



Sustainability Assessment of Urban Systems

(ENV-461) – BS 170

6: Indicators for Urban Sustainability (2)

Lecturers:

Prof. Dr. Claudia R. Binder
Gloria Serra-Coch

Assistants:

Gloria Serra Coch, Ankita Singhvi, Giulia Frigo, Simon Ladino Cano, Hanbit Lee



MONET .
a practical
example

Introductory remarks

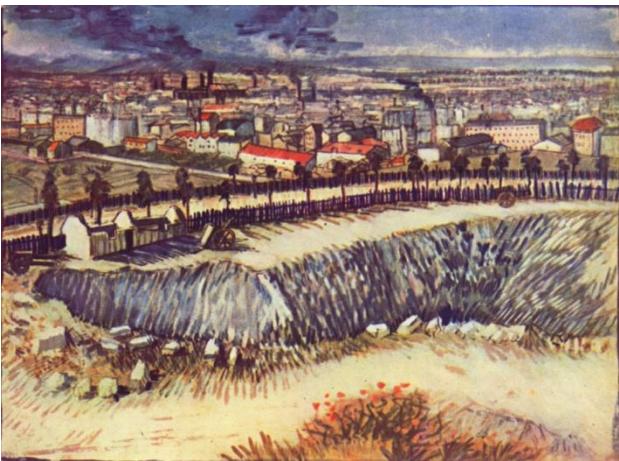
- MONET
(Monitoring der Nachhaltigen Entwicklung = sustainable development monitoring)
- MONET 2030
(Monitoring of the Agenda 2030 for Switzerland)

Introductory remarks

... on MONET and Cercle Indicateurs:

- Products of the public administration
- Based on the principles of official statistics
- Main data source: official statistics
- 3-dimensional model of SD, no “environmental sustainability”
- Intended audience: decision-makers, policy-makers, academics, (interested) general public

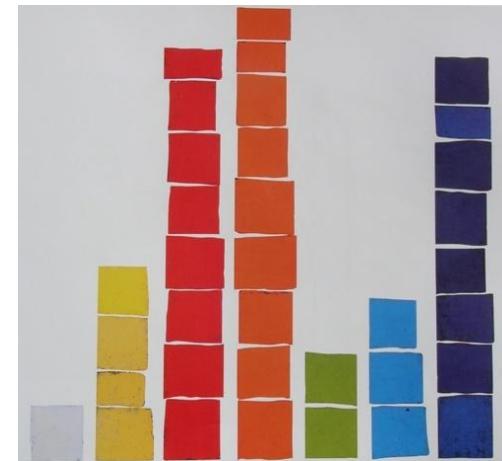
From indicators to an indicator system



The « real » world

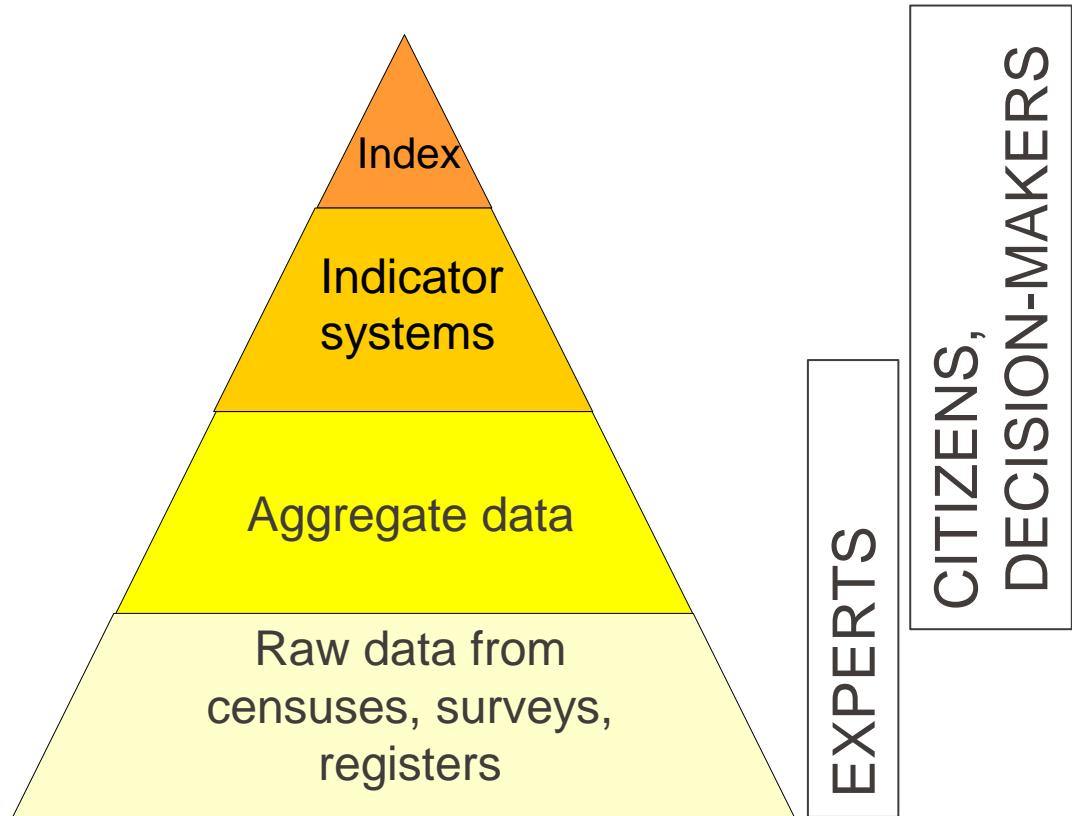


Indicator system



Statistical data

The information pyramid



Adapted from Braat, 1991

The challenge

To reconcile

Sustainable development

- A normative and ambiguous notion
- An ever-evolving process
- Diverging interests and expectations
- A complex communication

With

The mission and requirements of official statistics

Bellagio Principles...

