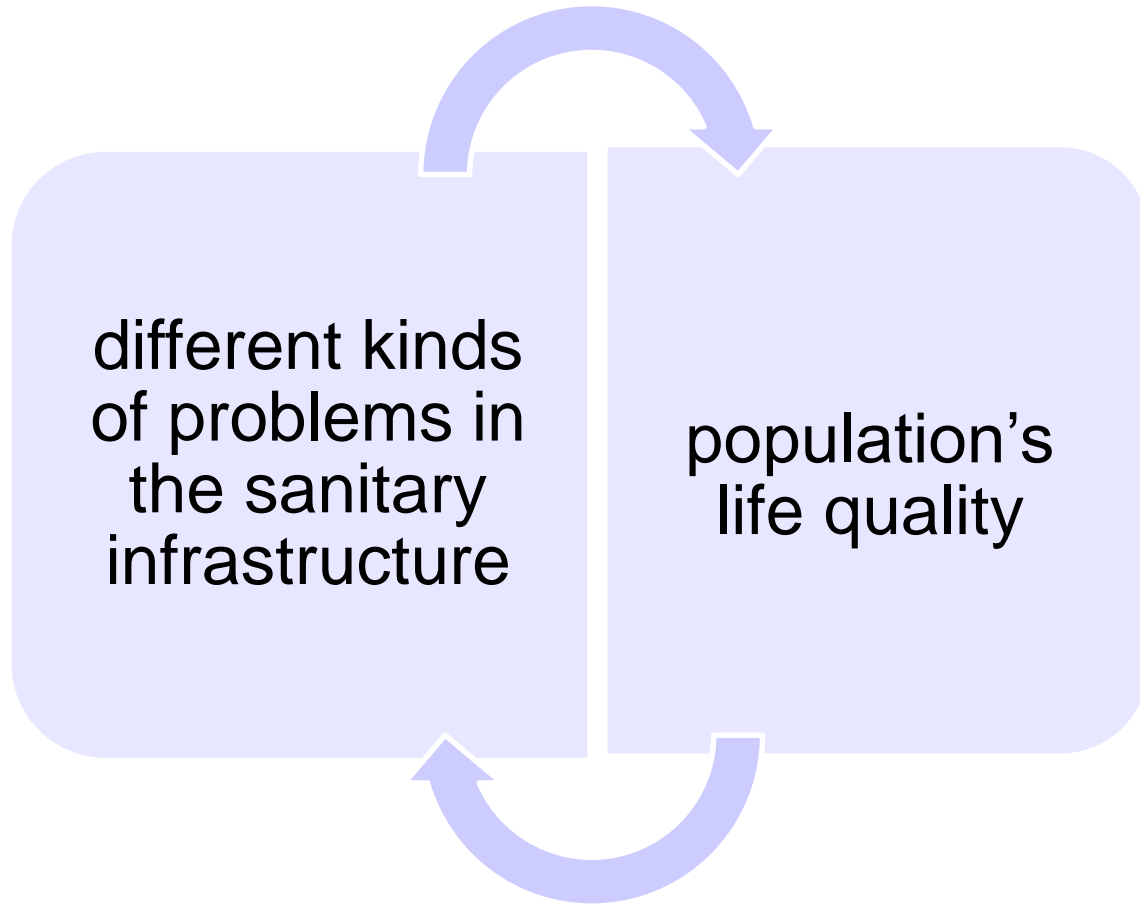


Application of the UWU model for urban water use management

Daniel Costa dos Santos
