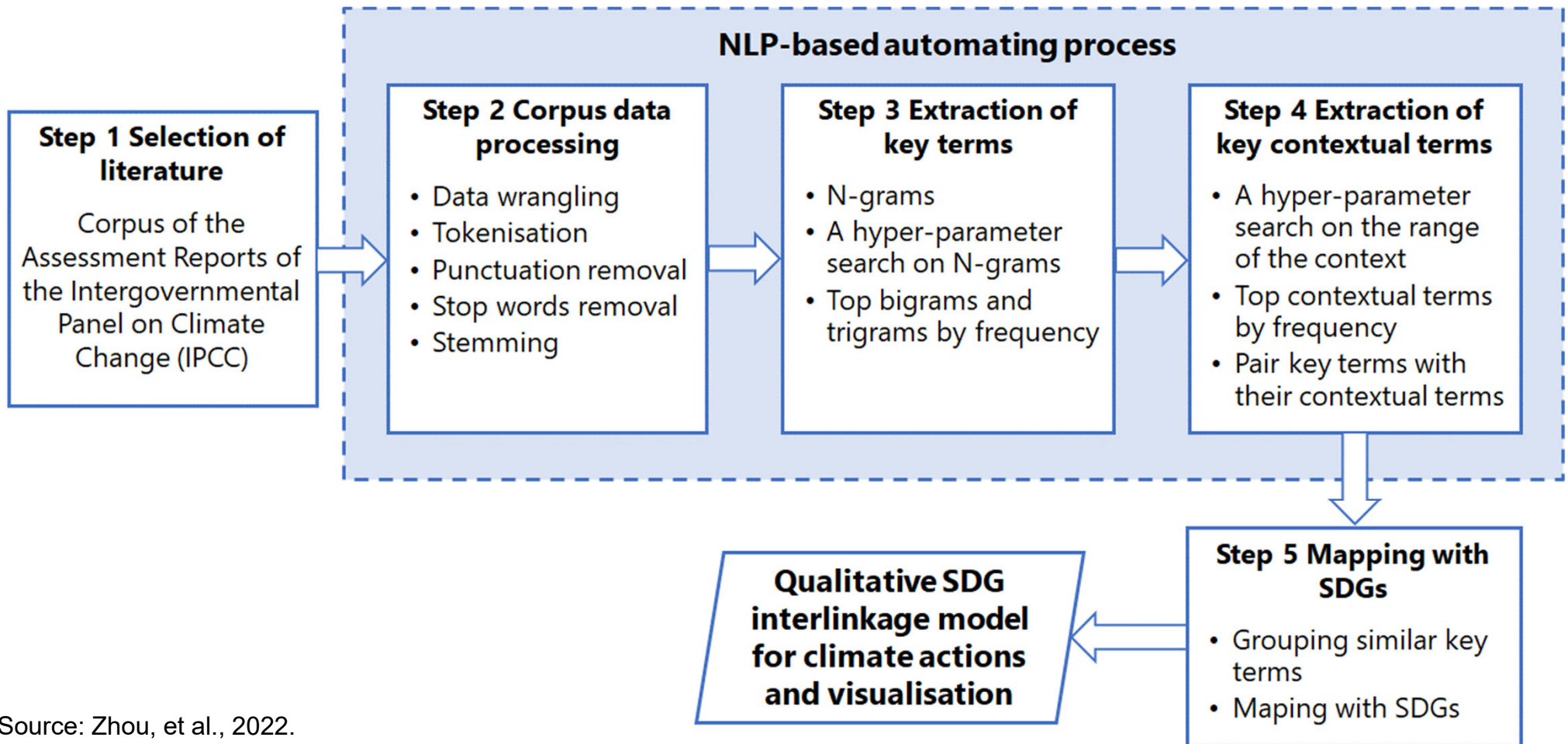
Abstract

Climate action, Goal 13 of the UN Sustainable Development Goals (SDG), cuts across almost all SDGs. Achieving climate goals can reinforce the achievements in many other goals, but at the same time climate mitigation and adaptation measures may generate trade-offs, such as levelling the cost of energy and transitioning away from fossil fuels. Leveraging the

Leveraging the synergies and minimizing the trade-offs among climate goals and other SDGs is an imperative task for ensuring policy coherence. Understanding the interlinkages of climate action within the SDGs can help inform about the synergies and trade-offs.