- Set of guiding principles to measure and assess progress toward sustainable development
- Established by a group of experts
- 1996 first release of the principles
- 2009 second release of the principles: BellagioSTAMP (**SusTainability Assessment and Measurement Principles**)



Guidelines for the choice and design of indicators, their interpretation and communication of the result:

- Clear vision of what SD is
- Understanding of the “whole” system (e.g. social, economic, environmental), including interactions
- Adequate scope (temporal and spatial scale)
- Conceptual framework
- Standardised measurement methods (comparability)





Guidelines (continued):

- Comparison of indicator values with targets
- Transparency (including about assumptions made)
- Limited number of indicators
- Effective communication
- Participation of the main groups involved (legitimacy !)
- Continuity and capacity

- Rio Agreements 1992, Agenda 21 (chap. 40)
- Swiss Federal Constitution (Art. 2 and 73)
- Sustainable Development Strategy of the Swiss Federal Council (since 1997, current Strategy for the period 2016-19)
- Agenda 2030 (17 Sustainable Development Goals SDGs, 169 targets)
Accepted in September 2015 by the United Nations General Assembly

Construction and structure of MONET

- 3 qualitative objectives
- 47 principles of sustainable development
- 73 indicators
- Each indicator relates to at least one principle
(allows the definition of the desired evolution)
- Built in a participative manner

FRAME OF REFERENCE



3

qualitative
objectives



47 SD
principles

17 SDGs (Agenda 2030)



169
Swiss targets



Brundtland definition

Social solidarity

Principles on

- Living conditions
- Equal opportunity
- Social cohesion
- International solidarity
- Maintenance of human capital

Economic efficiency

Principles on

- Economic system
- Efficiency / competitiveness
- Flexibility / stability
- Production / consumption
- Employment
- International trade

Environmental responsibility

Principles on

- Consumption of resources
- Materials and wastes
- Risks
- Rate of change
- Natural and cultural landscape

- 2b Promoting health

Human health should be promoted and protected

- 4b Equal opportunities and fair distribution of wealth

Each member of society should have equal rights and opportunities.

Society should strive to achieve fairer access to resources and their equitable distribution

- 12a Ecologically acceptable production

Environmental impact and risks emanating from production plants should be minimised, while energy and material flows should be optimised



169 targets

«Translation» of
targets in Swiss
context (2016-17)

169 Swiss targets

FRAME OF REFERENCE



3
qualitative
objectives



47 SD
principles

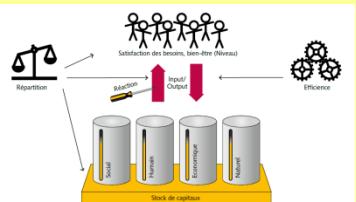
17 SDGs (Agenda 2030)