Professor at Federal University of Parana, Brazil

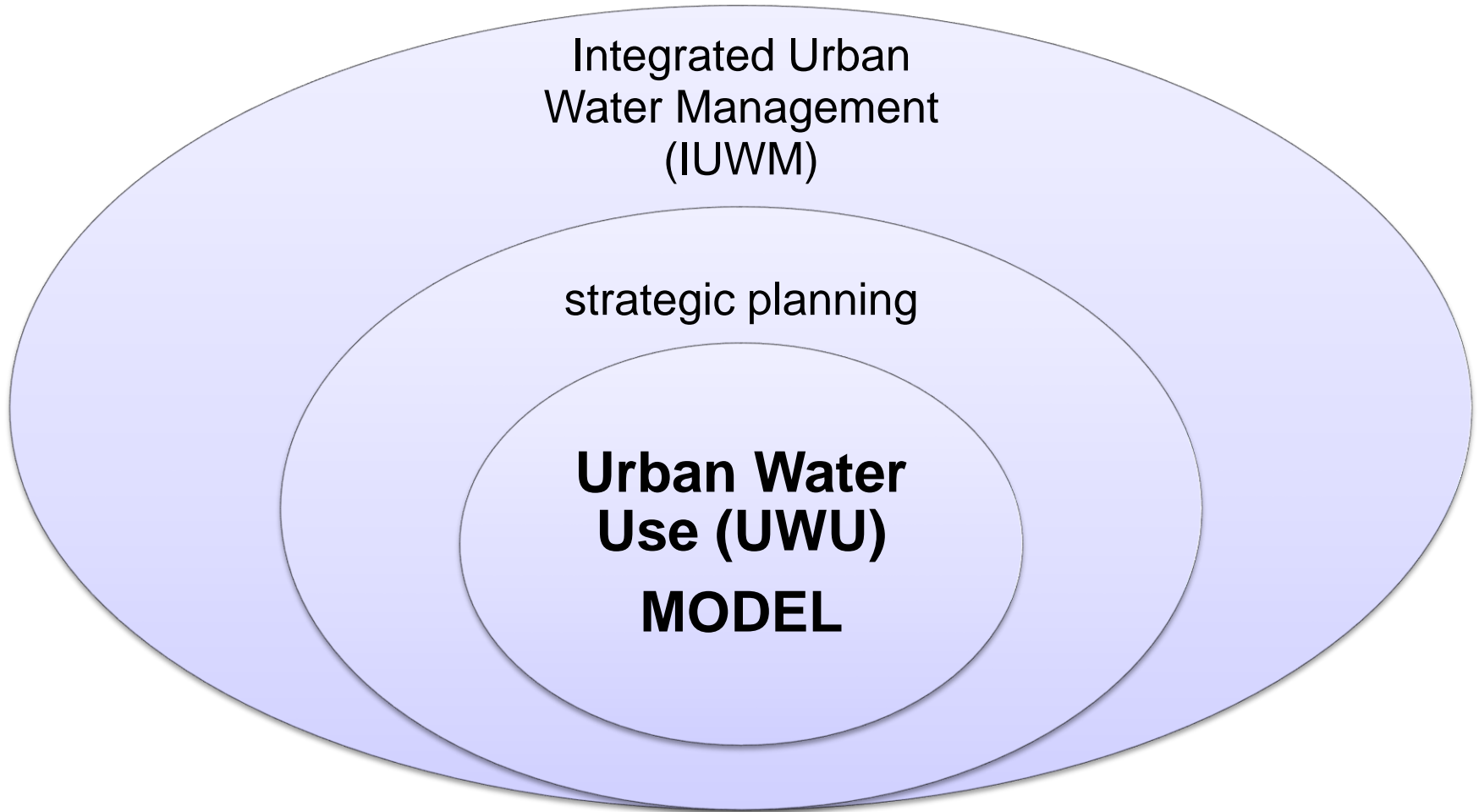
Introduction:

The complexity in urban area water use



Aim:

To present an application of the UWU model based on a case study



UWU Background



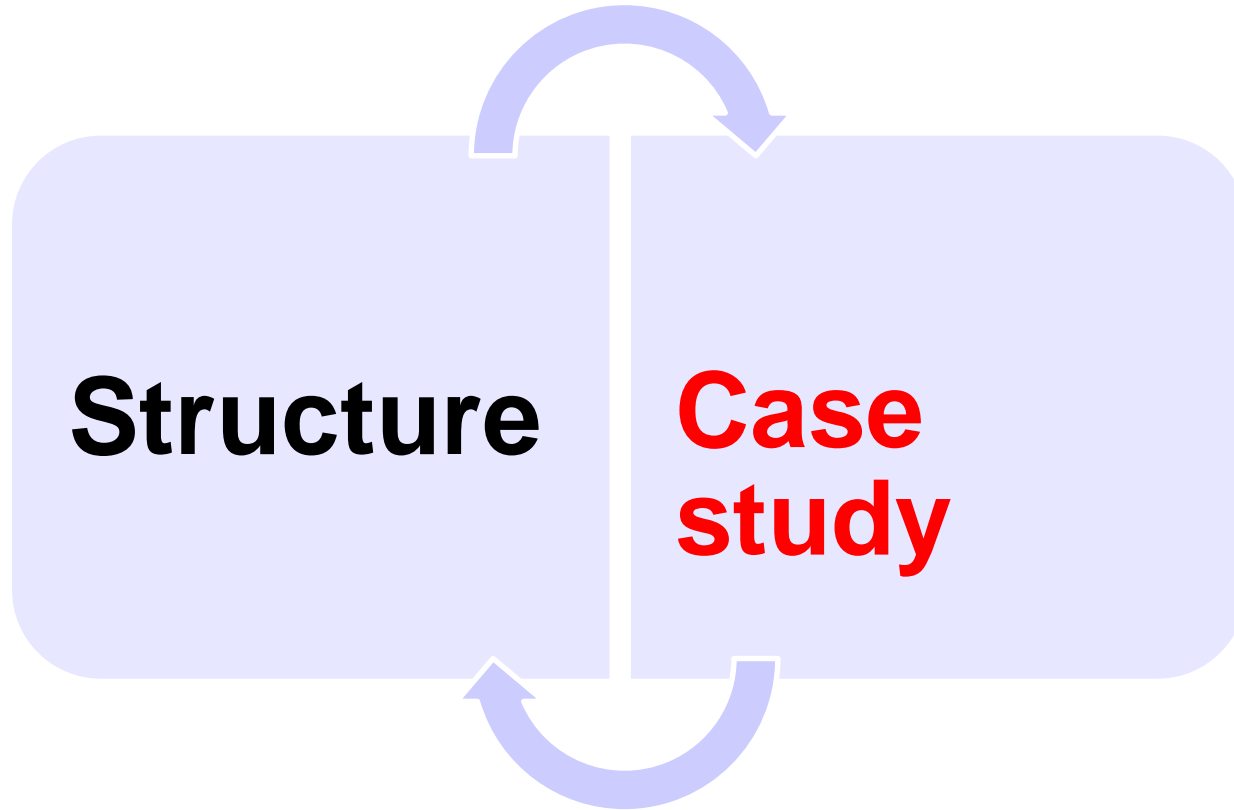
- Ideal strategy:

to achieve the vision under as many scenarios as possible

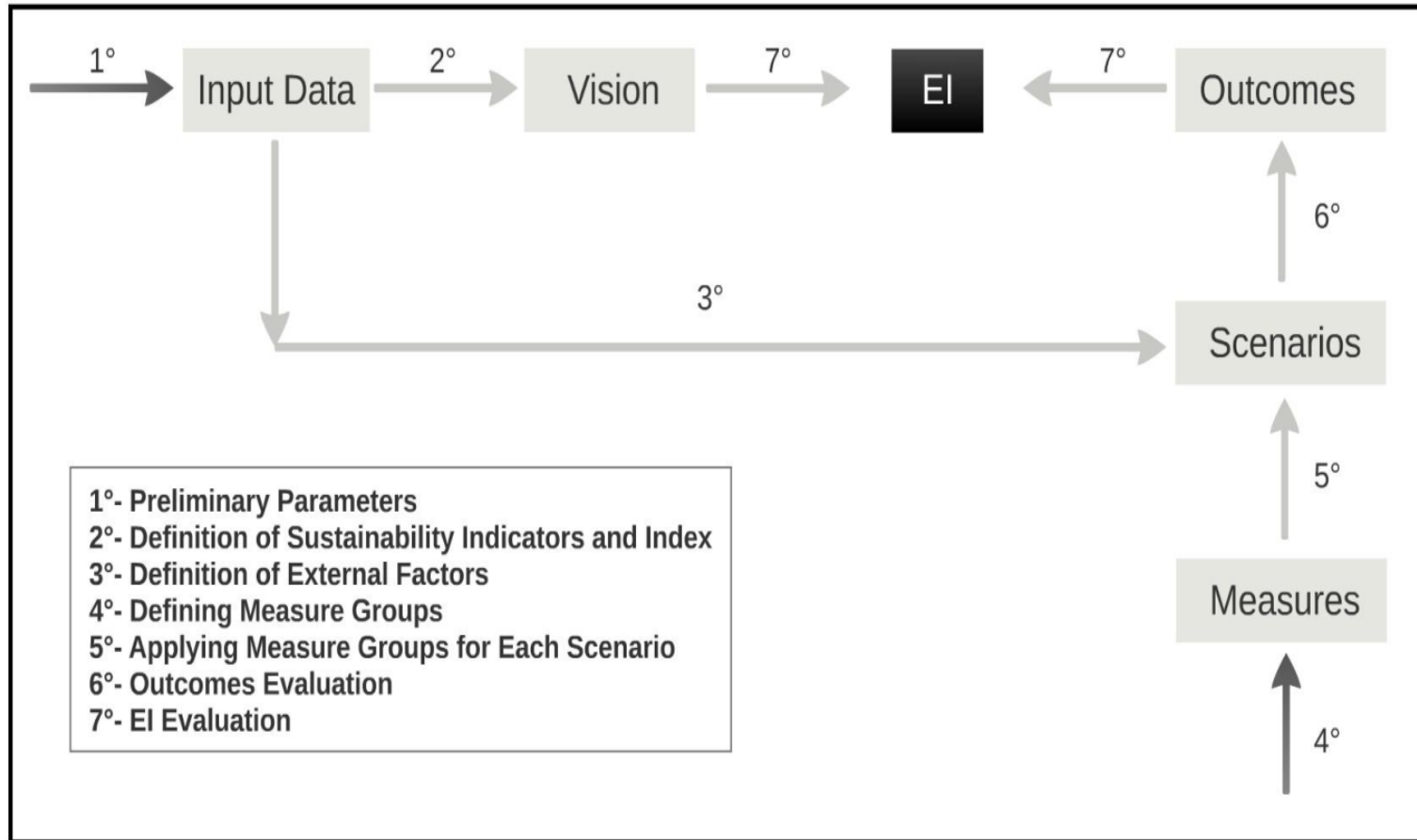
- The UWU Model deals with the key question:

***is the city moving towards the sustainability
vision or not?***

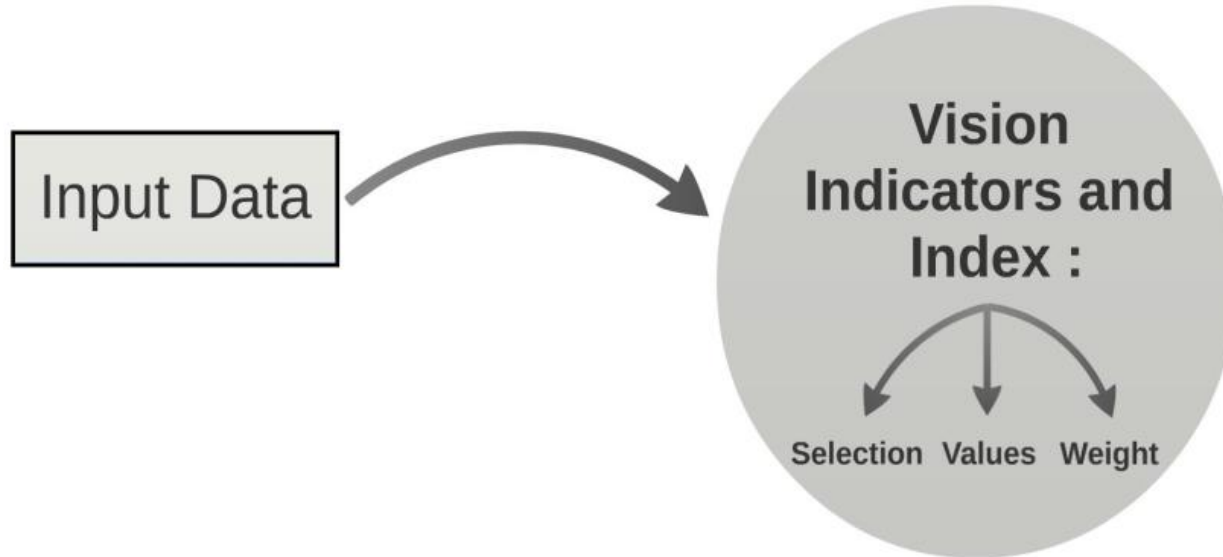
The UWU model



UWU STRUCTURE



UWU STRUCTURE: Input Data and Vision



Case study:

Almirante Tamandaré, Paraná State, Brazil

Location: south of Brazil;

Population (2010): 103,245.00 inhabitants

The population has grown 1.57% /year;

Area: 195,145 km²;

Infant mortality: 16 deaths per year;

Human Development Index: 0,728;

GDP per capita: USD 2,500/inh/year;

Minimum average temperature: 12°C;

Maximum average temperature: 26°C.

Average intensity of annual rainfall: 1500 mm / year.

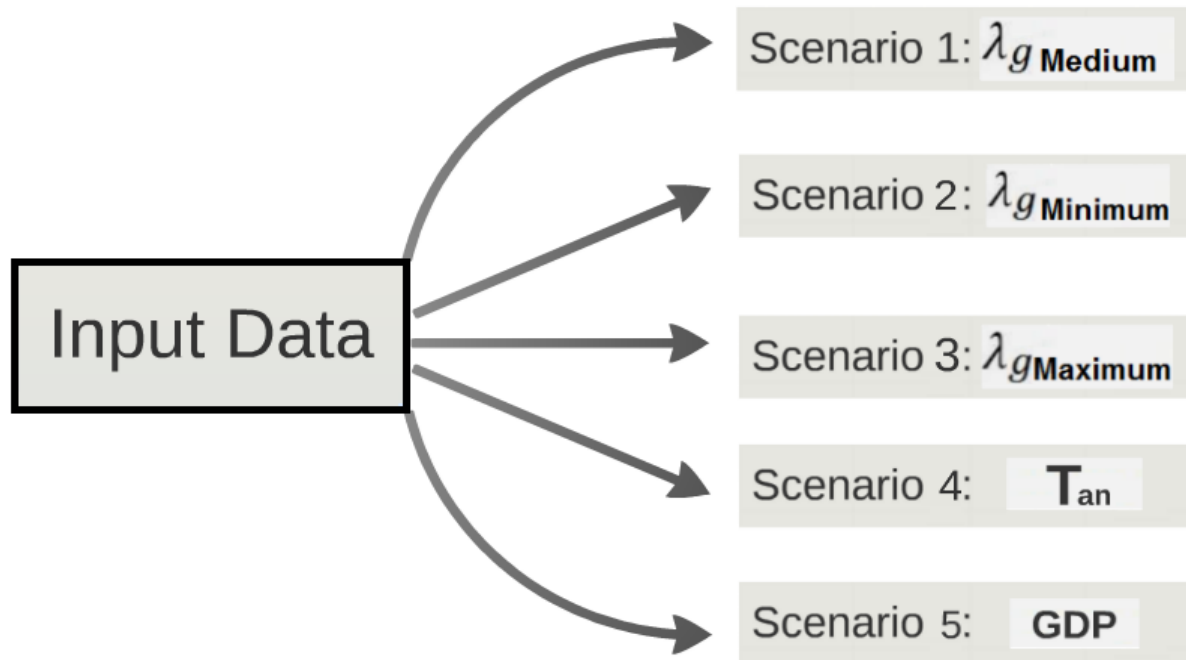
Case Study:

Vision (for 20 years)

Indicator	un	Value	Weight (%)
WSS Coverage	%	95.00	20
SS Coverage	%	75.00	20
Total Cost	U\$	4.0.10 ⁷	20
Agriculture Production	ton/year	1500	10
DO at Disposal Point	mg/l	5.0	10

UWU STRUCTURE: Scenarios Elaboration

Based on external factors such as **Population Growth Rate (λg)**, **Temperature** and **Gross Domestic Product (GDP)**.



