



URB401: Systems Approaches for Urban Transitions

Prioritizing Interventions
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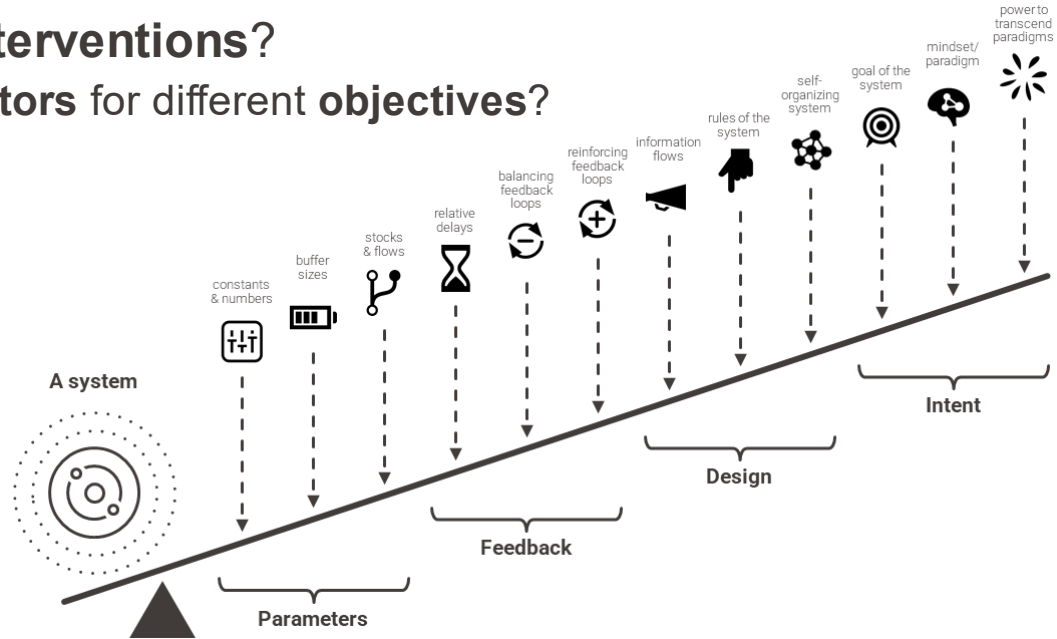
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Learning objectives

- For the identified interventions, assess potential **co-benefits**, **trade-offs**, and **anticipated challenges** that may influence their **feasibility** or **acceptance**
- Firmly ground the assessment in your identified system **interactions**, **feedbacks**, and **actors**, thereby illuminating effective transition pathways

Recap from last session

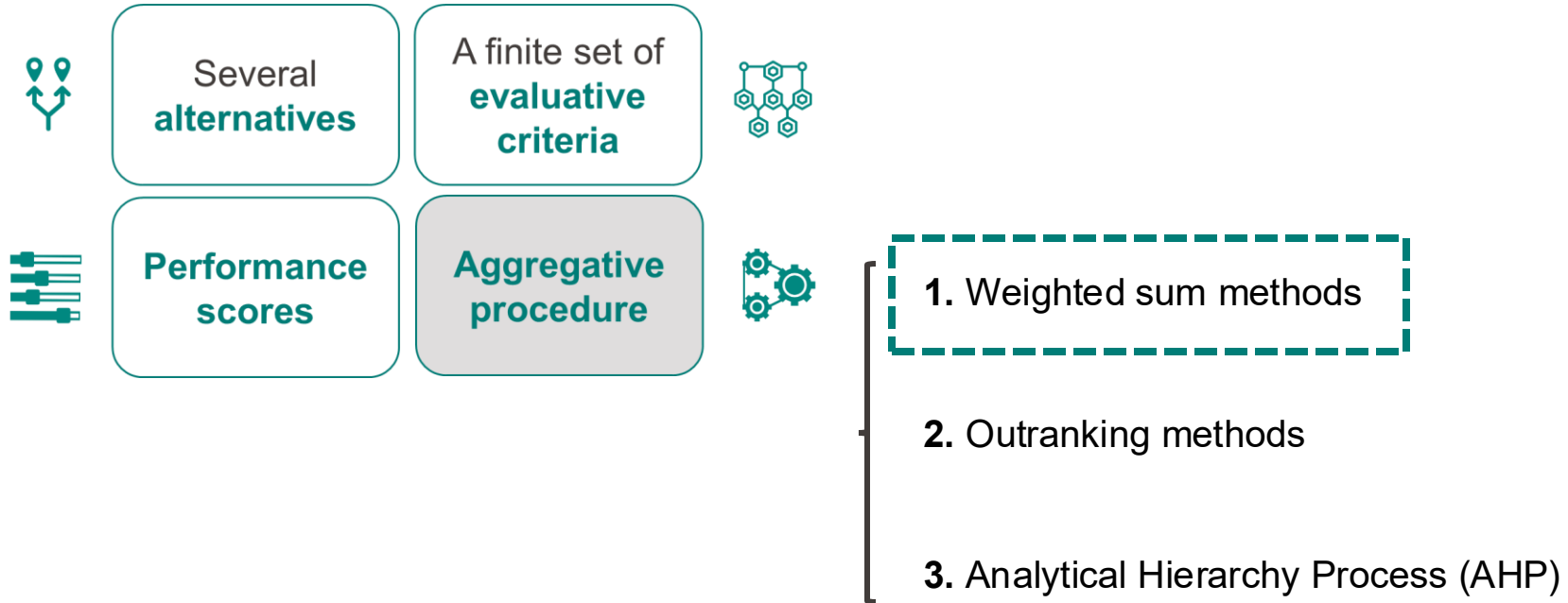
- Recap from previous exercise session
- What are potential **interventions**?
 - What are the **indicators** for different **objectives**?