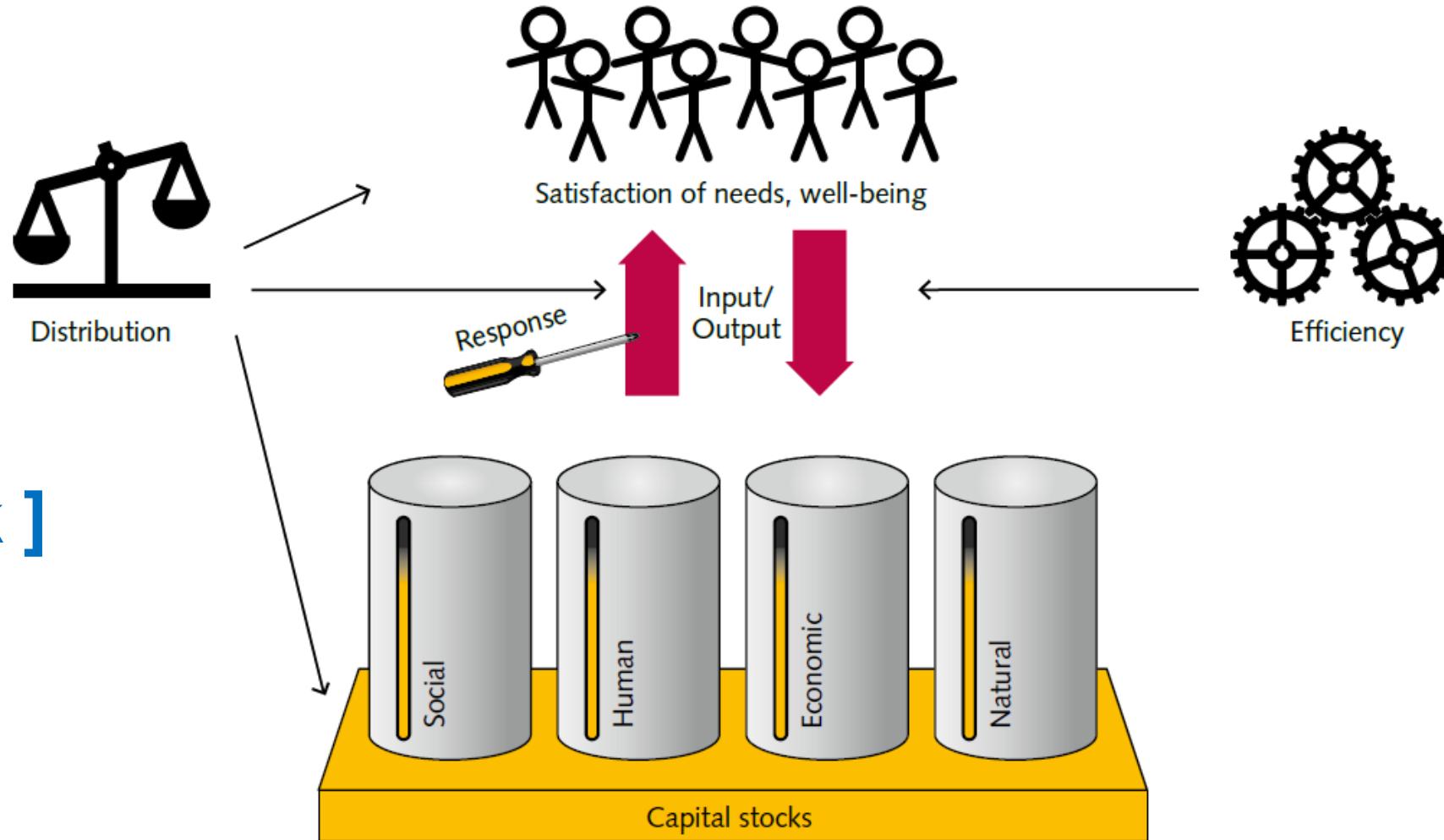


169
Swiss targets

SYSTEMIC STRUCTURE

- Typology



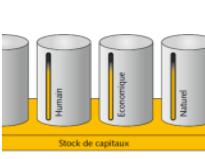


[systemic
framework]

Small exercise

- Let's say you have developed a frame of reference which contains the topic «Energy».
- What indicators would you select to cover this topic in a balanced manner, avoiding biases as much as possible?

Level	Stocks	Input/Output	Efficiency	Distribution	Reaction
	 Stock de capitaux				

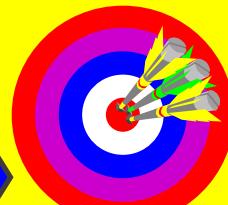
	Level 	Stocks 	Input/Output 	Efficiency 	Distribution 	Reaction 
Energy			Final energy consumption per capita	Renewable energy (share in total consumpt.)	Energy dependency	

FRAME OF REFERENCE



3

qualitative
objectives



47 SD
principles

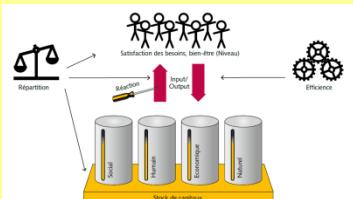
17 SDGs (Agenda 2030)



169
Swiss targets

SYSTEMIC
STRUCTURE

- Typology



- 17 SDGs

MONET 2030
SYSTEM

108
indicators

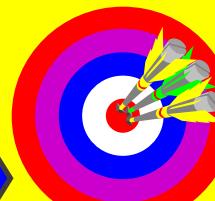
Indicator
selection

Predefined selection
processes and criteria
[procedural framework]

FRAME OF REFERENCE



3 qualitative objectives



47 SD principles

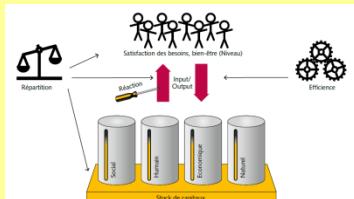
17 SDGs (Agenda 2030)



169 Swiss targets

SYSTEMIC STRUCTURE

- Typology



- 17 SDGs

SUSTAINABLE DEVELOPMENT MONITORING

Assessment of the evolution



MONET 2030 SYSTEM

108 indicators



Indicator selection

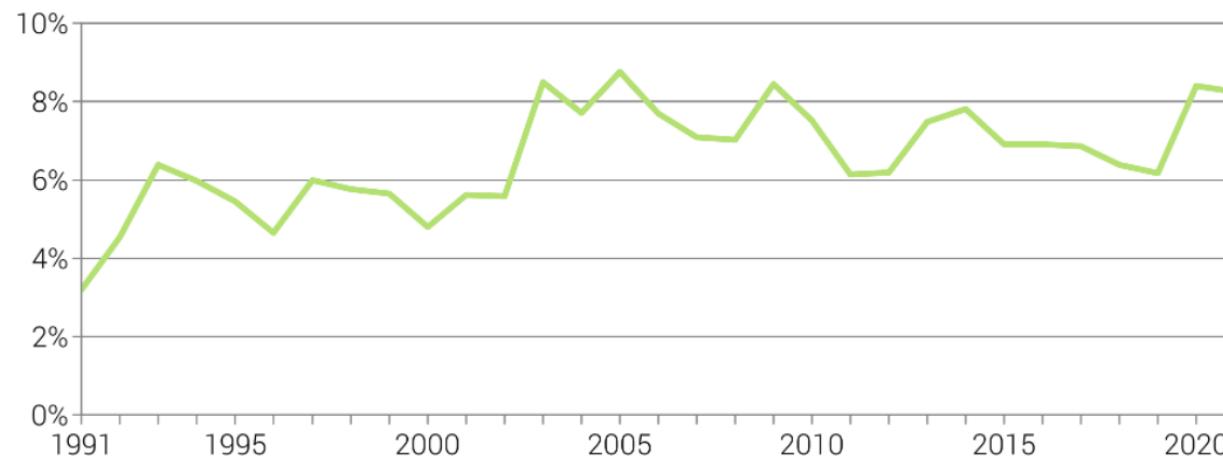
Predefined selection processes and criteria

