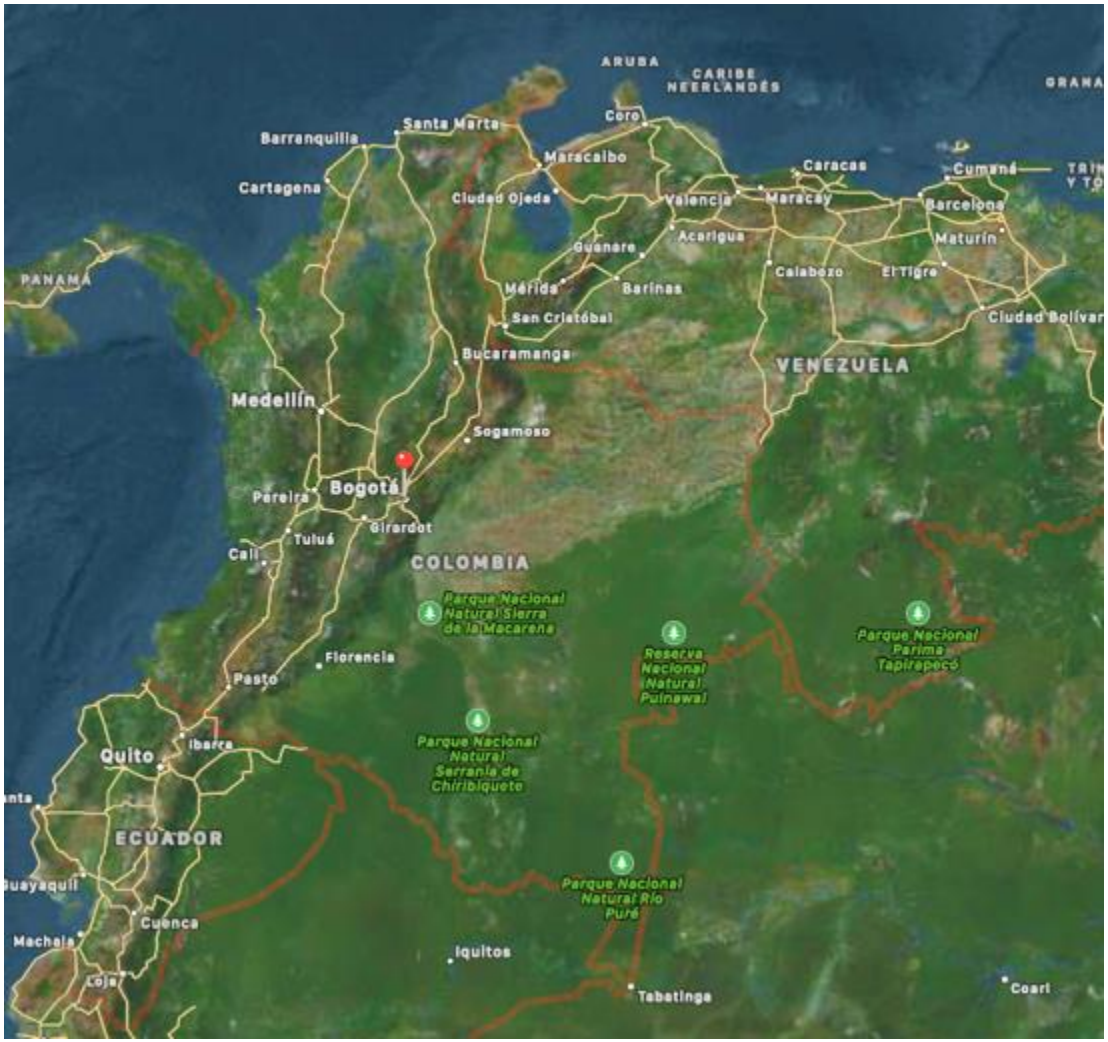
Systemic Perspectives on Low-Carbon Cities in Colombia

An Integrated Urban Modeling approach to Policy Analysis

Angela Cadena
Nicanor Quijano
M.Espinosa, G.Jiménez-Estévez; H.Vargas; J.Rodríguez;
M.Rodríguez; L.Guzmán; J.Guevara; J.Mariño

Universidad de los Andes
Facultad de Ingeniería

We come from...


ARUBA
CARIBE NEERLANDÉS
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Ciudad Bolívar
Bucaramanga
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COLOMBIA
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Parque Nacional Natural Parima Tapirapecó
Florencia
Pasto
Parque Nacional Natural Serranía de Chiribiquete
Quito
Ibarra
ECUADOR
Parque Nacional Natural Río Puré
Cuenca
Machala
Iquitos
Loja
Tabatinga
Coari

Objective

Provide an approach, technical criteria, tools (set of indicators and models) and policy and regulatory recommendations for sustainable urban developments in Colombia (climate change mitigation synergies between sectors, urban adaptation goals, and SDGs)

1. Objetivos de Desarrollo Sostenible

https://electricayelectronica.uniandes.edu.co/es/ciudades-con-bajas-emisiones-de-carbono-en-colombia

Approach

- Develop a vision for planning and operating a city or urban project
- Apply a set of indicators (adaptable) to evaluate an urban project and its evolution towards an expected situation
- Build inventories and baselines
- Apply a set of models to evaluate options for mitigation, adaptation and improvement of living conditions
- Develop a tool to integrate the recommended options

DEPLOYMENT SCENARIOS

Analyze mitigation scenarios and options for increasing resilience and improving conditions for two case studies:

1. Macro project in operation phase.
(Ciudad Verde en Soacha)
2. Project in design phase.
(inicialmente Ciudad Norte, ahora Lagos de Torca)

Lagos de Torca

Project in design phase.

1801.47 Hectares

135,000 Residencial Units.

352,642 Projected inhabitants.

5.64 Ciudad Verde – 17.9 Simón Bolívar

Ciudad Verde

Project in operation phase.

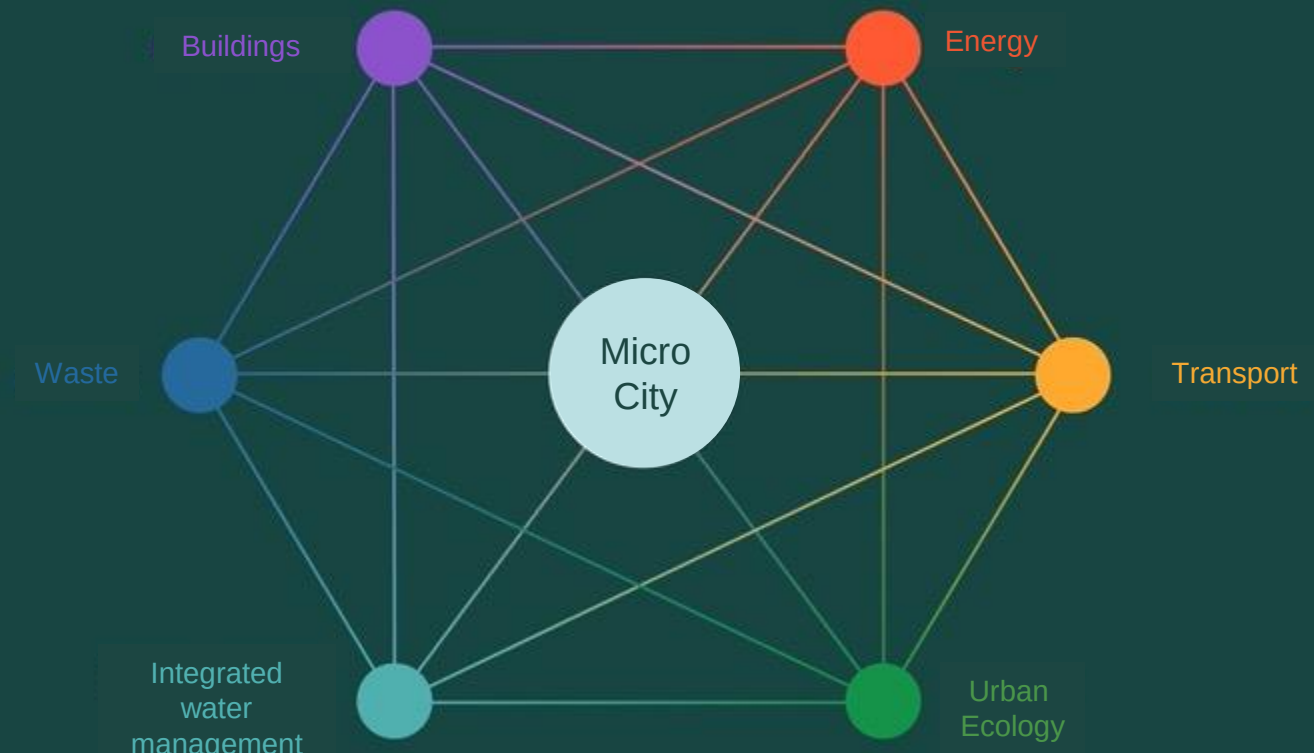
319.46 Hectares.