What is Multi-Criteria Decision Analysis (MCDA)?

- **MCDA** is an **integrated assessment** method that can be used to support decisions:
 - Includes series of **indicators** within the same assessment.
 - Captures the values of different **stakeholders** by using different **weights** of the different dimensions.
 - Allows to set **priorities** of where measures should be taken.

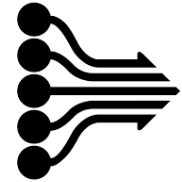
Main elements of MCDA



Weighted sum methods

- All performance scores obtained by an option are aggregated and then integrated within an overall score:
 1. Standardizing performance scores
 2. Multiplying such scores by their respective weights
 3. Adding all the resulting scores

Aggregation



Comparison

“Standard deviation from the mean” (imposing a standard normal distribution):

$$\begin{aligned} \uparrow: & \frac{\text{actual value} - \text{mean value}}{\text{standard deviation}} \\ \downarrow: & - \left(\frac{\text{actual value} - \text{mean value}}{\text{standard deviation}} \right) \end{aligned}$$

Positive (negative) values for a given city indicate above (below)-average performance

“Distance from the group leader” (it assigns 100 to the leading alternative while other alternatives are ranked as percentage points from the leader):

$$\begin{aligned} \uparrow: & 100 \left(\frac{\text{actual value}}{\text{best value}} \right) \\ \downarrow: & 100 \left(\frac{\text{best value}}{\text{actual value}} \right) \end{aligned}$$

“Distance from the mean” (the mean value is given 100, and alternatives receive scores depending on their distance from the mean):

$$\uparrow: 100 \left(\frac{\text{actual value}}{\text{mean value}} \right)$$

$$\downarrow: 100 \left(1 - \frac{\text{actual value} - \text{mean value}}{\text{mean value}} \right)$$