Indicator-based assessment (MONET)

Qualitative assessment of the evolution since 2000 (or since 1st available data)

Youth unemployment

Proportion of unemployed persons based on ILO definition in economically active population of 15–24 year-olds (in 2nd quarter)



Source: FSO – Swiss Labour Force Survey (SLFS)

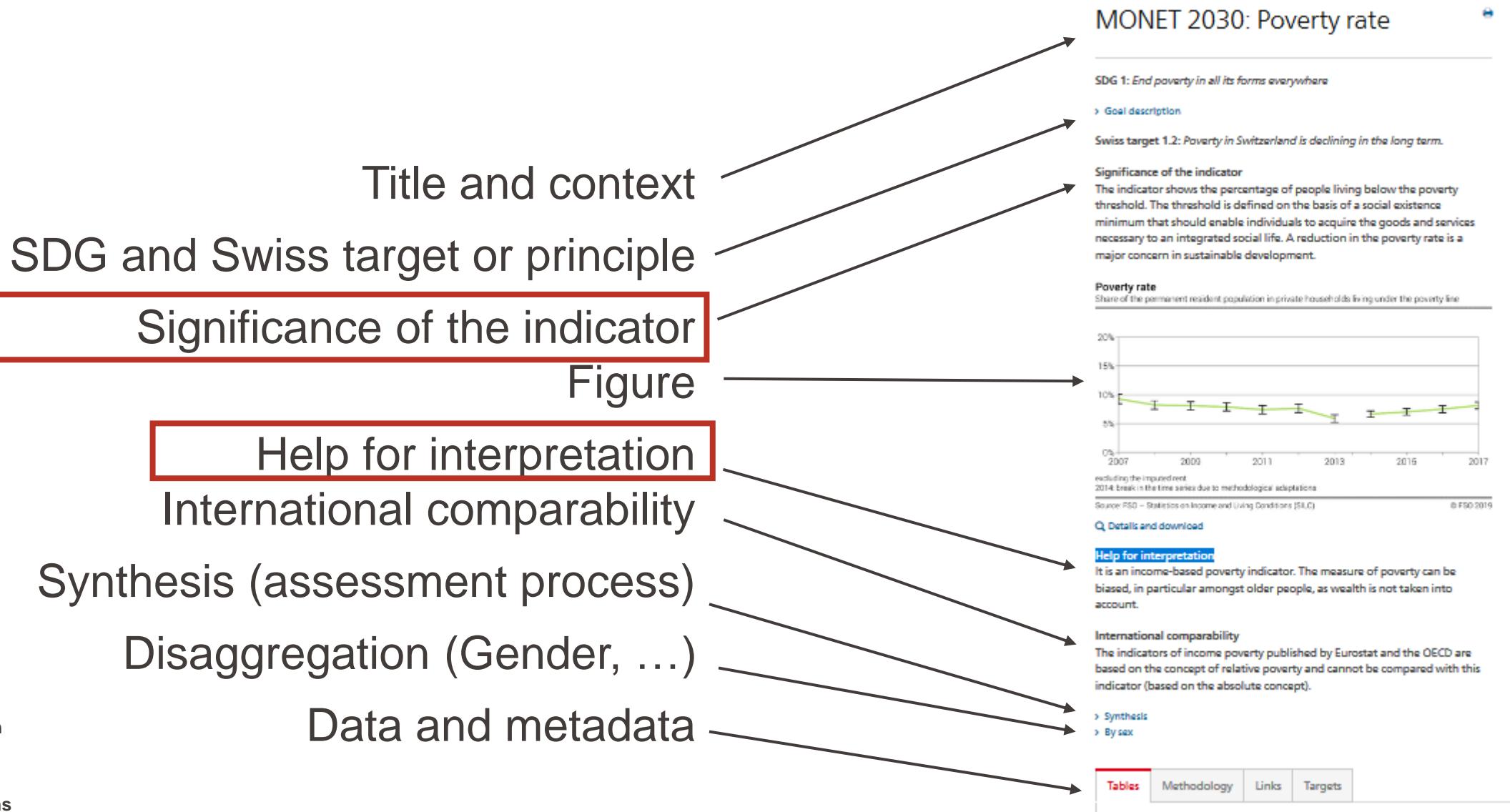
© FSO 2021



Excerpt from Swiss target 8.b:
Young people can fit into the labour market quickly and sustainably. [...]

Visualisation of the MONET 2030 system





Urban Green Spaces

- Green spaces = “total area in respect to the total population (m²/inhabitant)”



iStock photo © Sonia Lekovic

Questions on MONET 2030?

