

Understanding SDG synergies and trade-offs for sustainable, resilient and inclusive development

River basins as 'living laboratories' for achieving sustainable development goals across national and sub-national scales

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The Sustainable Development Goals

SUSTAINABLE DEVELOPMENT GOALS



Integrated and Indivisible



Goal interaction scoring

GOALS SCORING

INDIVISIBLE

The strongest form of positive interaction in which one objective is inextricably linked to the achievement of another. Reduction of air pollution (12.4) is indivisible from improved health and reducing non-communicable diseases (3.4).

+3

REINFORCING

One objective directly creates conditions that lead to the achievement of another objective. Increasing economic benefits from sustainable marine resources use (14.7) reinforces the creation of decent jobs and small enterprise in e.g. tourism (8.5 and 8.9)

+2

ENABLING

The pursuit of one objective enables the achievement of another objective. Developing infrastructure for transport (9.1) enables participation of women in the work force and in political life (5.5)

+1

CONSISTENT

A neutral relationship where one objective does not significantly interact with another or where interactions are deemed to be neither positive nor negative. By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution (14.1) is consistent with target 3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.

0

CONSTRAINING

A mild form of negative interaction when the pursuit of one objective sets a condition or a constraint on the achievement of another. Conserving coastal areas (14.5) and development of safe affordable housing and basic services (11.1) may constrain each other

-1

COUNTERACTING

The pursuit of one objective counteracts another objective. Ensuring access to safe, nutritious and sufficient food can counteract sustainable water withdrawals (6.4) and reduction of chemicals releases (12.4)

-2

CANCELLING

The most negative interaction is where progress in one goal makes it impossible to reach another goal and possibly leads to a deteriorating state of the second. A choice has to be made between the two. Developing infrastructure (9.1) could be cancelling the reduction of degradation of natural habitats in terrestrial ecosystems (15.1)

-3

Outdoor and indoor air pollution is responsible for 7 million deaths annually, as well as respiratory and cardiovascular disease but also increases in perinatal deaths. In 2012, ambient (outdoor) air pollution was responsible for 3 million deaths, representing 5.4% of the total deaths. Worldwide, ambient air pollution is estimated to cause about 25% of the lung cancer deaths. Major urban centers in low and middle-income countries are the most exposed to this burden. (WHO, 2016).

Sustainable and diversified strategies for using the marine resource base open up opportunities for small enterprises in fisheries or other harvesting and associated value-addition activities, as well as activities related to tourism. Many SIDS and LDCs that are rich in these resources also have poor, vulnerable and marginalized coastal communities.

Affordable public transport promotes social inclusion, more equal access to different parts of the city, and enabling employment for marginalized groups. In many places, women do not have access to a car and depend on public transport, walking or bicycling to get around, to work places and to social or political activities (NCE, 2016; GSDR, 2016)

There is no significant interaction between the two targets.

Establishing protection areas in the coastal zone and expanding urbanization, infrastructure or transport risks spatial competition especially in densely populated areas. Integrated coastal zone management and marine spatial planning tools are readily available to mitigate spatial competition.

Increasing productivity in agriculture is a necessary (but not sufficient) condition to improve food security. In many places, this might entail increased and/or better irrigation as well as increased use of agro-chemical inputs.

In underdeveloped regions, developing roads, dams, and power grids might be a high priority, although it will cause some unavoidable fragmentation of habitats and compromising the integrity of the natural ecosystem, leading to risks to biodiversity as well as social risks.