Values higher than 100 indicate above-average performance

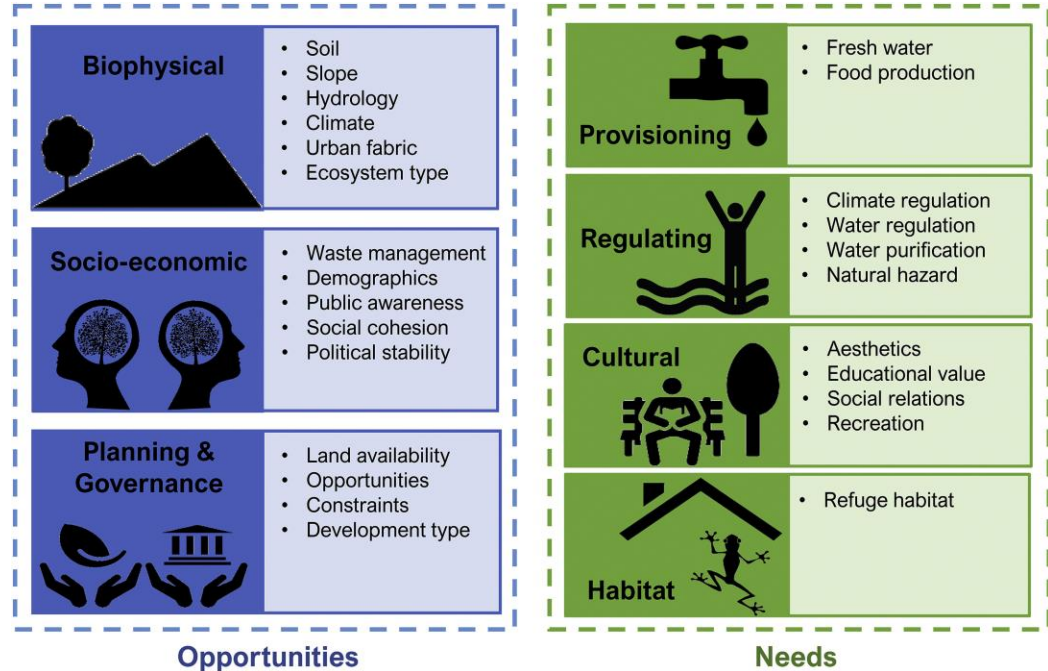
“Distance from the best and worst performers” (positioning is in relation to the global maximum and minimum; the index takes values between 0-laggard and 100-leader):

$$100 \left(\frac{\text{actual value} - \text{worst value}}{\text{best value} - \text{worst value}} \right)$$

MCDA for Nature-based Solutions (NbS)

spatial suitability

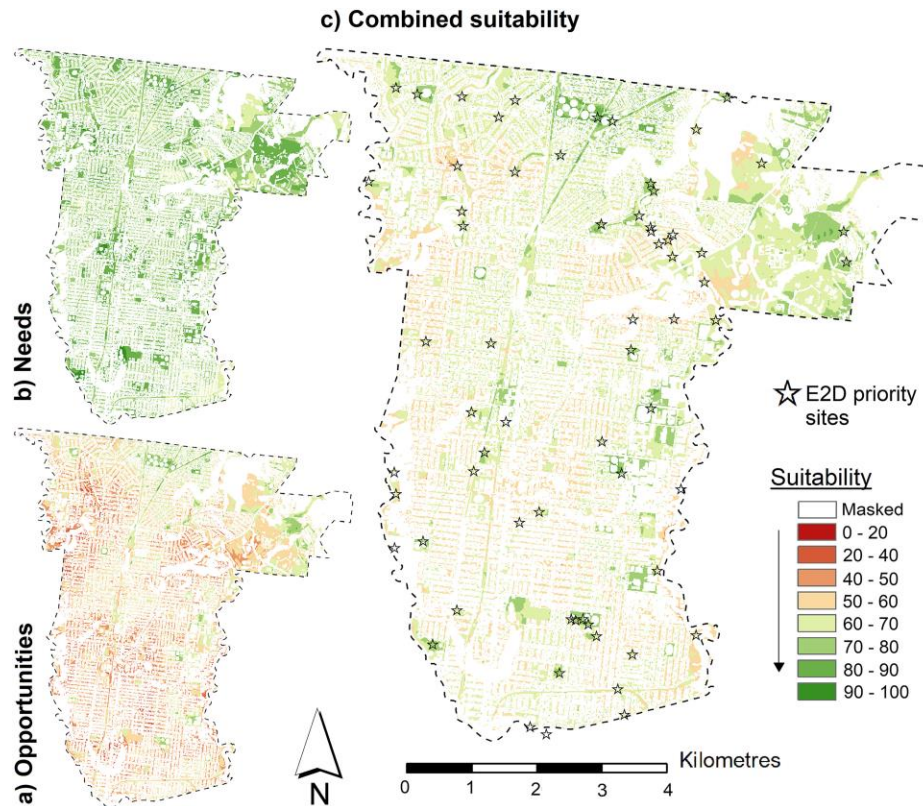
- Different NbSs support different sets of functions.
- Sometimes, trade-offs must be made between types of ecosystem services and different local needs.
- Spatially explicit participatory suitability tools, such as GIS-MCDA, are useful for this purpose.