Official statistics at the municipal level in Switzerland (1/2)

- **Cercle Indicateurs** (French and German): www.cercleindicateurs.bfs.admin.ch
- → Daten/Données (29 cities; last update 2021, next update Nov. 2023)
- **City statistics** (French, German and English): www.urbanaudit.ch
→ Data for the 9 participating cities (9 largest Swiss cities)
- **Statistique des villes suisses** (French and German):
→ Data for round 170 cities/towns, detailed basic data ([access](#))

Official statistics at the municipal level in Switzerland (2/2)

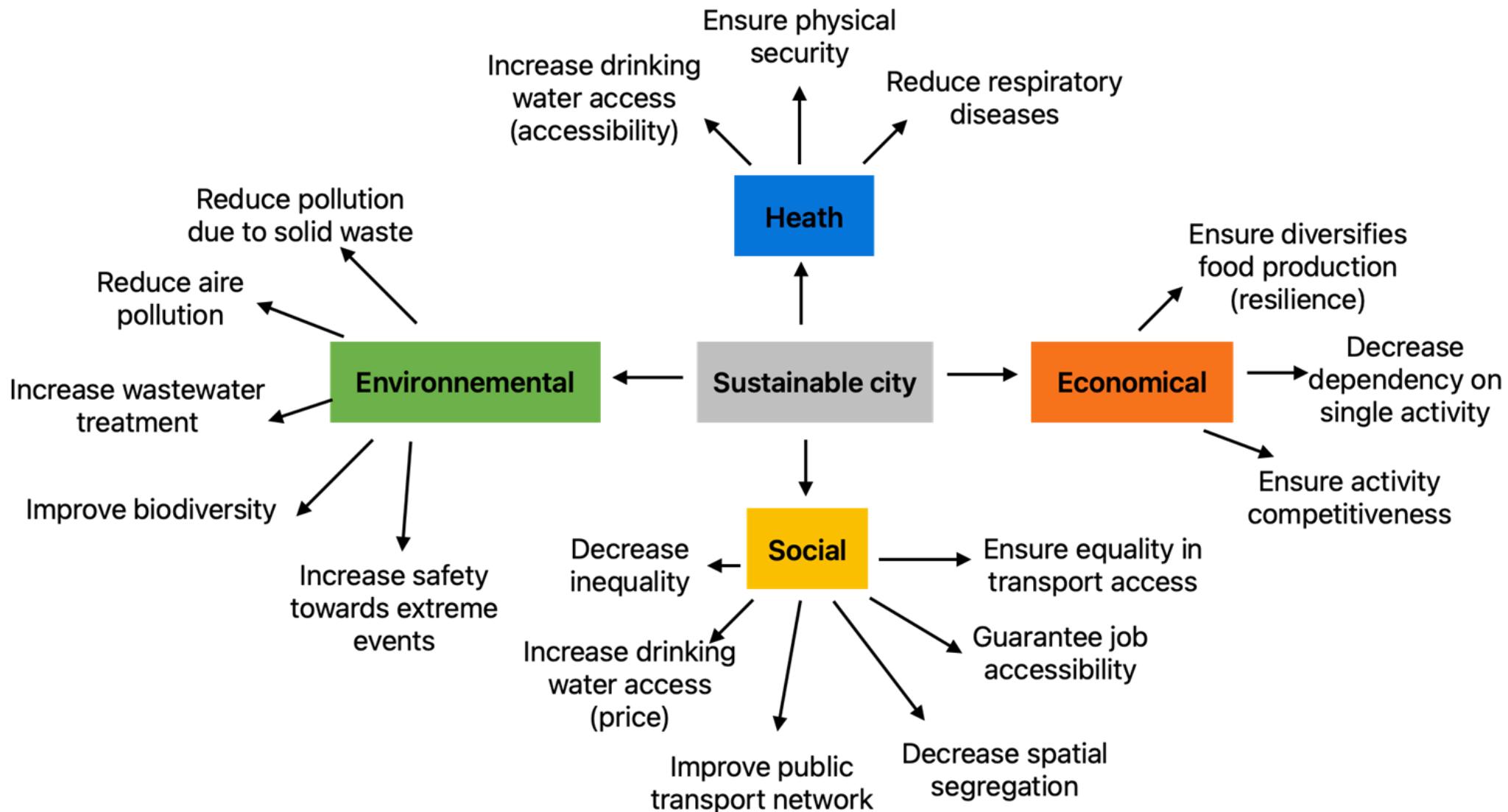
- Project-independent data on FSO website:
Catalogues and databases
 - Mostly «Tables» (data in Excel sheets) and «Data» (data cubes)
 - Restrict to spatial division «Communes».