Total interaction score between targets of 3 SDGs

	6.1	6.2	6.3	6.4	6.5	6.6	6.a	6.b	2.1	2.2	2.3	2.4	2.5	2.a	2.b	2.c	7.1	7.2	7.3	7.a	7.b
6.1		1	2	2	3	1	1	2	0	0	0	1	3	3	-1	1	2	2	2	3	2
6.2	1		2	2	3	1	1	3	1	1	1	1	3	3	-1	1	2	2	2	3	2
6.3	2	2		2	3	2	1	3	2	2	2	2	3	3	0	1	2	3	2	3	2
6.4	2	2	2		3	2	1	3	2	2	2	2	3	3	0	1	2	3	2	3	2
6.5	3	3	3	3		2	2	3	3	3	3	3	3	3	0	1	3	3	2	3	3
6.6	1	1	2	2	2		2	1	-1	-1	-1	0	2	2	-1	1	2	1	2	2	1
6.a	1	1	1	1	2	2		2	0	0	0	1	2	2	-1	1	1	2	2	2	1
6.b	2	3	3	3	3	1	2		2	2	2	2	3	-1	3	1	3	2	2	3	3
2.1	0	1	2	2	3	-1	0	2		-1	-1	0	3	1	-1	-1	1	1	1	3	-1
2.2	0	1	2	2	3	-1	0	2	-1		-1	0	3	1	-1	-1	1	1	1	3	-1
2.3	0	1	2	2	3	-1	0	2	-1	-1		0	3	1	-1	-1	1	1	1	3	-1
2.4	1	1	2	2	3	0	1	2	0	0	0		3	3	0	1	2	2	2	3	1
2.5	3	3	3	3	3	2	2	3	3	3	3	3		3	0	1	3	3	2	3	3
2.a	3	3	3	3	3	2	2	-1	1	1	1	3	3		-1	0	3	3	2	3	2
2.b	-1	-1	0	0	0	-1	-1	3	-1	-1	-1	0	0	-1		-1	-1	-1	-1	0	-1
2.c	1	1	1	1	1	1	1	1	-1	-1	-1	1	1	0	-1		1	1	1	1	0
7.1	2	2	2	2	3	2	1	3	1	1	1	2	3	3	-1	1		3	2	3	2
7.2	2	2	3	3	3	1	2	2	1	1	1	2	3	3	-1	1	3		2	3	3
7.3	2	2	2	2	2	2	2	2	1	1	1	2	2	2	-1	1	2	2		2	2
7.a	3	3	3	3	3	2	2	3	3	3	3	3	3	3	0	1	3	3	2		3
7.b	2	2	2	2	3	1	1	3	-1	-1	-1	1	3	2	-1	0	2	3	2	3	

4 = indivisible	(-4) = cancelling
3 = supporting	(-3) = restricting
2 = reinforcing	(-2) = counteracting
1 = enabling	(-1) = constraining
0 = consistent	

Existing methodologies for SDG interlinkage studies

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, several 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 wetland scapes	33 relevant targets	Target level	Questionnaire survey, seven-point typology, network analysis