51,616 Residencial Units.

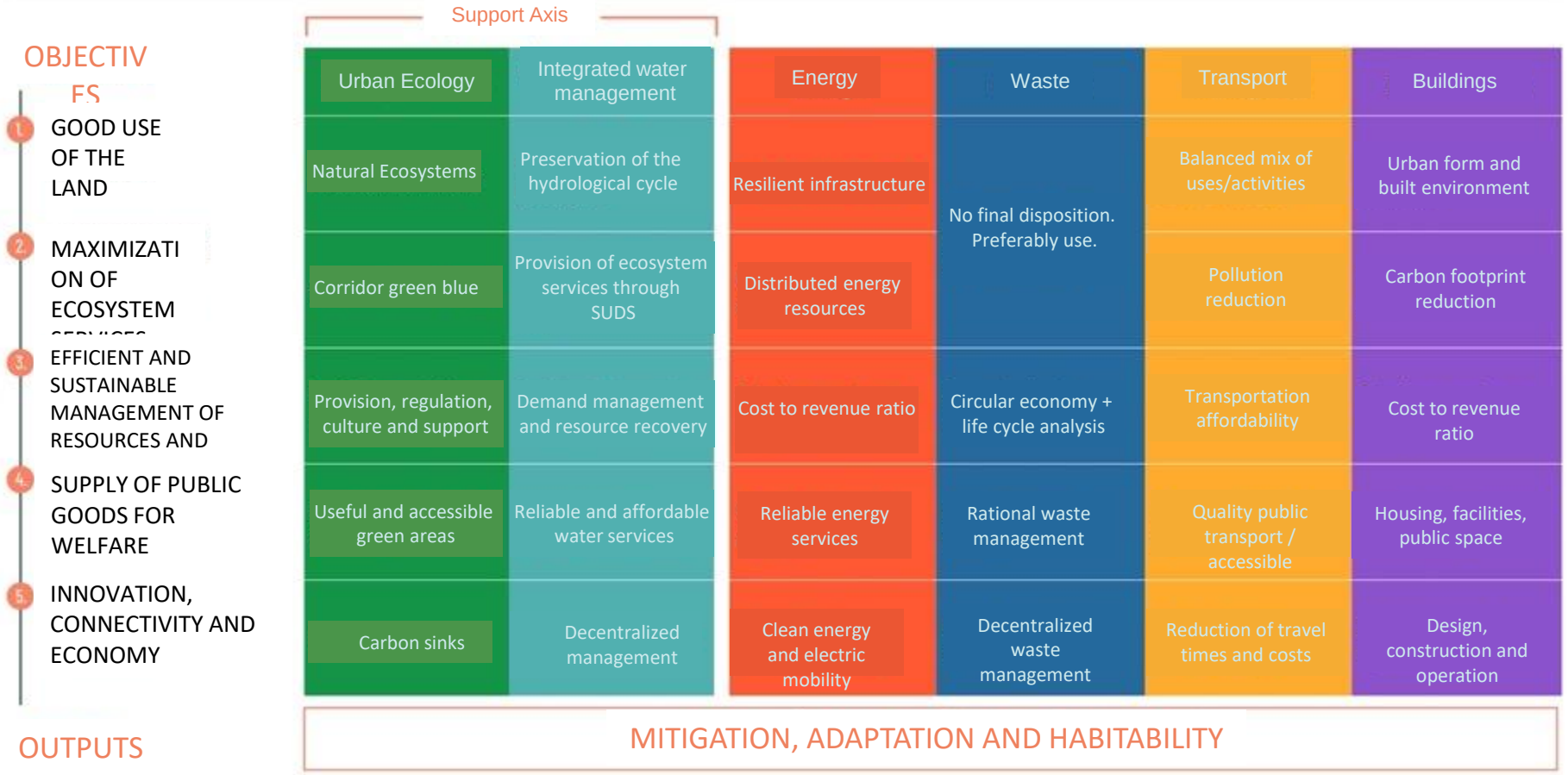
159,686 Projected inhabitants.