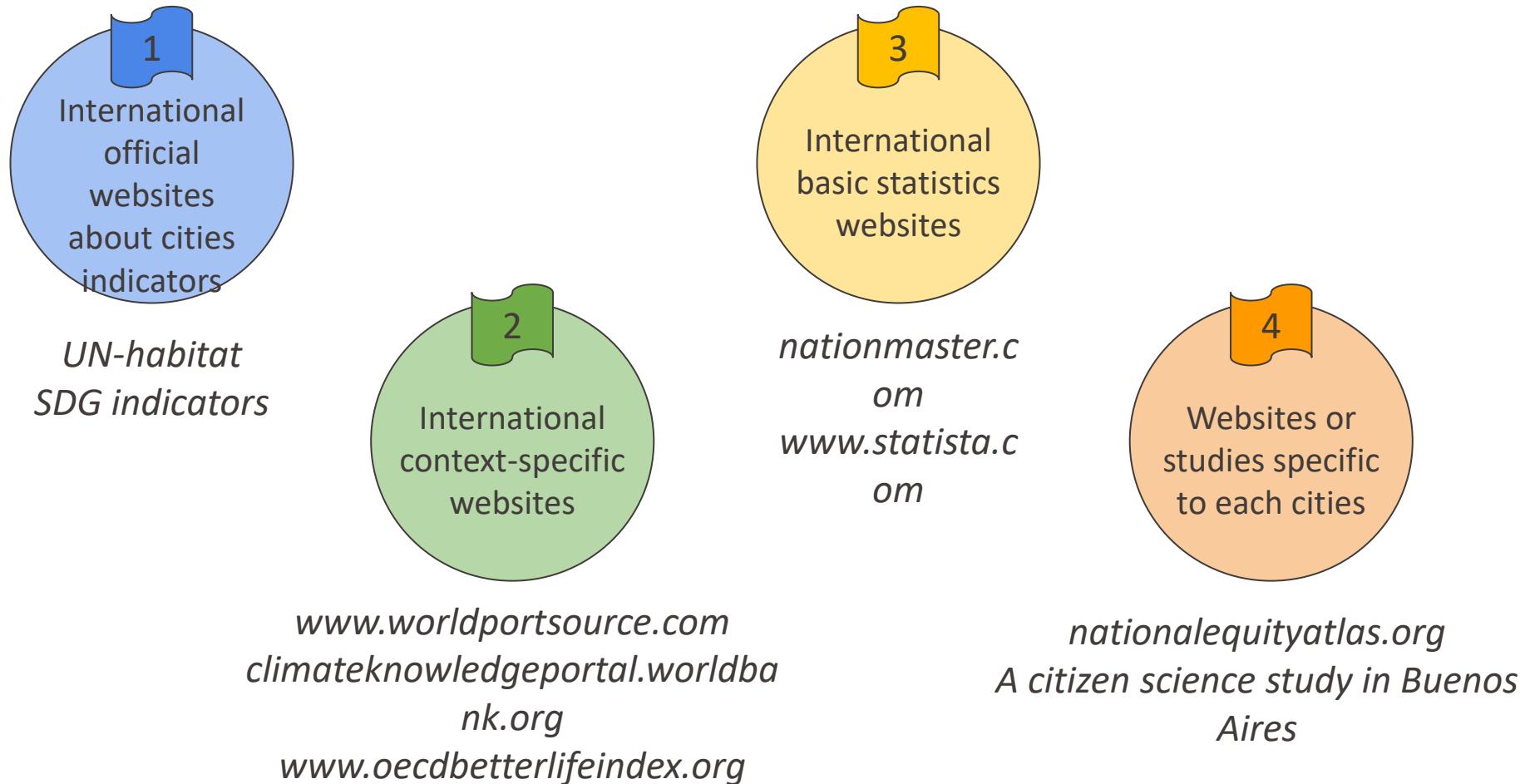
CAUTION: More in French/German than in English!
- Statistical offices of the Swiss cantons and of some cities.
- E.g. Vaud: <http://www.scris.vd.ch> => data at municipal level available
- E.g. Lausanne, Zurich, ...

For more information

- www.monet2030.admin.ch
- monet@ bfs.admin.ch

Project examples





EPFL Sustainability assessment of estuarine cities

Goals	Indicators	Units
Ensure physical security	Homicide rate	murders/100000 hab
Ensure equality in transport access	Proximity to public transit	m
Improve public transport network	Number of bus lines/area	bus lines/km ²
Reduce respiratory diseases	Mean population exposure to PM2.5	mg/m ³
Reduce air pollution	Air quality index	days/year
Increase Waste Water Treatment	Part of water treated	%
Improve Biodiversity	Evolution in tree cover	%
Reduce pollution due to solid waste	Solid waste per inhabitants	g/day/hab
Increase safety towards extreme events	Ratio of deadly extreme events	deaths/100000 hab
Decrease inequality	GINI index	%
Increase drinking water access (price)	Price of potable water, piped water	US\$/m ³
Increase drinking water access (accessibility)	Part of the population connected to the sanitary sewer system	%
Ensure diversified food production (resilience)	agriculture rate per GDP	%
Decrease dependency on single activity	maritime export rate per GDP	%
Guarantee job accessibility	Unemployment rate	%
Ensure activity competitiveness	Volume of goods export and import	Mn tonnes/year
Decrease spatial segregation	Part of the population living in slums	%

Sustainability Assessment of the last 4 cities what hosted the Olympic games

Framework	Goal	Label	Unit
Environmental	Adapt to climate change	Percentage of urban green space	%
		Percentage of population living in area at risk of flooding	%
	Manage waste efficiently	Waste recycling rate	%
	Reduce air pollution	Waste generation rate PM10	kg / pers / day µg/m ³
Economic	Improve attractiveness and tourism	Share of direct tourism GDP in total city GDP	%
		Number of tourists	#
	Manage public finance effectively	Cost overrun	%
Social	Ensure access to affordable and decent housing for residents	Ratio of average house price to average salary	%
		Number of people displaced by the Olympic Games	#
	Enhance access to sports and culture	Percentage of people meeting the 150 min MVPA guidelines	%
		Obesity rate	%
	Improve health and well being	Percentage of public expenditure on healthcare	%
Political	Build useful infrastructures	Vacancy rate	%
		Average time spent in transport	minutes
	Improve transport connections and congestions	Urban Mobility Index	%