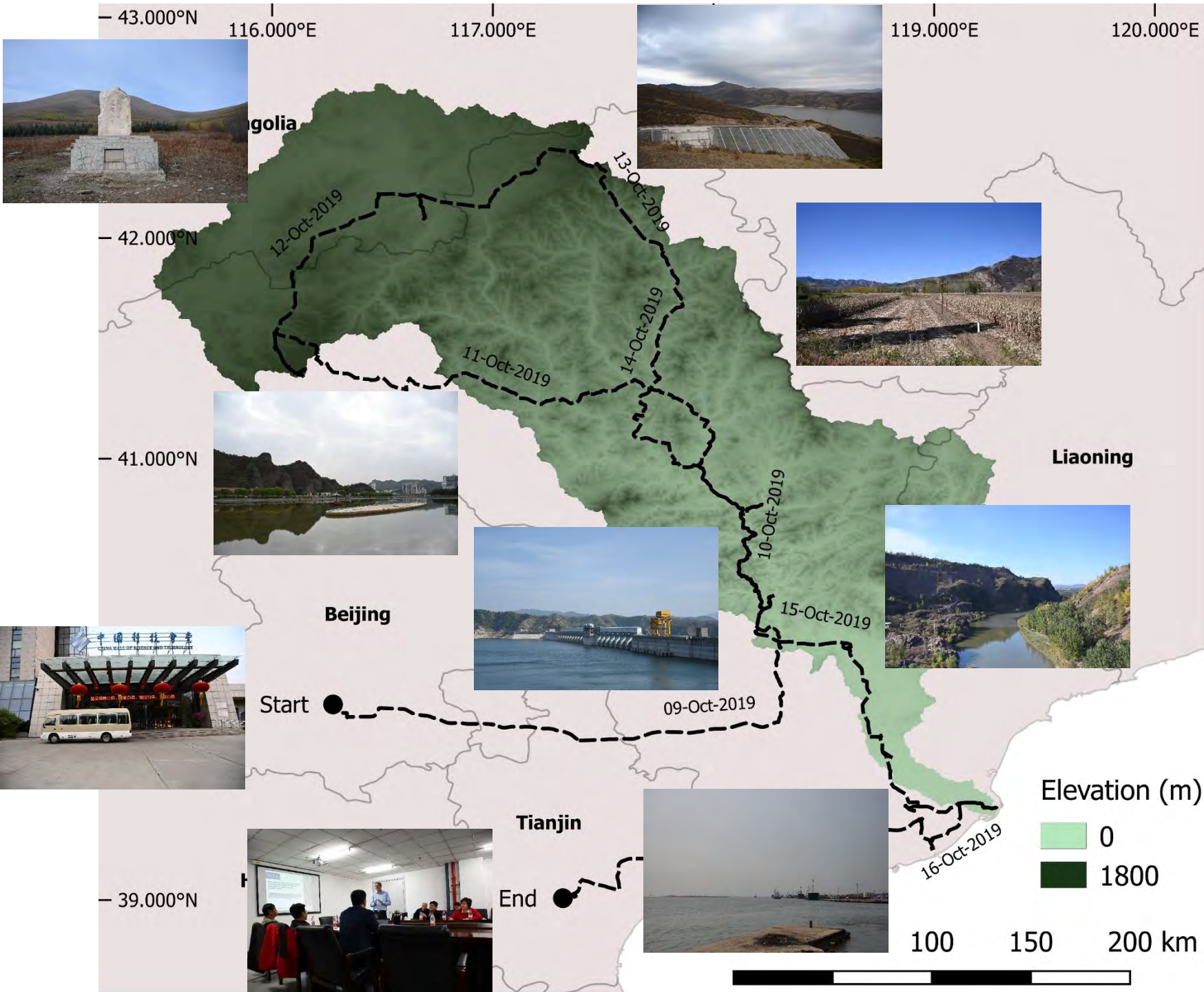
Project Hypothesis and Aim

Links between national and sub-national agenda can be contested as targets acted upon at the local level¹

Hypothesis: Trade-offs between goals and targets at the sub-national scale create inequalities between segments of society in terms of achieving the SDGs at the national level

Overarching Aim: provide scientifically-grounded, policy-relevant information on the synergies and trade-offs between selected sustainable development goals and targets within a large river basin

¹Source: Nilsson et al (2016): A draft framework for understanding SDG interactions. ICSU. Available at: <https://council.science/wp-content/uploads/2017/05/SDG-interactions-working-paper.pdf>



Land use change scenarios



“Trend”

Follows the Middle of the Road shared socioeconomic pathway (SSP2), which is a pathway of socio-economic trend does not shift markedly from historical patterns, with relatively low commitment to achieve development goals



“Sustainability”

Follows the Sustainable shared socioeconomic pathway (SSP1) “National planning on medium- and long-term food security” (2008–2020) and “General Land Use Planning in Hebei Province (2006–2020)”



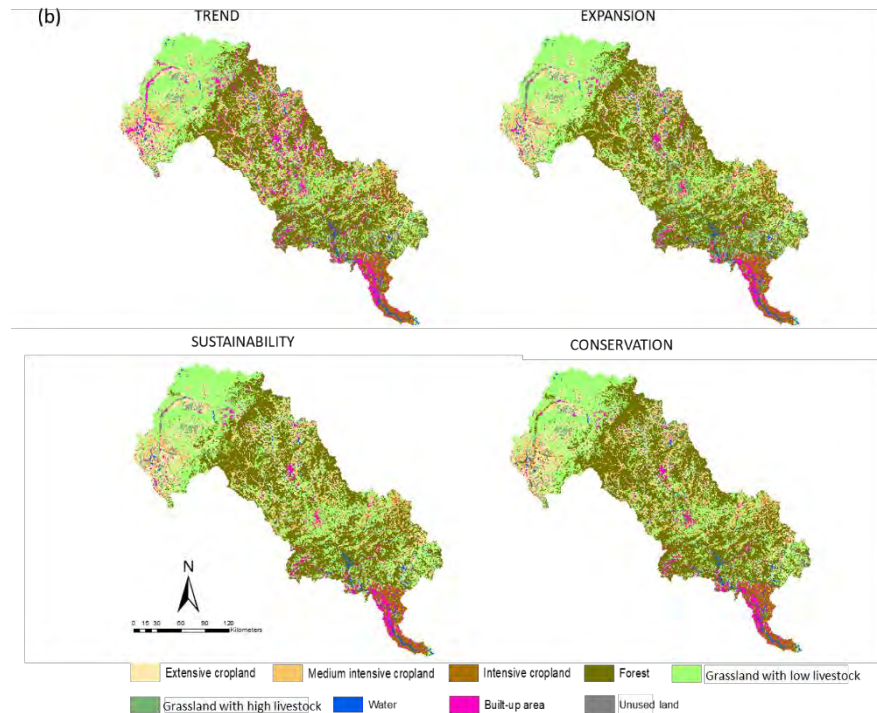
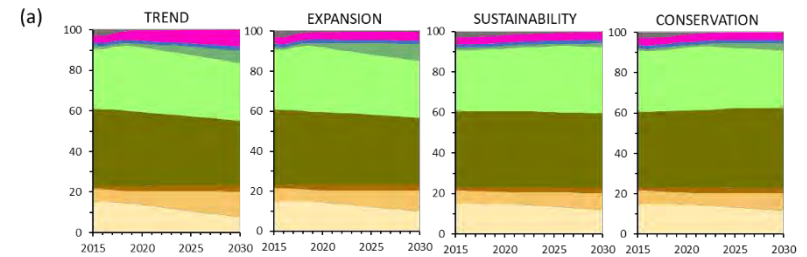
“Expansion”