Case study: Scenarios (for 20 years)

Scenarios		External	Factors
	λ_1 (% per year)	T (°C)	GDP per capita (US\$/inh/year)
01	1,57	19	2,500
02	4.00	19	2,500
03	1.00	19	2,500
04	1.57	30	2,500
05	1.57	19	5,000

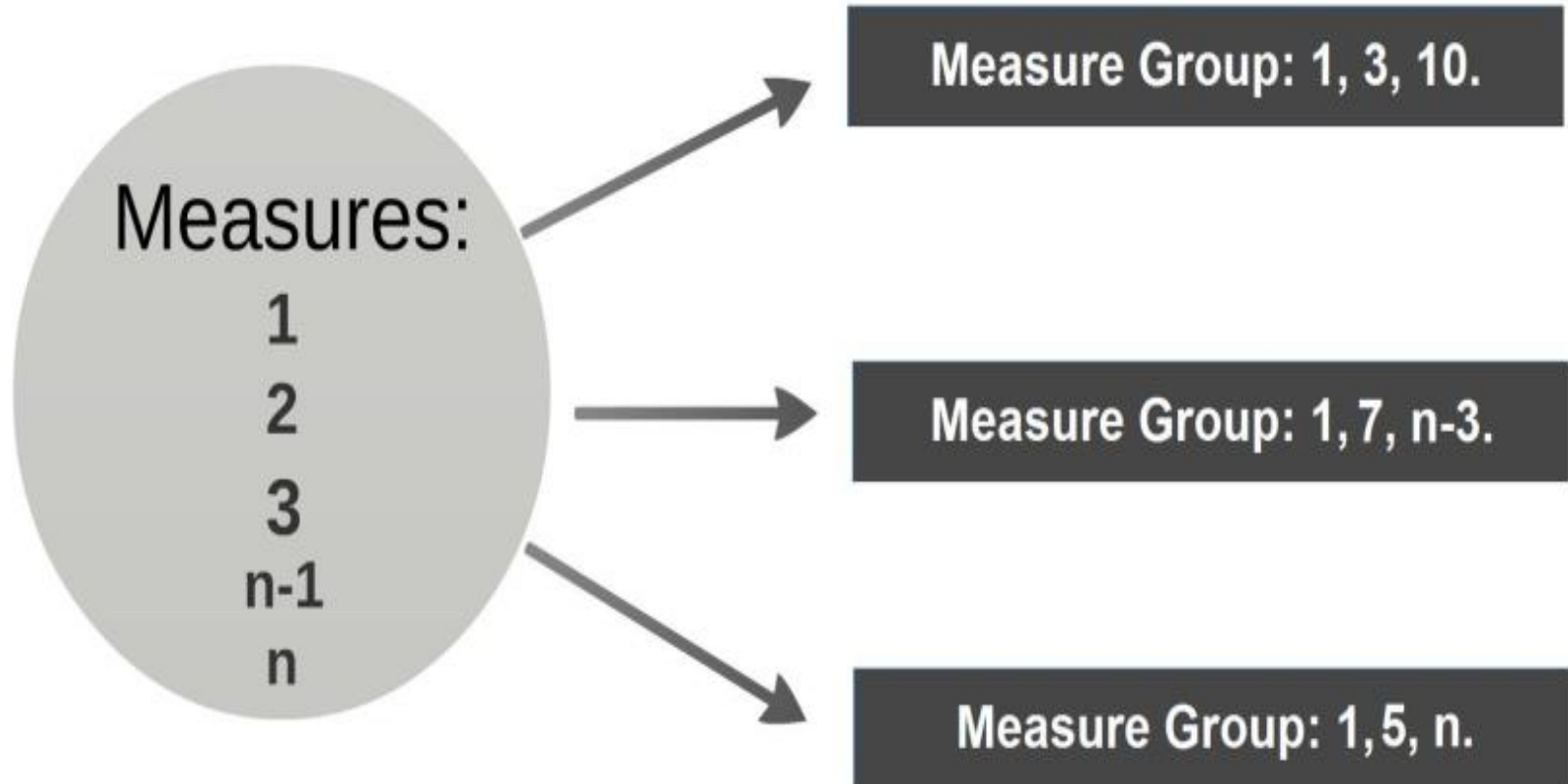
UWU STRUCTURE: Measures Conception



Case study: Measures

No.	Measure	Description
01	Water consumption reduction by low-flush toilet	The current toilets work with 12 liters per flush and this measure predicts that in 2032 approximately 50% of the population will be using low-flush toilets with 06 liters per flush.
02	Graywater for toilets, cleaning and irrigation	This measure proposes to use 50% of graywater generated in the building to meet 20% of the population in 2032.
03	Reduction of water losses in the distribution pipelines	The aim is to achieve the reduction around 25%.
09	Expansion of the current wastewater treatment plant	Whereas the current system meets 20% of the population, this measure may meet 80% of the population in 2032.
05	Use of treated wastewater for agriculture	The idea of this measure is to divert 25% of the flowrate from the wastewater treatment plant designed in Measure 11 to agriculture production.
11	Construction of new sanitation system	This measure focuses the construction, for 2032, of the new wastewater treatment plant with a capacity of 100 l / s which will be composed of an anaerobic reactor, a pond, a wetland and a soil disposal system.

UWU STRUCTURE: Measures Groups



Case study:

Groups of Measures

Groups	Measures
0	No Measures
1	1,2,3 e 9
2	1,3,5 e 11
3	1,2,5 e 11
4	1,2

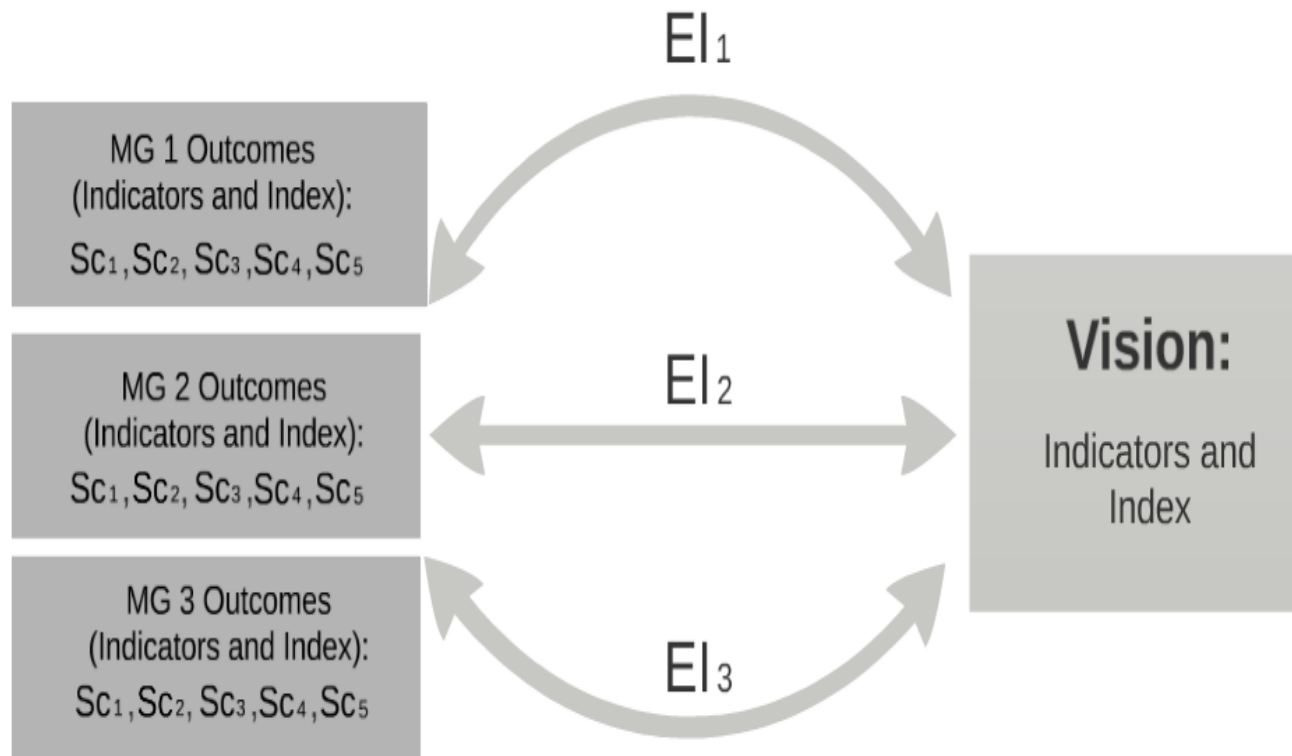
UWU STRUCTURE: Outcomes

Measure Group	Indicators and Index	Outcomes for:				
		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
MG 1	A	✓	✗	✓	✓	✓
	B	✗	✓	✓	✗	✗
	C	✓	✓	✓	✗	✗
MG n	A	✓	✗	✗	✓	✗
	B	✗	✓	✓	✗	✗
	C	✓	✓	✗	✗	✗

MG: Measure Group; A, B, and C: vision indicators; ✓ vision indicator achieved in scenario; ✗ vision indicator not achieved in scenario.

UWU STRUCTURE: Final Evaluation

Effectiveness Index: $EI = \sum (W_i * N_j)$



UWU STRUCTURE



Effectiveness Index: $EI = \sum (W_i * N_j)$

- W_i : The relative weight of each indicator chosen in the vision;
- N_j : Number of scenarios where each indicator achieved the vision.

Case study:

Outcomes: Effectiveness Index

Groups	Measures	Effectiveness Index	Evaluation
0	No Measures	1.9	inadequate
1	1,2,3 e 9	3.5	reasonable
2	1,3,5 e 11	4.0	good
3	1,2,5 e 11	3.8	reasonable