3.17 Parque Simón Bolívar

Más información: Informe Final Capitulo 5

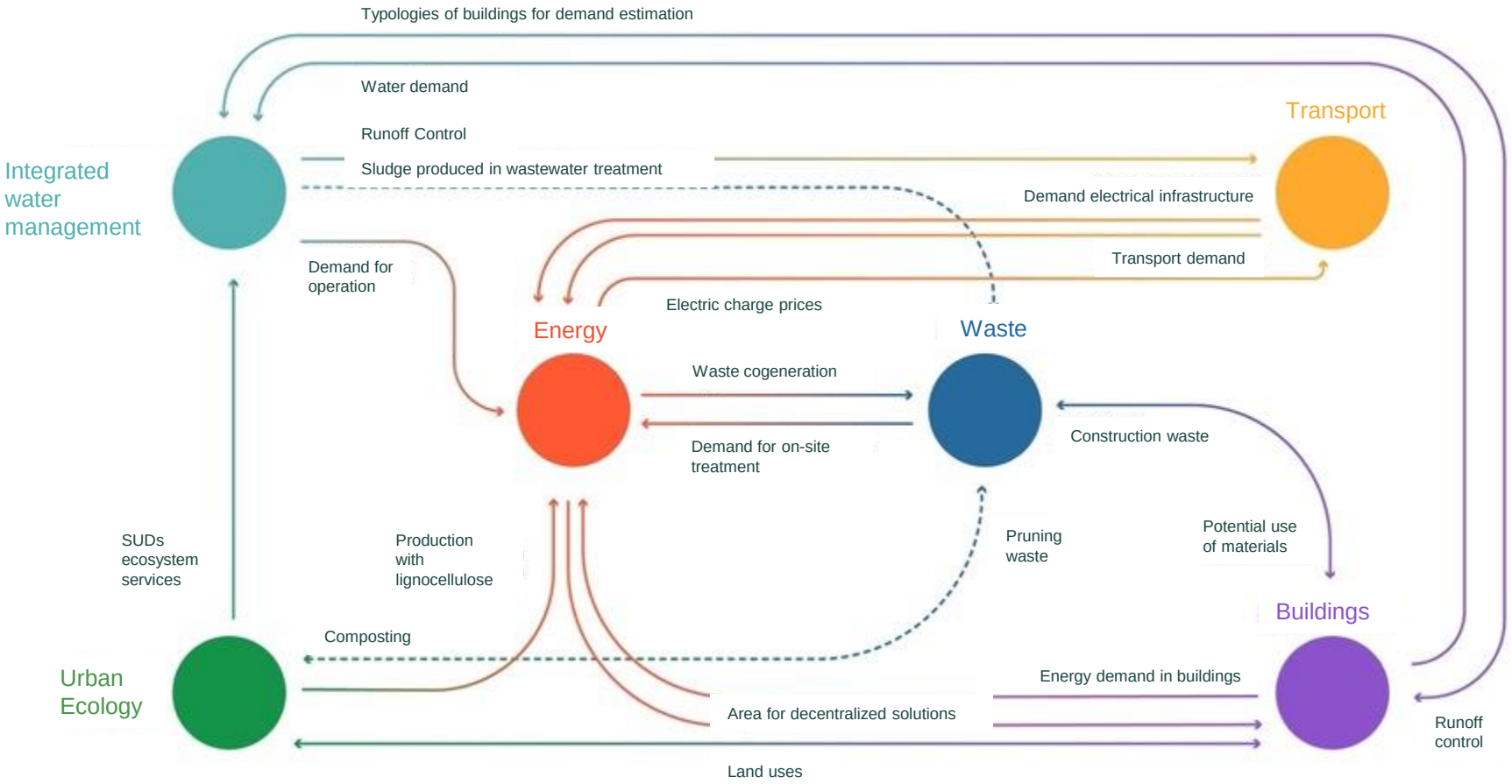

Buildings
Energy
Waste
Micro City
Transport
Integrated water management
Urban Ecology

PLANNING FRAMEWORK



Más información: Informe Final Capítulo 1

SECTOR MODELING AND RELATIONSHIPS



Más información: Informe Final Capitulo 3

Sensitive city

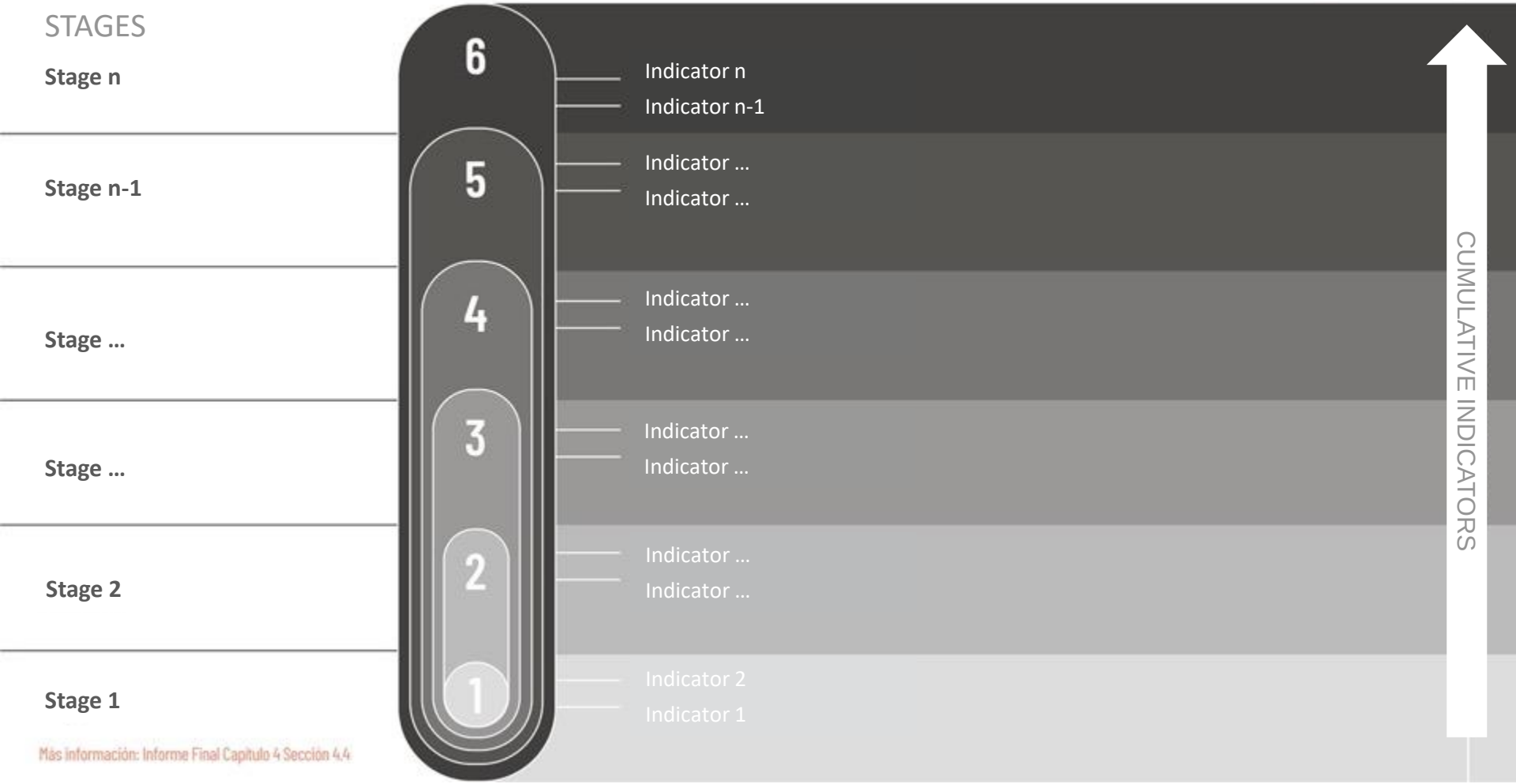
The methodology used considers different stages to go through in each sector to move from an initial situation represented by a minimum state of sustainability to a final situation represented by the achievement of a sensitive city in sustainability in that sector.