Follows the fossil-fueled development shared socioeconomic pathway (SSP5), where people exploit abundant fossil fuel resources, the global economy grows at the highest speed.



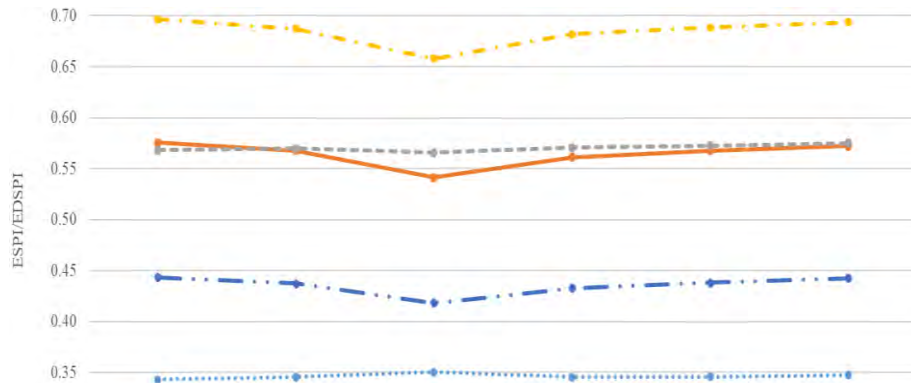
“Conservation”

Sustainability scenario was used as a baseline, extended by the implementation of the ecological restoration and protection policy targets
A series of policies promoting afforestation have been implemented for biodiversity conservation and sand fixation.



Land use change from 2015 to 2030 in LRB under different scenarios. (a) Quantitative change. (b) Land system maps in 2030

Ecosystem services



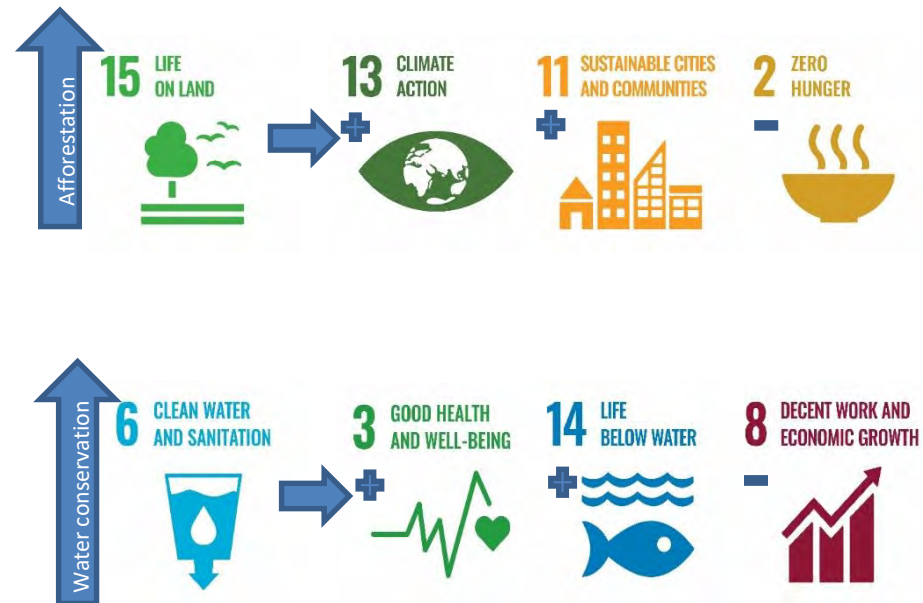
	1980	2018	2030 Trend	2030 Expansion	2030 Sustainability	2030 Conservation
PS	0.443	0.437	0.418	0.433	0.438	0.443
RS	0.576	0.568	0.541	0.561	0.568	0.572
CS	0.568	0.570	0.566	0.571	0.572	0.575
EI	0.696	0.687	0.658	0.682	0.689	0.694
EDS	0.343	0.345	0.350	0.345	0.346	0.347