Raphaël Lemerle

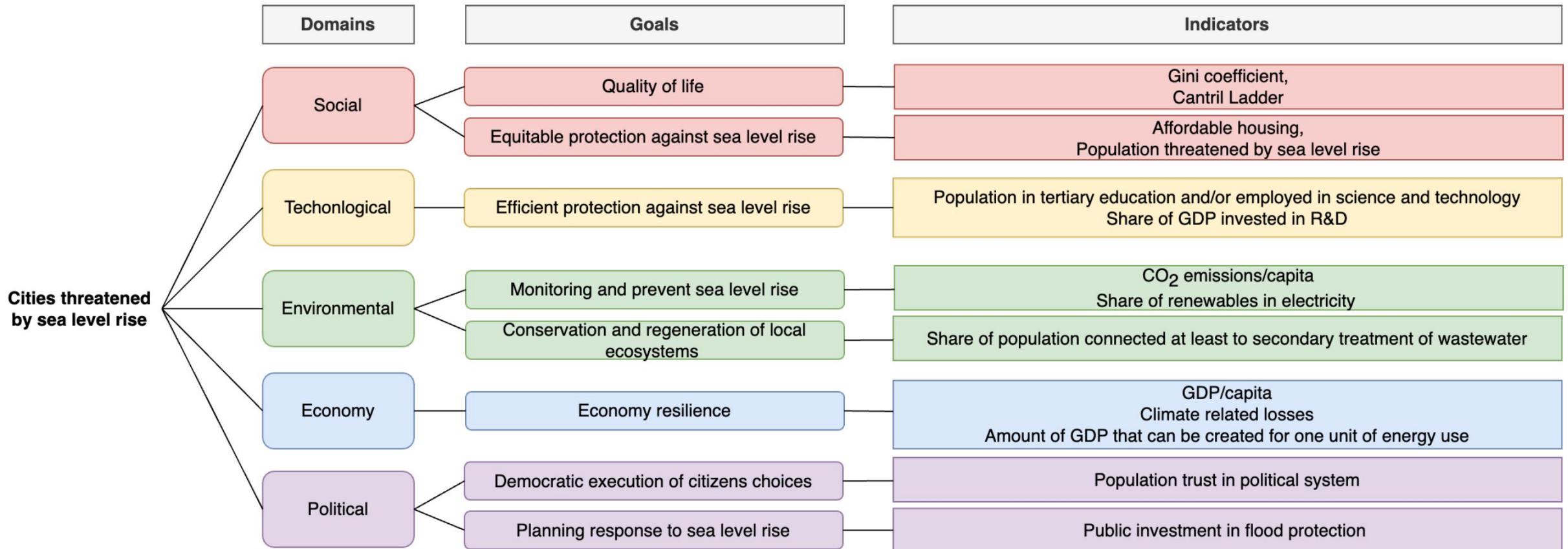
Marguerite Fauroux

Naoufal Rhiss

Juliette Auer

Zélie Cortès

Sustainability Assessment of cities threatened by sea level rise⁶⁰



Sustainability Assessment of cities threatened by sea level rise⁶¹

- Specific indicators related to sea level rise
 - Population threatened by sea level rise
 - Potential climate related economic losses as a share of the GDP
 - Public investment in flood protection as a share of the GDP
- Main data sources: Eurostat, Our World in Data, Statista, OECD, Data World Bank



Ambre de Herde

Jules Ghozland

Léa Bitard

Léna Karch

Sinclair Augereau

Sustainability Assessment of four cities as major financial centers⁶²

◆ Conceptual framework:

A set of guidelines, procedures, or steps to be followed in a specific order to achieve the main goal of sustainability development

◆ Various types of frameworks

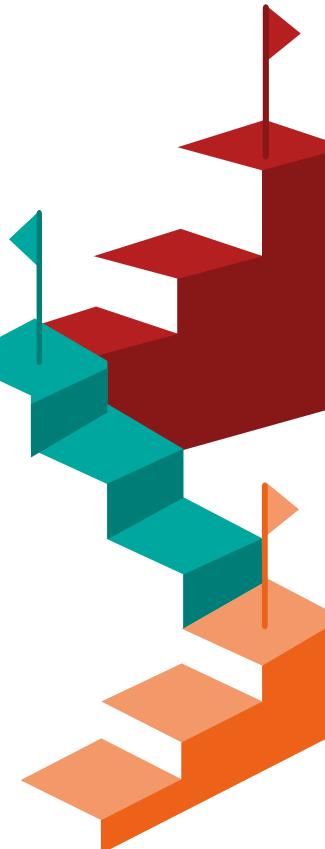
◆ Domain-based framework:

- ✓ Comprehensive
- ✓ Easy to understand
- ✓ Flexible
- ✓ Holistic..



Environmental

- Improving air quality
- Reducing carbon footprint
- Adapting to rising sea levels and reducing the risk of coastal flooding
- Increasing green areas
- Mitigating the urban heat island effect
- Ensuring the supply of fresh water
- Promoting waste reduction and management



Economic

- Promoting economic growth
- Improving resource efficiency in consumption and production
- Reducing resource dependence on imports and ensuring energy/food security
- Reducing corruption



Social

- Improving social equality
- Ensuring affordable housing
- Guaranteeing health quality
- Providing high-quality education