Más información: Informe Final Capítulo 1, Capítulo 4 Sección 4.4

METHODOLOGY

SENSIBLE CITY / INDICATORS

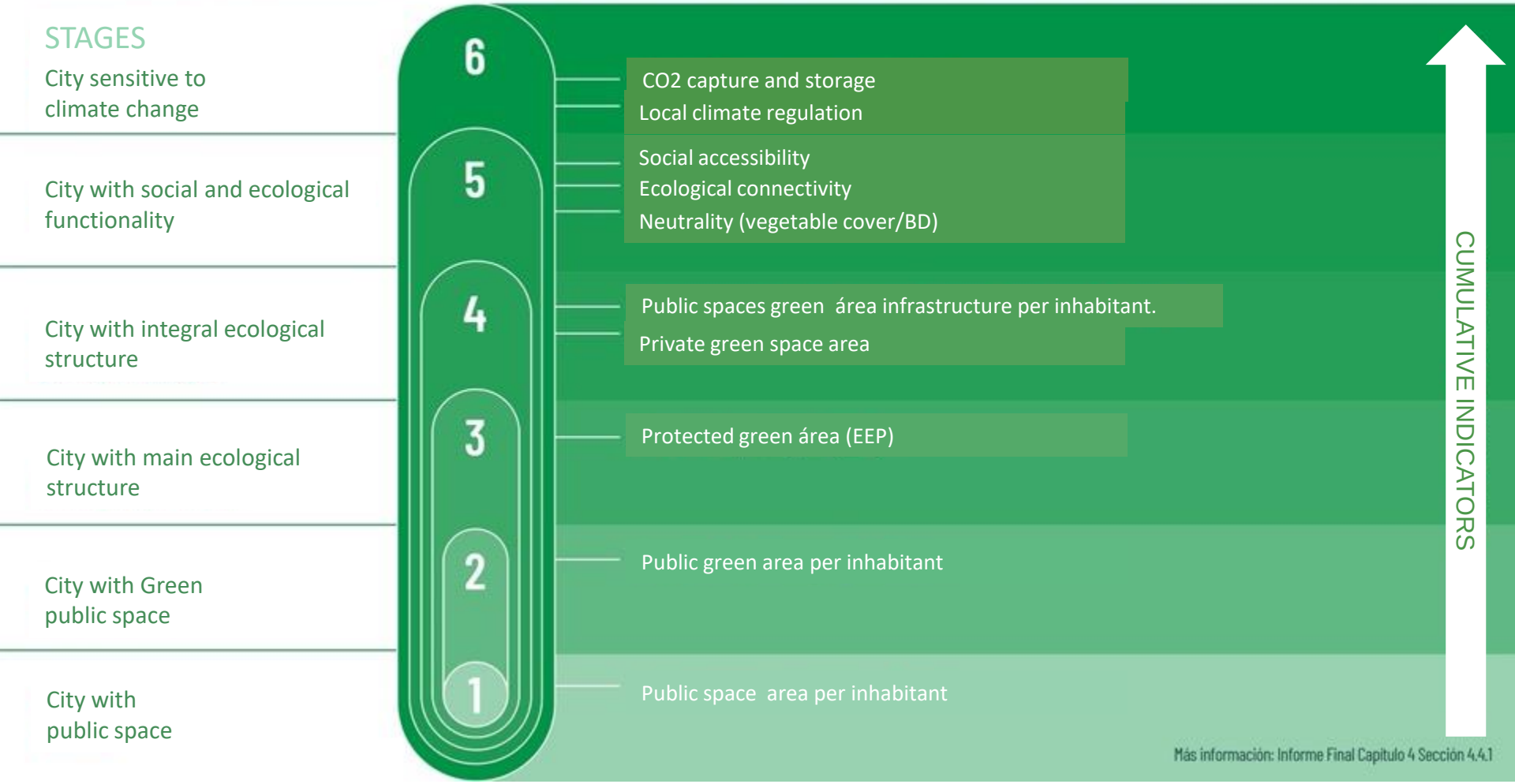
STAGES



Más información: Informe Final Capítulo 4 Sección 4.4

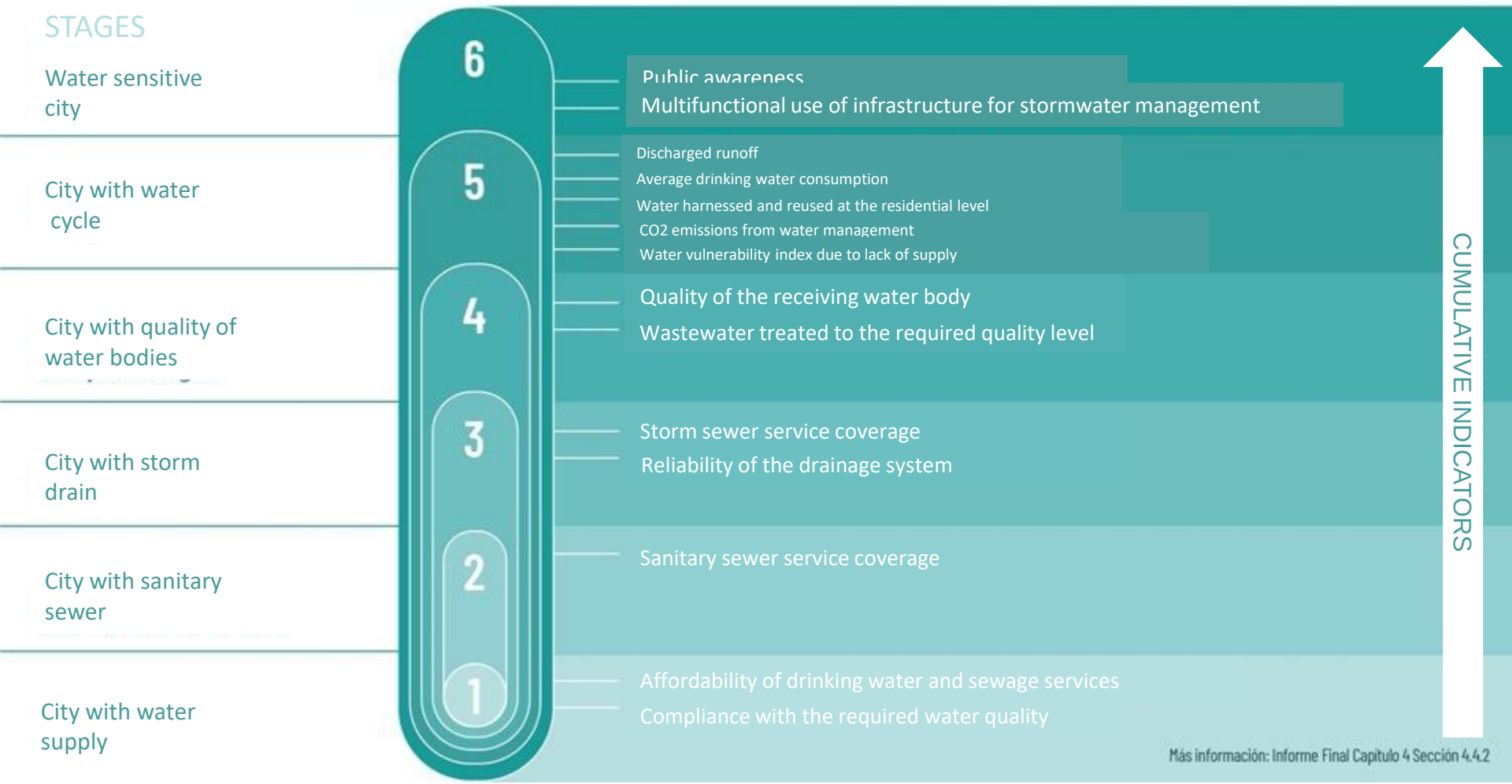
ECOSYSTEM-SENSITIVE CITY / INDICATORS

CASE STUDY / CIUDAD VERDE



WATER SENSITIVE CITY / INDICATORS

CASE STUDY / CIUDAD VERDE

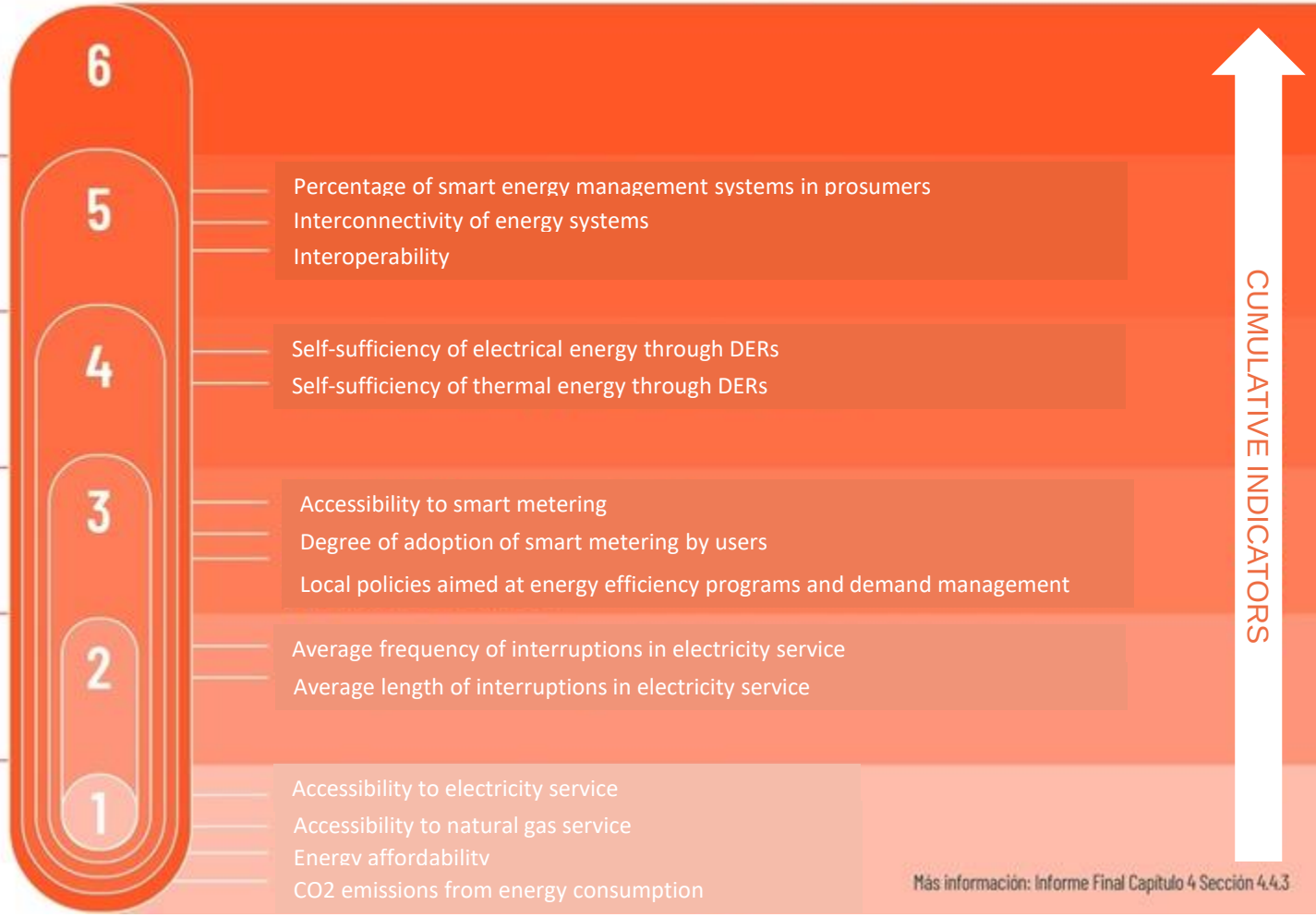


Más información: Informe Final Capitulo 4 Sección 4.4.2

ENERGY SENSITIVE CITY / INDICATORS

CASE STUDY / CIUDAD VERDE

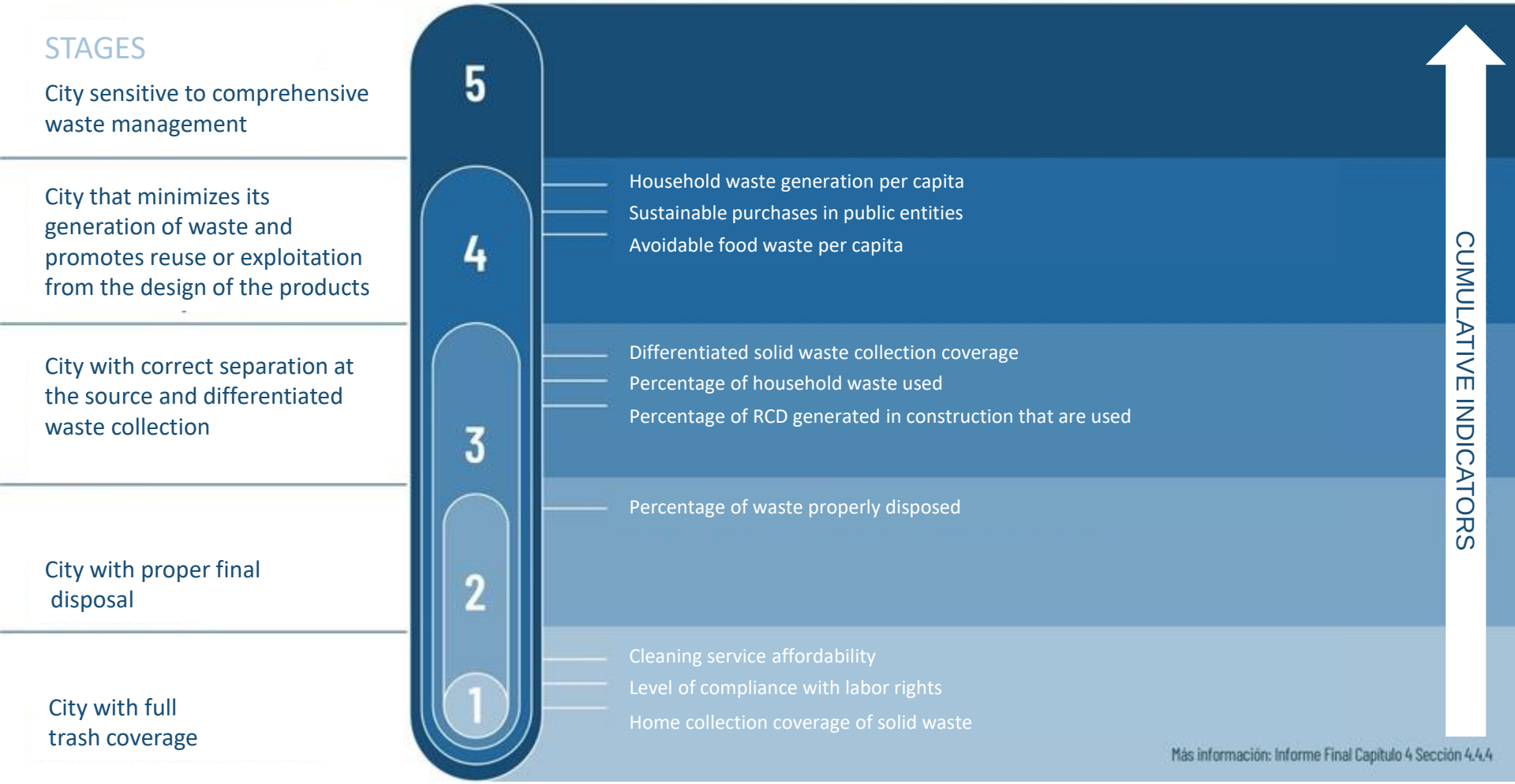
STAGES



Más información: Informe Final Capítulo 4 Sección 4.4.3