ESPI of PS ($ESPI_{PS}$), RS ($ESPI_{RS}$), CS ($ESPI_{CS}$), EI ($ESPI_{EI}$) and EDSPI dynamic under past (1980), current (2018) and future (2030) land use

The ESPI of all the ESs declined from 1980 to 2018 and will continue to decline until 2030 without sustainable and conservational development strategy (i.e. *Sustainability* and *Conservation* scenarios).

Compared with the EDSPI in 1980, the EDSPI under all future scenarios in 2030 are projected to be increased.

SDG synergies and tradeoffs



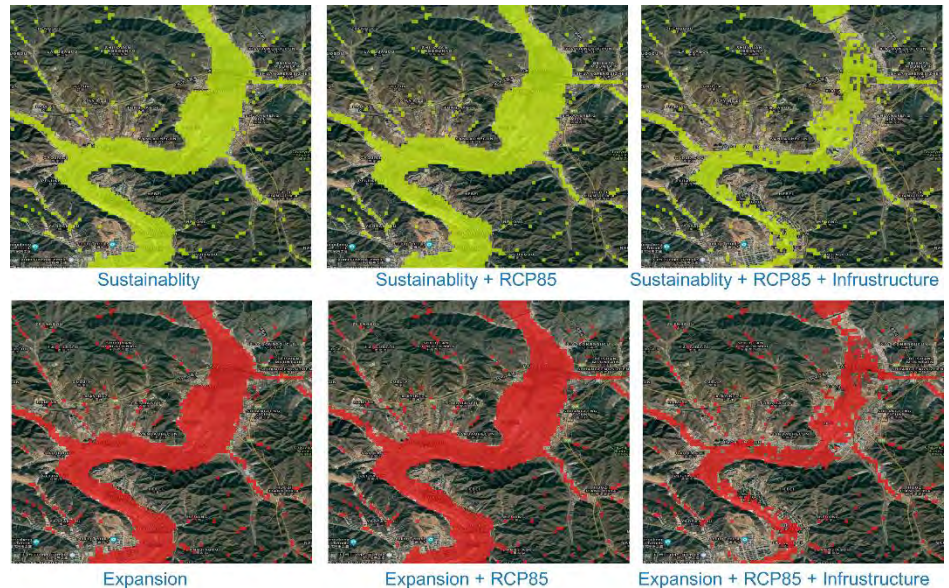
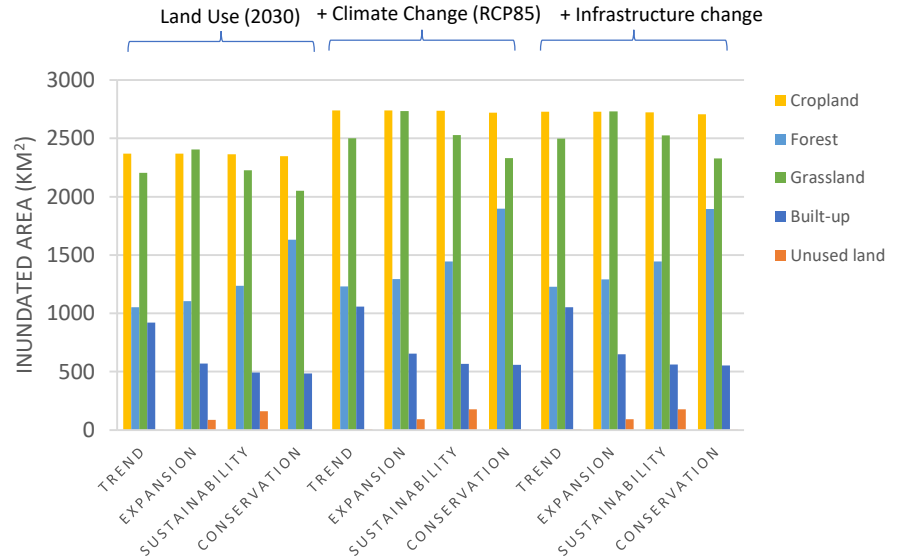
Flood risk assessment under different development strategies