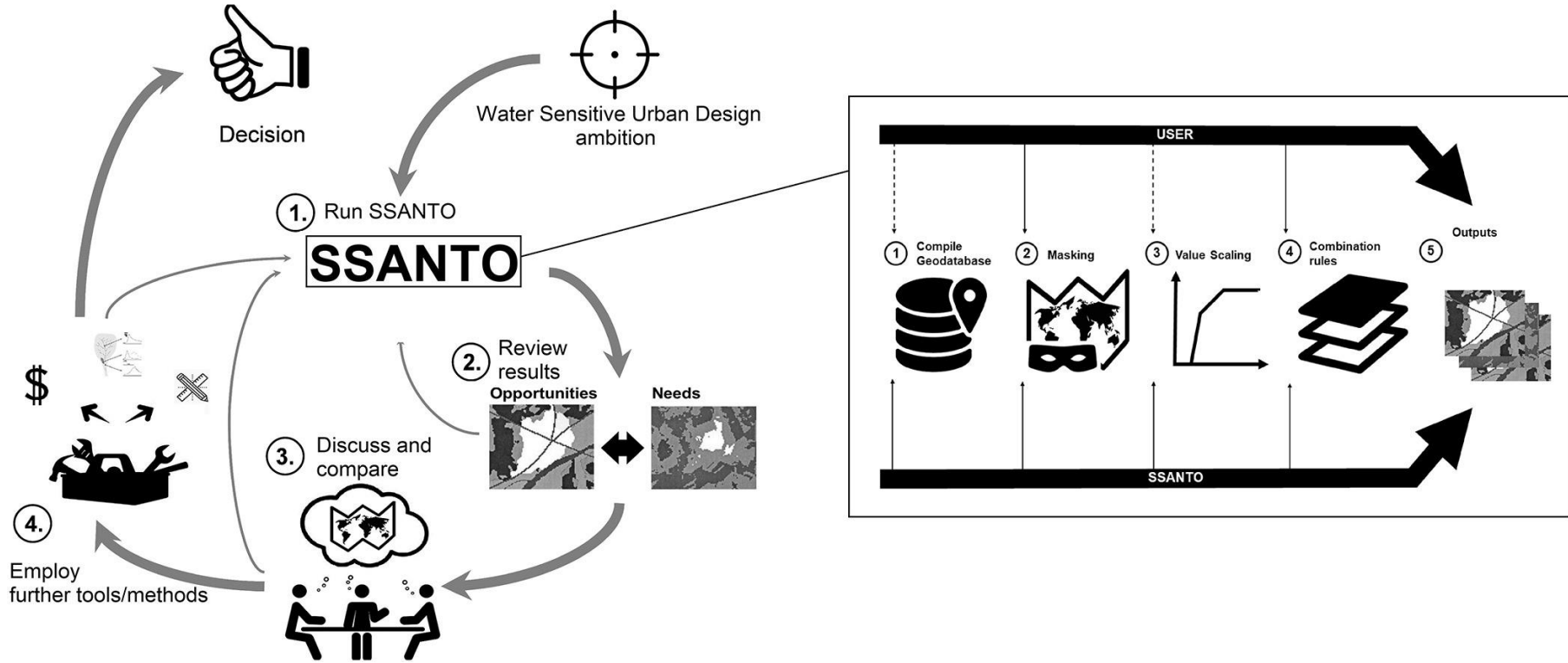


Spatial Suitability Analysis Tool

(SSANTO) addresses this for the implementation of seven types of Blue Green Systems (BGS) by exploring the answers to two simple but fundamental questions:

- Where does the urban context best accommodate BGS?
- Where are the various benefits and co-benefits of BGS most needed?





Case study: Local energy transition in St-Prex

- Concrete projects already at an advanced stage of development



1 Tree planting

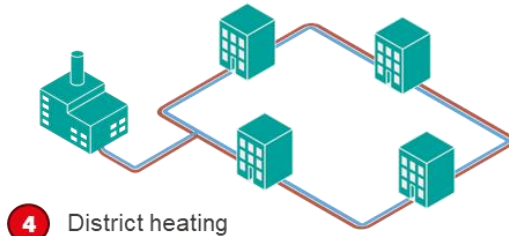


2 PV panels on the roof of municipal buildings



3 Energy renovation of Vieux Moulin

- Possible long-term projects



4 District heating



5 EV mobility

Case study: Criteria set

Financial <ul style="list-style-type: none">• CAPEX [CHF]• OPEX [CHF]• Annual savings [CHF]• Economic attractiveness [qual]	Social <ul style="list-style-type: none">• Popular support [qual]• Impact on the local quality of life [qual]• Job creation at a cantonal level [nb]• Public awareness [qual]
Environmental <ul style="list-style-type: none">• Avoided CO_2 [kg/yr]• Land use [m^2]• Impact on biodiversity [qual]• Resilience [qual]	Technological <ul style="list-style-type: none">• Avoided energy consumption [MWh/yr]• Local energy production [MWh/yr]• Lifetime of the project [yr]• Risk evaluation [qual]