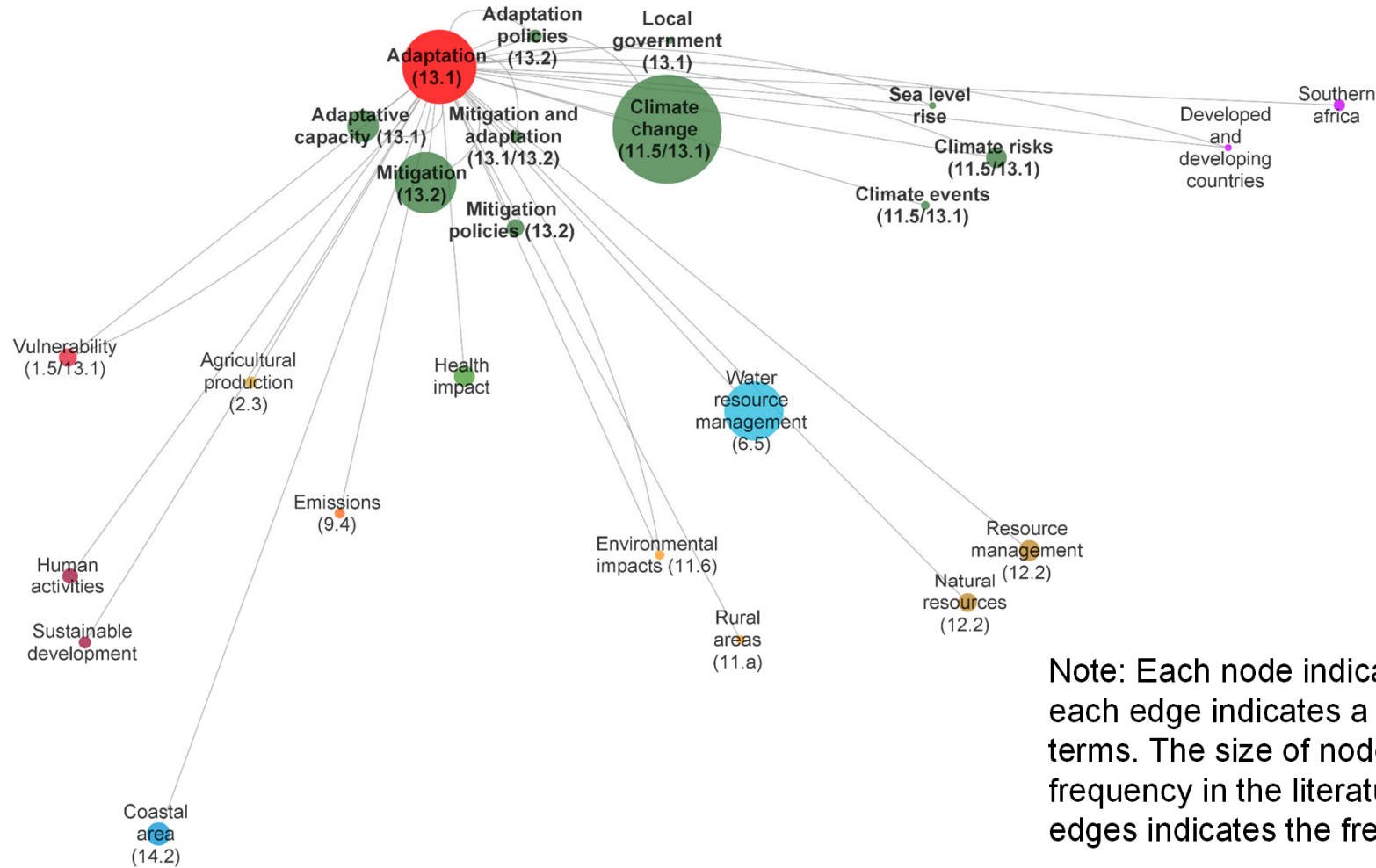
There is a gap in the scientific knowledge about how the

Methodology: Using NLP to systematically extract key SDG linkages from climate change literature



Source: Zhou, et al., 2022.

Climate adaptation and linkages with the SDGs



Note: Each node indicates a key term and each edge indicates a link between a paired terms. The size of nodes indicates their frequency in the literature and the width of edges indicates the frequency of paired terms.

Areas of application

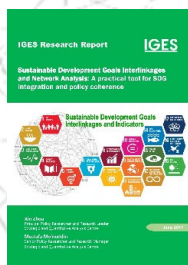
- 🌍 The SDG interlinkages tool can be used to inform policy makers on the interactions between climate action and SDGs and identify system challenges and solutions (e.g. integrated priority setting and institutional and financial arrangement).
- 🌍 The SDG interlinkages tool can be used to communicate among stakeholders on the synergies and trade-offs and help reconcile conflicting interests and turn into win-win solutions.
- 🌍 The SDG interlinkages tool can help raise the awareness on systemic impacts of climate change and raise urgency for taking action.
- 🌍 IGES is providing technical assistance to West Java on facilitating the integration of the SDGs into the development of a long-term climate mitigation strategy
 - Stakeholder consultation (questionnaire survey and focus group discussion) aiming at raising the awareness and co-creation of local knowledge on climate-SDG interactions, identifying priority areas and seeking system solutions.

Further reading

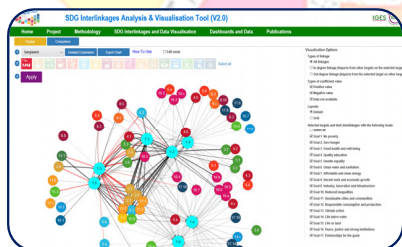
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Thank you!

Contact: zhou@iges.or.jp



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