SENSITIVE TO COMPREHENSIVE WASTE MANAGEMENT CITY / INDICATORS

CASE STUDY / CIUDAD VERDE



SUSTAINABLE MOBILITY CITY / INDICATORS

CASE STUDY / CIUDAD VERDE

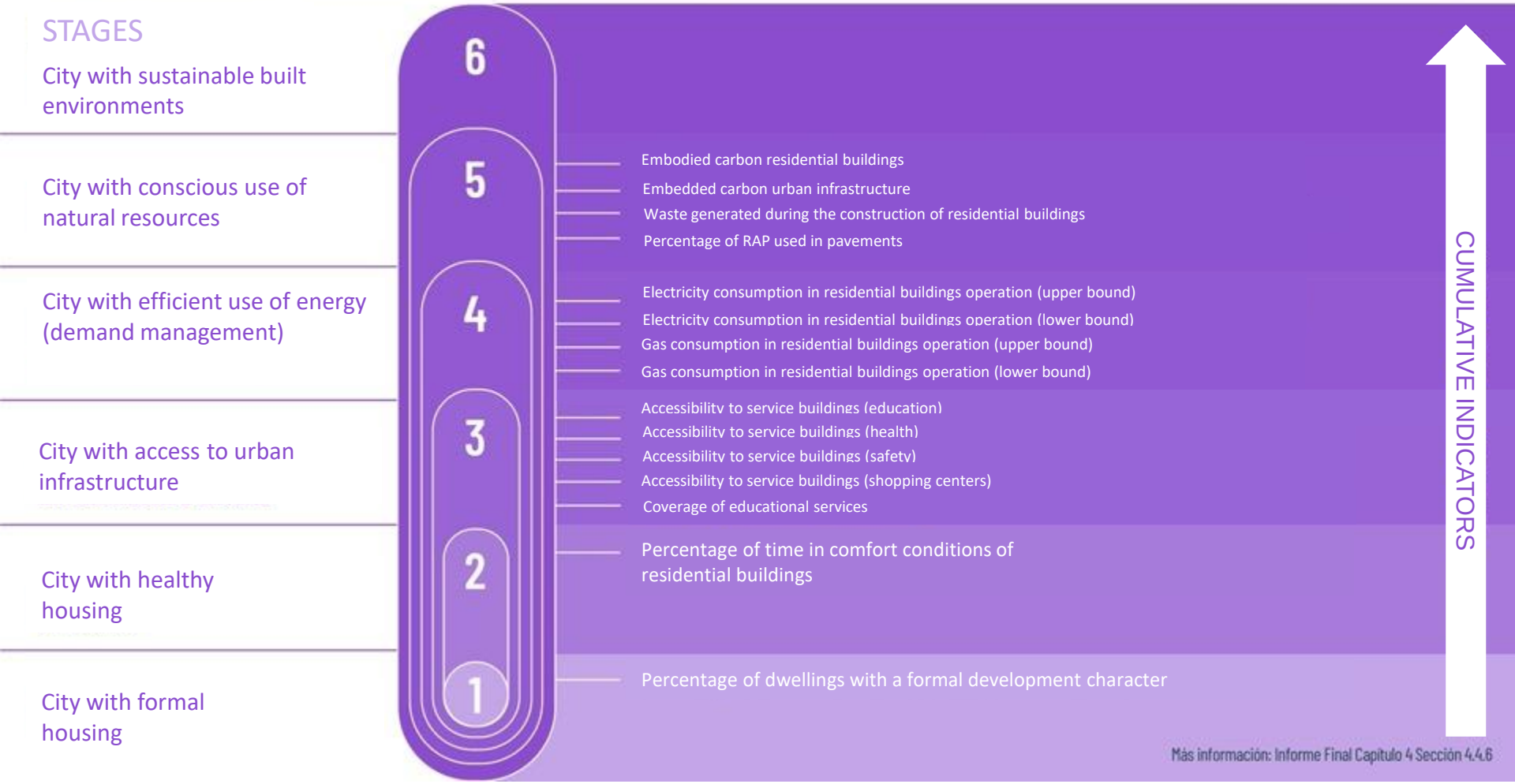
STAGES

Más información: Informe Final Capítulo 4 Sección 4.4.5
*Discriminado por género

CITIES WITH SUSTAINABLE BUILT ENVIRONMENTS/ INDICATORS

CASE STUDY / CIUDAD VERDE

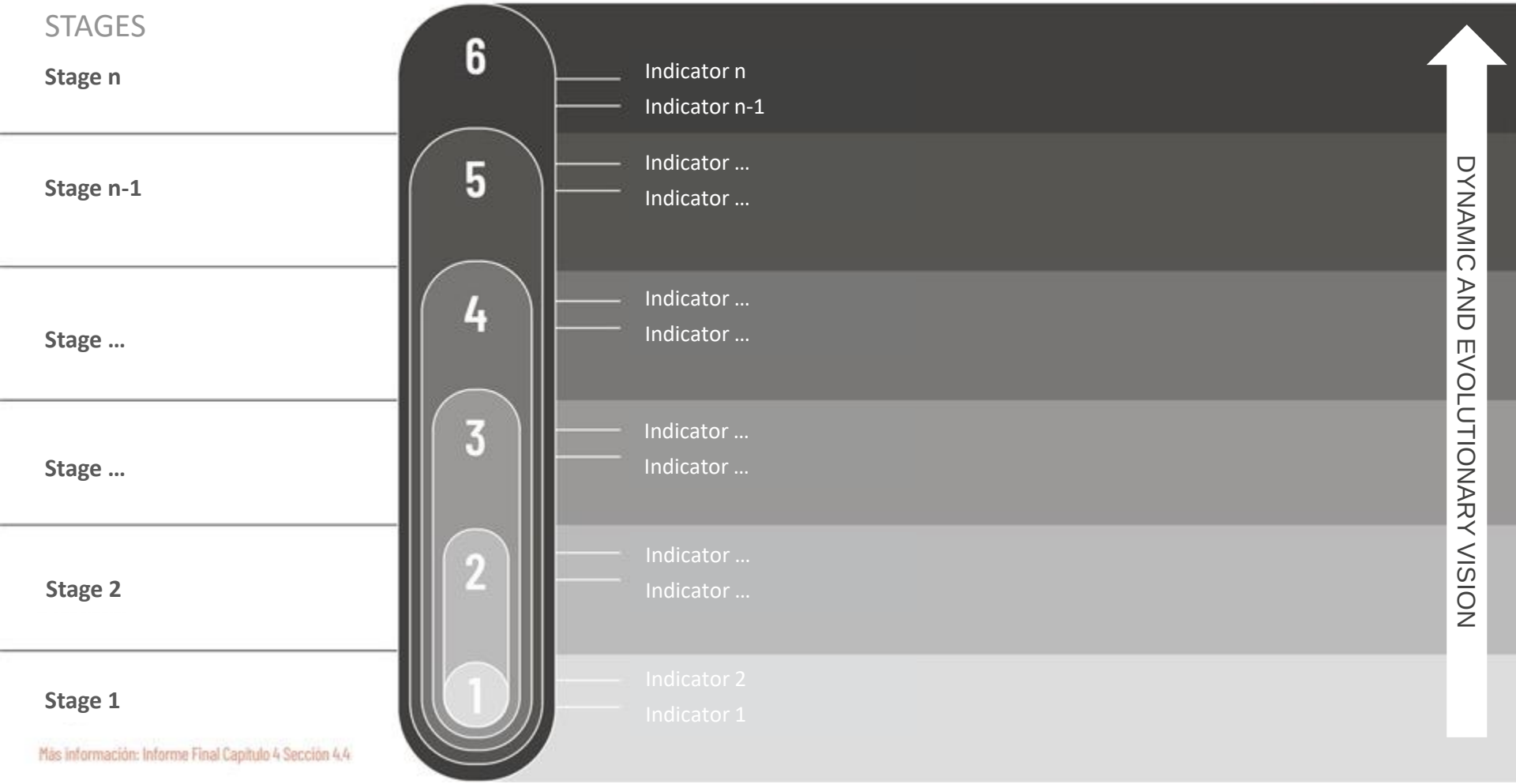
STAGES



Más información: Informe Final Capítulo 4 Sección 4.4.6

SENSIBLE CITY / INDICATORS

STAGES



Más información: Informe Final Capítulo 4 Sección 4.4

Indicators

The indicators as a tool for planning and management, have as main objectives to generate useful information for monitoring, evaluation and decision making, as well as to monitor compliance with the objectives set. The most relevant characteristics of the indicators are:

1. Universality
2. Objectivity and clarity
3. Ease of collection
4. Representativeness

Más información: Informe Final Capítulo 2 Sección 2.3

METHODOLOGY

Fuzzy Comprehensive Assessment Methodology

1

It allows to obtain a description of the current situation of the case study and to determine the stages and indicators that require priority attention.

2

They must take action or improvement measures and establish a time interval to monitor the evolution of the stages and indicators.