Case study: Criteria set

	Economic				Social			
	CAPEX	OPEX	Annual Savings	Economic attractivity	Social acceptance	Life quality	Public awareness	Job creation
Tree planting	177000	75000	0	No impact	High	Positive impact	Positive impact	0.53
PV panels on STEPI's roof	476700	7900	105000	No impact	High	No Impact	Positive impact	0.13
PV panels on Vieux Moulin's parking	322100	5975	63360	No impact	Medium	No Impact	Positive impact	0.08
PV panels on Vieux Moulin's roof	288000	8630	128000	No impact	Medium	No Impact	Positive impact	0.14
Energy renovation of Vieux Moulin	1996760	3000	26300	No impact	Medium	Positive impact	No Impact	0.06
EV charging stations	69000	1524	0	No impact	High	Positive impact	Positive impact	0.00
District heating	4250000	110000	0	Positive Impact	Low	Positive impact	No Impact	3.00

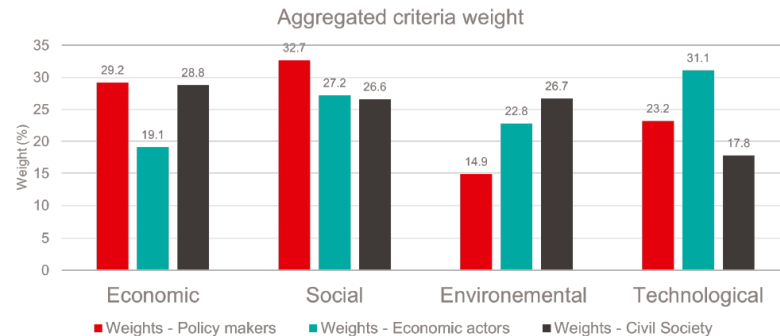
	Environmental				Technological			
	Avoided CO2	Land use	Biodiversity	Resilience	Avoided energy consumption	Local energy production	Lifetime	Risk evaluation
Tree planting	3	-320	Positive impact	Positive impact	0	0	25	Medium risk
PV panels on STEPI's roof	17.55	0	No Impact	No Impact	0	150	15	Low risk
PV panels on Vieux Moulin's parking	10.296	0	No Impact	No Impact	0	88	25	Low risk
PV panels on Vieux Moulin's roof	18.72	0	No Impact	No Impact	0	160	25	Low risk
Energy renovation of Vieux Moulin	45.76	0	No Impact	Positive impact	200	0	50	No risk
EV charging stations	0	0	No Impact	No Impact	0	0	10	No risk
District heating	1274	2400	No Impact	No Impact	0	4715	50	Medium risk

Case study:

Criteria weights per actor group

Position	Policy makers	Economic actors	Civil society
1	Social acceptance	Social acceptance	Social acceptance
2	Job Creation Economic attractiveness	Blank	OPEX Annual savings
3	Annual savings Lifetime Risk evaluation CAPEX	Local energy production Avoided CO2 Avoided energy consumption	Land use Life quality Biodiversity Public awareness Avoided CO2
4	Biodiversity Public awareness	Public awareness	Local energy production Economic attractiveness Avoided energy consumption
5	Life quality	Lifetime	CAPEX
6	Avoided CO2 Avoided energy consumption	Biodiversity Economic attractiveness Life quality	Resilience Lifetime
7	OPEX	CAPEX	Blank
8	Land use Local energy production	Land use Risk evaluation	Job creation
9	Resilience	OPEX	Risk Evaluation
10		Annual Savings	
11		Resilience	
12		Job Creation	

Case study: Criteria weights per actor group



1. Complete the performance matrix on the [shared excel spreadsheet](#)
 - Selected interventions
 - Selected criteria
2. Assume roles of 3 different stakeholders within your group. How would they weight the criteria differently? Do the results change?
3. Based on the results of the MCDA how would you prioritize the selected interventions and therefore design transition pathways?



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