Jingqi Liu

Nesrine Souissi

Ka Wing Sun

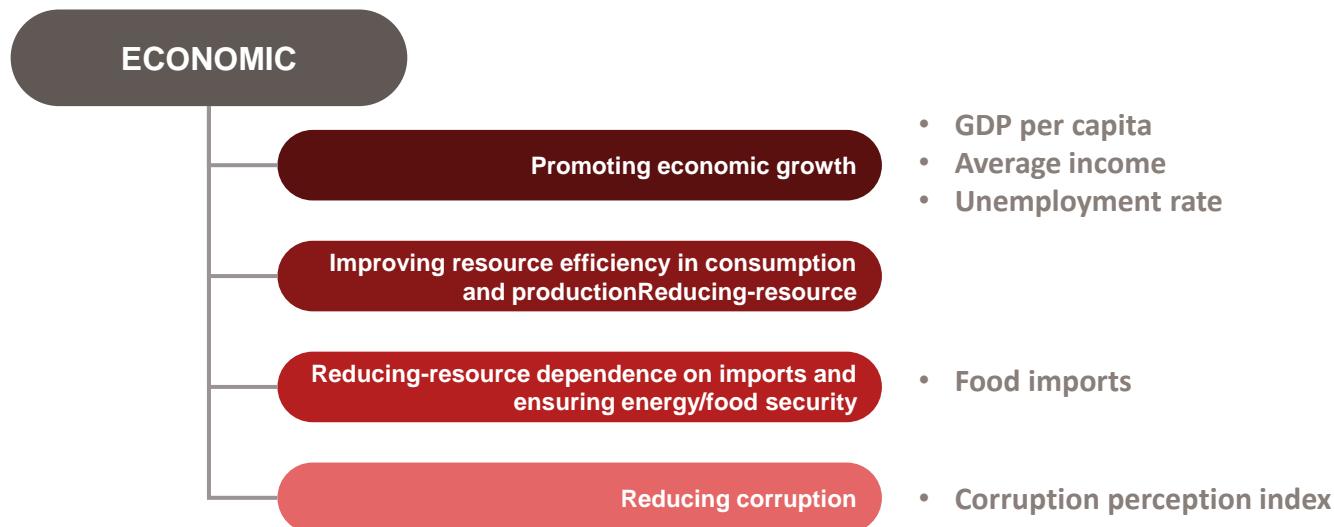
Lucas Riou

Caroline Hombourge

Sustainability Assessment of four cities as major financial centers⁶³

Choice of indicators :

Pertinence and availability → complete and credible results
! Adaptation and flexibility necessary



Sources: reports, databases, public authorities, NGOs, etc.

Jingqi Liu

Nesrine Souissi

Ka Wing Sun

Lucas Riou

Caroline Hombourge

2.3 - Indicator selection method

1. Collecting indicators

Sources:

- SDG
- Cercle indicateur

2. Influence matrix

3. First filter depending on activity/passivity score

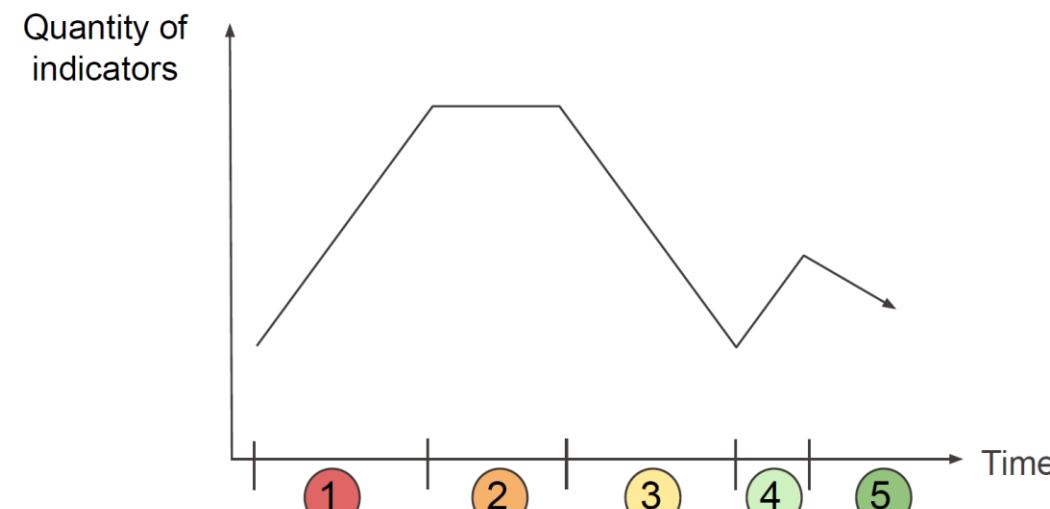
4. Relevance of indicators by goal

5. Found data

Sources:

- Eurostat
- Venice city

Indicators quantity during the selection process



Titouan Jérôme

Mael Mouhoub

Pierre-Jean Renaud

Théo Visbecq

Sustainability Assessment of cities with pedestrianized centers

	Domain	Sustainability objective	Indicator		
Sustainable pedestrian city	1 Social	Ensure mental health 1.1	Share of land (%): Urban green spaces	Share of land (%): Natural spaces	Population density
		Ensure safety 1.2	Road accidents		
		Ensure health protection against diseases 1.3	Air quality		
		Equal access to services 1.4	Social diversity : share of social help	Length of bicycle networks	Share of the pedestrianized area
		Ensure social interactions and sense of community 1.5	Participation in municipal elections	Population density	
	2 Environmental	Prevent climate crisis 2.1	Length of bicycle networks	Share of the pedestrianized area	
		Protect Biodiversity 2.2	Share of land: Natural spaces		
		Reduce pollution of the direct environment 2.3	Air quality	Share of land: Natural spaces	
	3 Economical	Affordable and efficient services 3.1	Modal split of transport	Population density	
		Keep city identity and community 3.2	Museum and theater		
		Make the city attractive 3.3	Visitors flux	Commerce unit per inhabitant	Share of the pedestrianized area

Titouan Jérôme

Mael Mouhoub

Pierre-Jean Renaud

Théo Visbecq

Appendix: additional indicator selection criteria

What characterizes official statistics as a data source (main data source for MONET and Cercle Indicateurs)

- [UN Fundamental Principles of Official Statistics](#)
- [European statistics Code of Practice](#)