3

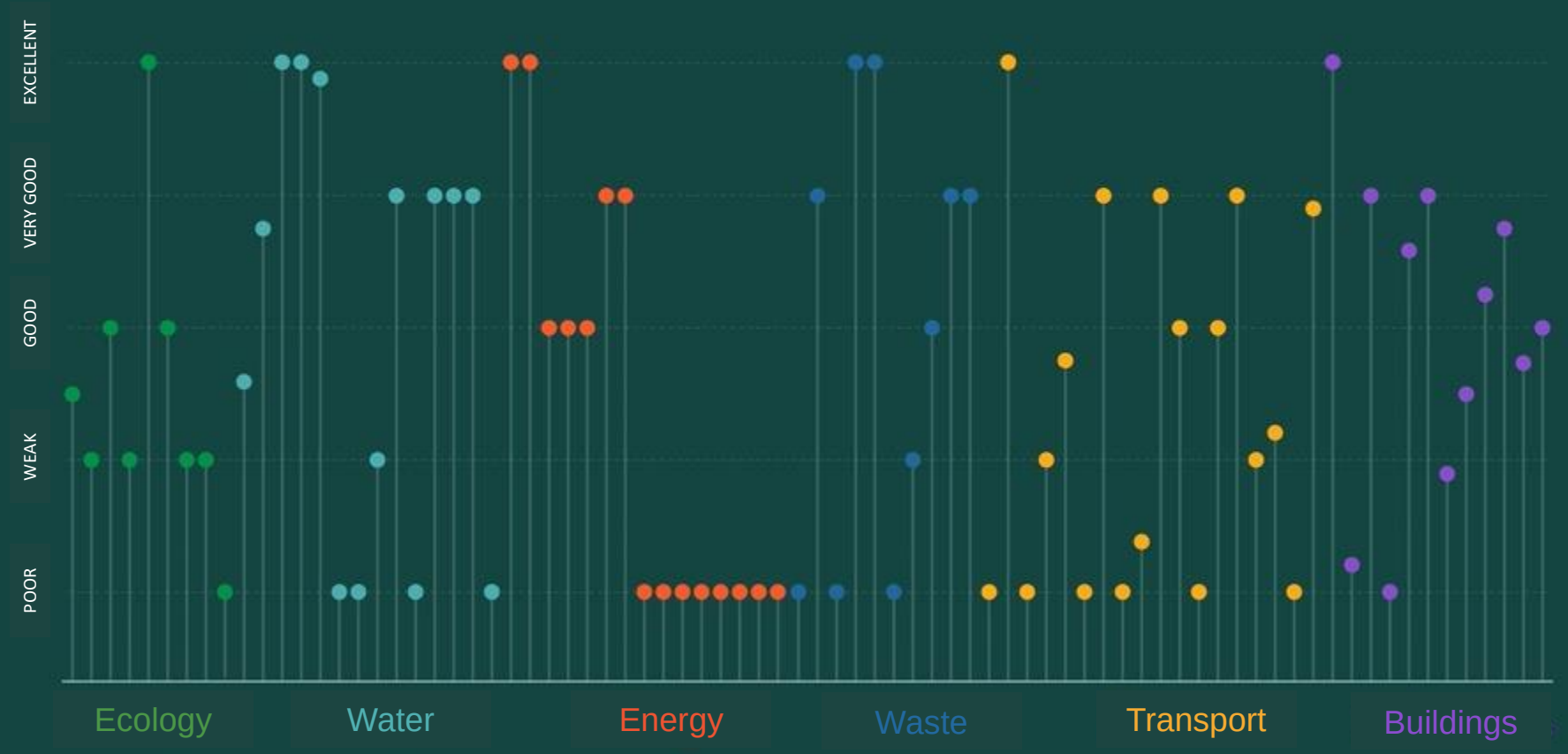
It allows an objective and comprehensive evaluation that involves linguistic terms in its description, facilitating its interpretation for decision making.