4	1,2	4.1	good

Conclusions

Case Study

with Water Demand Management and Decentralized Sanitation measures it was possible to build a **Management Plan** based on actions such as **water consumption per capita reduction in buildings** and to **install decentralized wastewater treatment plants**.

UWU Model

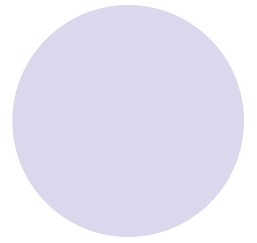
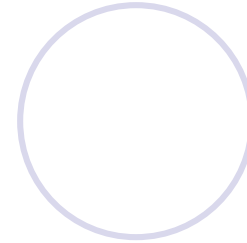
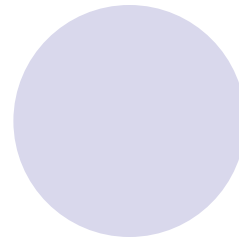
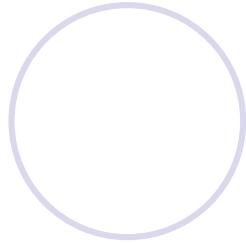
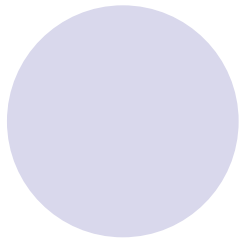
The UWU application has demonstrated some **flexibility to manage several variables since it is easy to review the vision and external factors**.

It is possible to explore the **synergy among measures**.



Overall Strategy for Water Conservation Planning

ALL STAKEHOLDER GROUPS TOGETHER,
COORDINATED BY URBAN WATER COUNCIL, COULD
DEFINE THE OVERALL STRATEGY SUPPORTED BY
UWU MODEL!



THANK YOU FOR YOUR ATTENTION!

dcsantos.dhs@ufpr.br