A newly develop framework is used for evaluating the flood risk for LRB with considering the influence from:

- Land use under different development strategies:
 - Trend; Expansion; Sustainability; Conservation
- Climate change:
 - RCP45; RCP85
- Infrastructure change:
 - Shuangfengsi reservoir

Key conclusions:

- Trend development strategy will result in the highest flood risk for the urban area
- The climate change will cause a higher flood risk in LRB
- Shuangfengsi reservoir can effectively decrease the flood risk for its downstream but little influence on the inundation area for the whole basin



The flood assessment under different developing strategies (inundation statistics for LRB (upper) and flood map at downstream of Shuangfengsi reservoir (lower))

Link to SDG Interlinkages Analysis and Visualisation Tool



SDG Interlinkages Analysis & Visualisation Tool (V3.0)

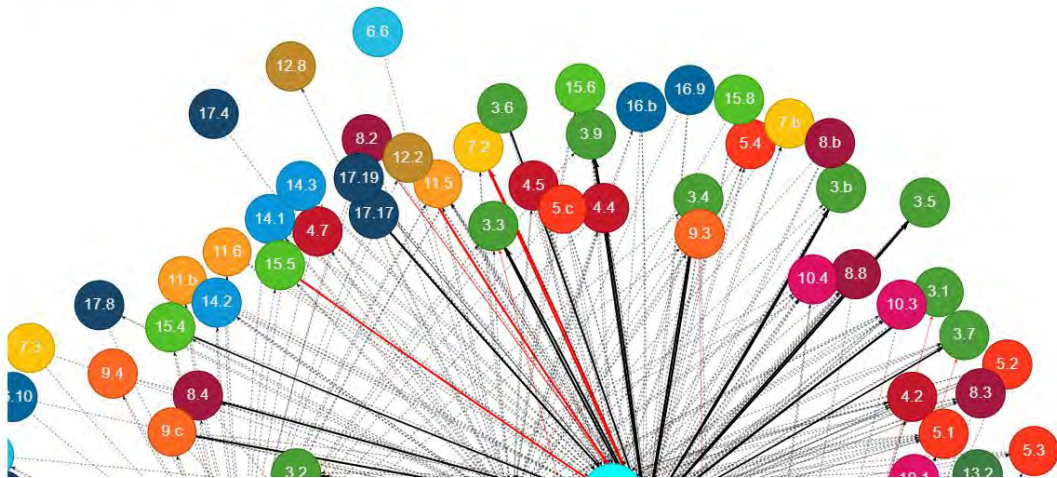


Home Project Methodology **SDG Interlinkage Visualisation** River Basin SDG Tool Dashboards and Data Publications

1 Afghanistan ▾ Detailed Explanation Export Chart Edit mode ⓘ How To Use

2  Select all

3 Apply



Visualisation Options

Types of linkage

- All linkages
- Out-degree linkages (directed links pointing from the selected target to other targets)
- In-degree linkages (directed links pointing from other targets to the selected target)

Positive/Negative linkages

- Positive linkages (synergies)
- Negative linkages (trade-offs)
- Data not available

Layouts

- Default
- Grid

Line thickness levels for the strength of the linkages

Selected targets and their interlinkages with the following goals

- Select all
- Goal 1. No poverty
- Goal 2. Zero hunger
- Goal 3. Good health and well-being
- Goal 4. Quality education



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Interlinkages Analysis also a component
of the Living Deltas Hub project

The screenshot shows the homepage of the Living Deltas Research Hub. The header is green with a white navigation bar. The main content area features a large, high-contrast image of a delta landscape with the text "Living DELTAS RESEARCH HUB" overlaid in white. The navigation bar includes links for Home, Overview, People, Blog, News, Events, and Resources. Logos for UK Research and Innovation and GCRF are also visible.

Living
DELTA
RESEARCH HUB

Select Language

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Thank You!

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<https://luanhelivinglab.home.blog/>



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