Más información: Informe Final Capítulo 2 Sección 2.6

EXAMPLE


Ciudad Verde
Soacha - Cundinamarca
Proyecto en etapa de operación

CIUDAD VERDE / RESULTS OF INDICATORS BY SECTOR



Results by stage

Más información: Informe Final Capítulo 6 Sección 6.1.1

Más información: Informe Final Capítulo 6 Sección 6.1.2

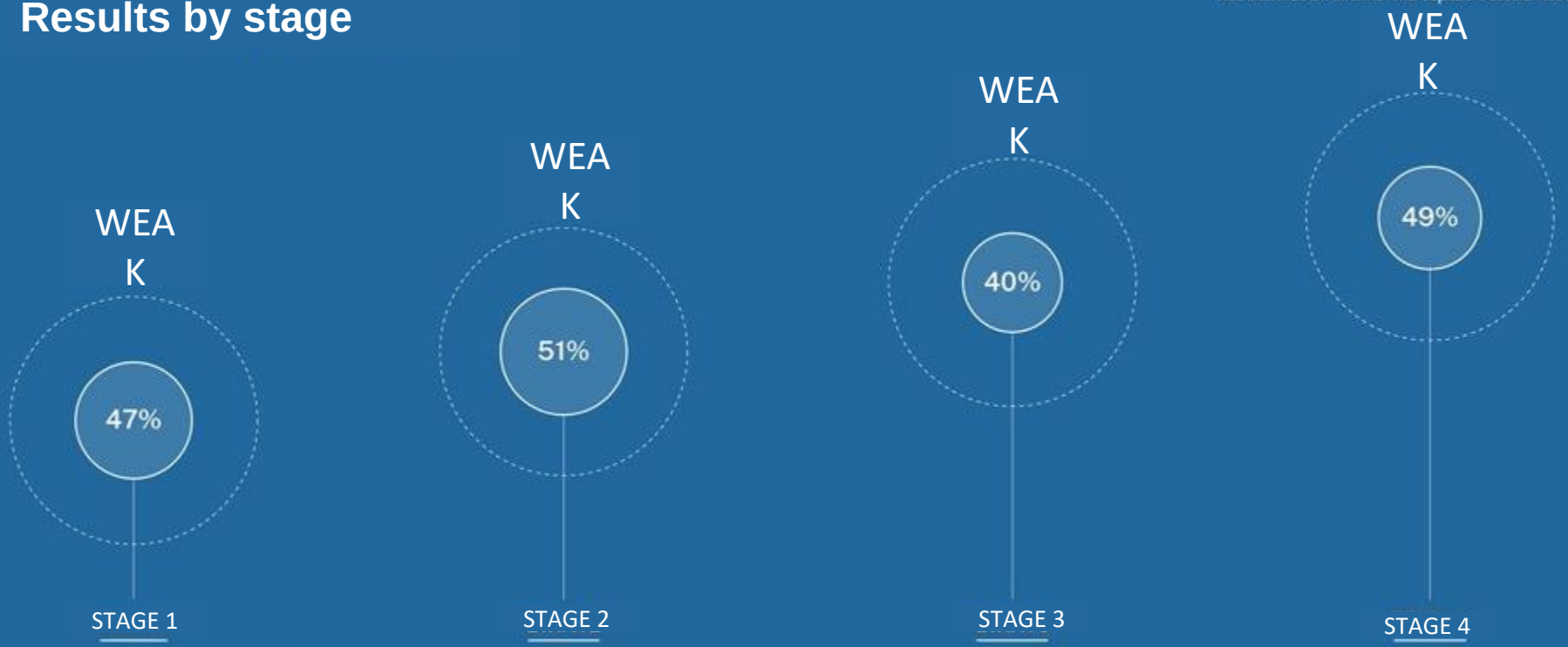
Results by stage

Results by stage

Más información: Informe Final Capítulo 6 Sección 6.1.3

Results by stage

Más información: Informe Final Capítulo 6 Sección 6.1.4

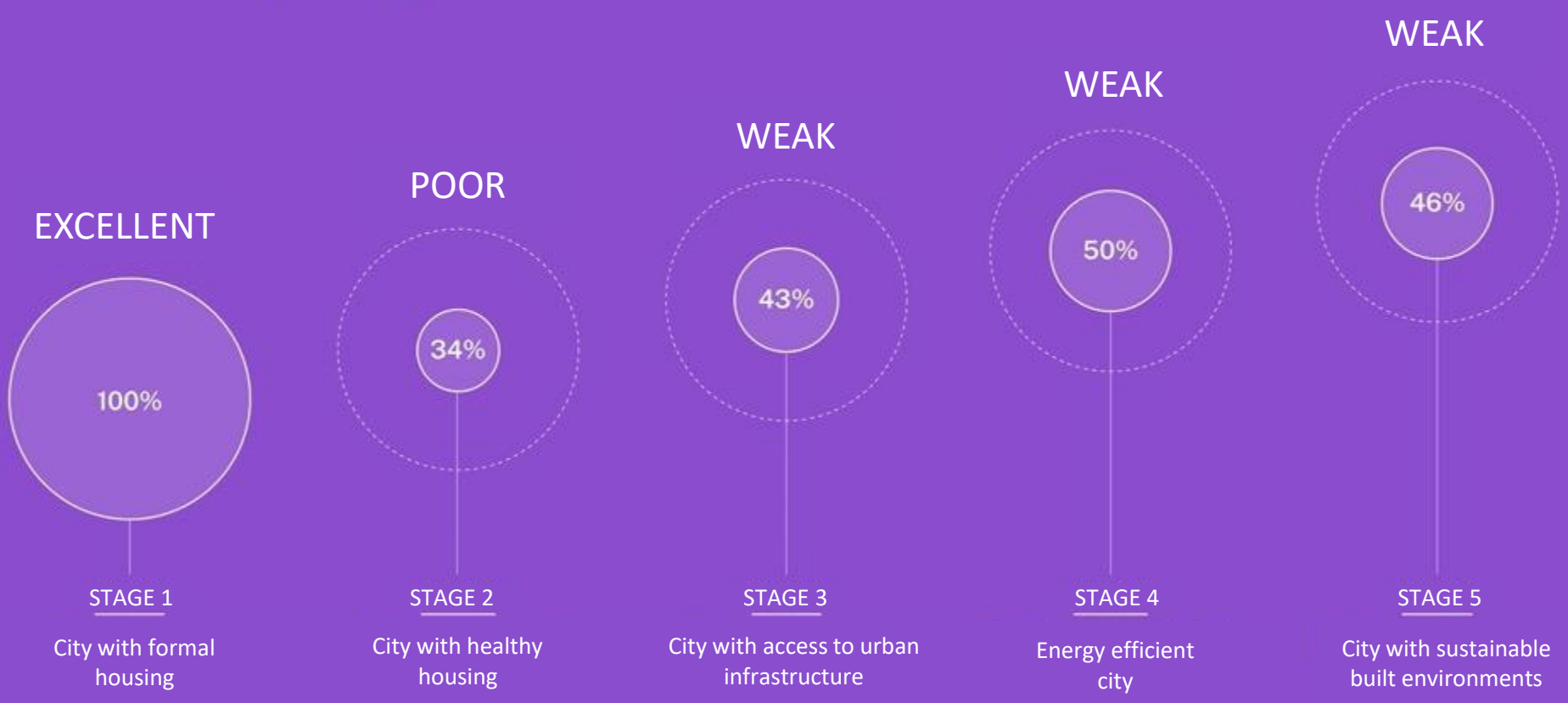


Results by stage

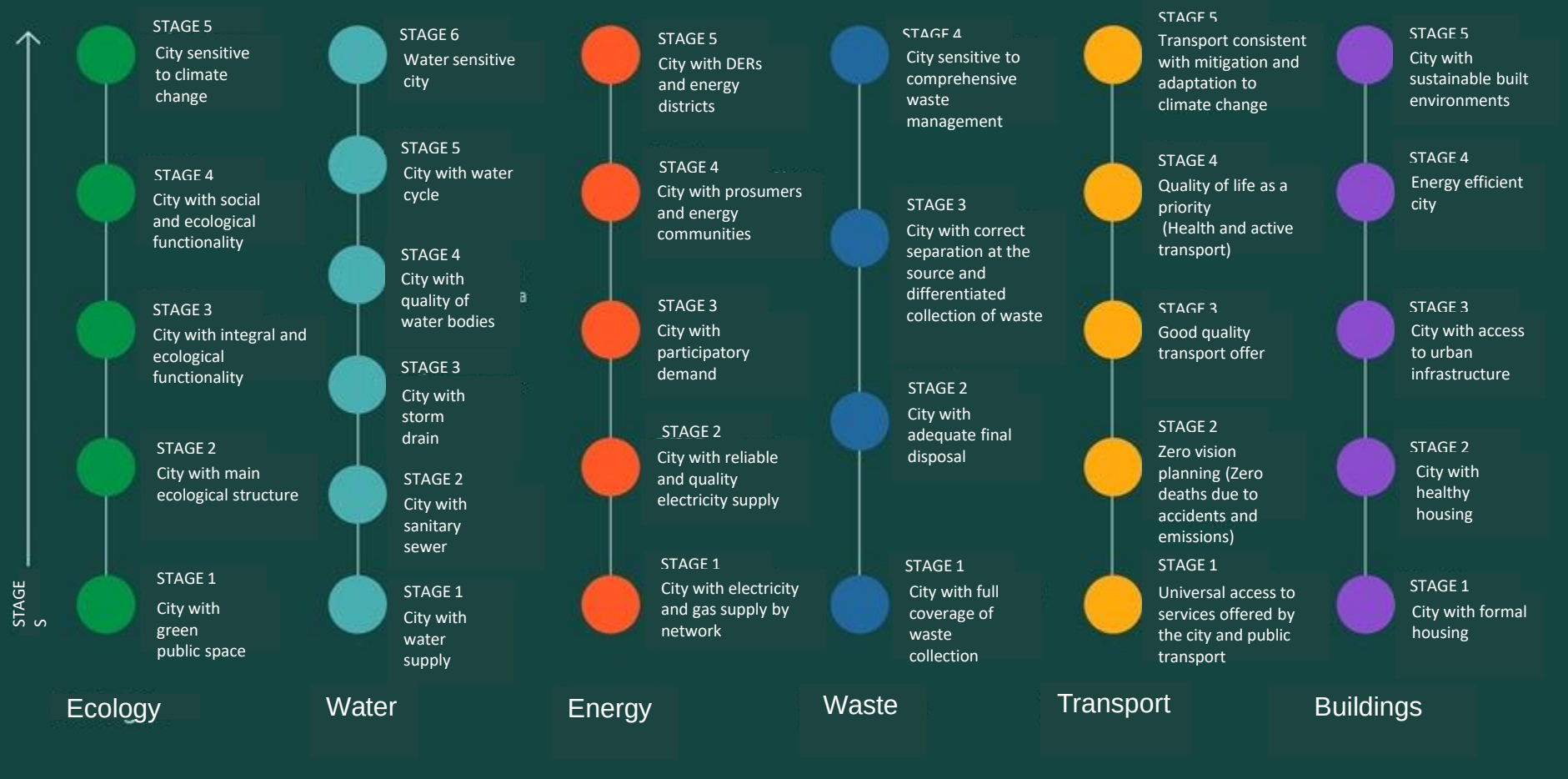
Más información: Informe Final Capítulo 6 Sección 6.1.5

Results by stage

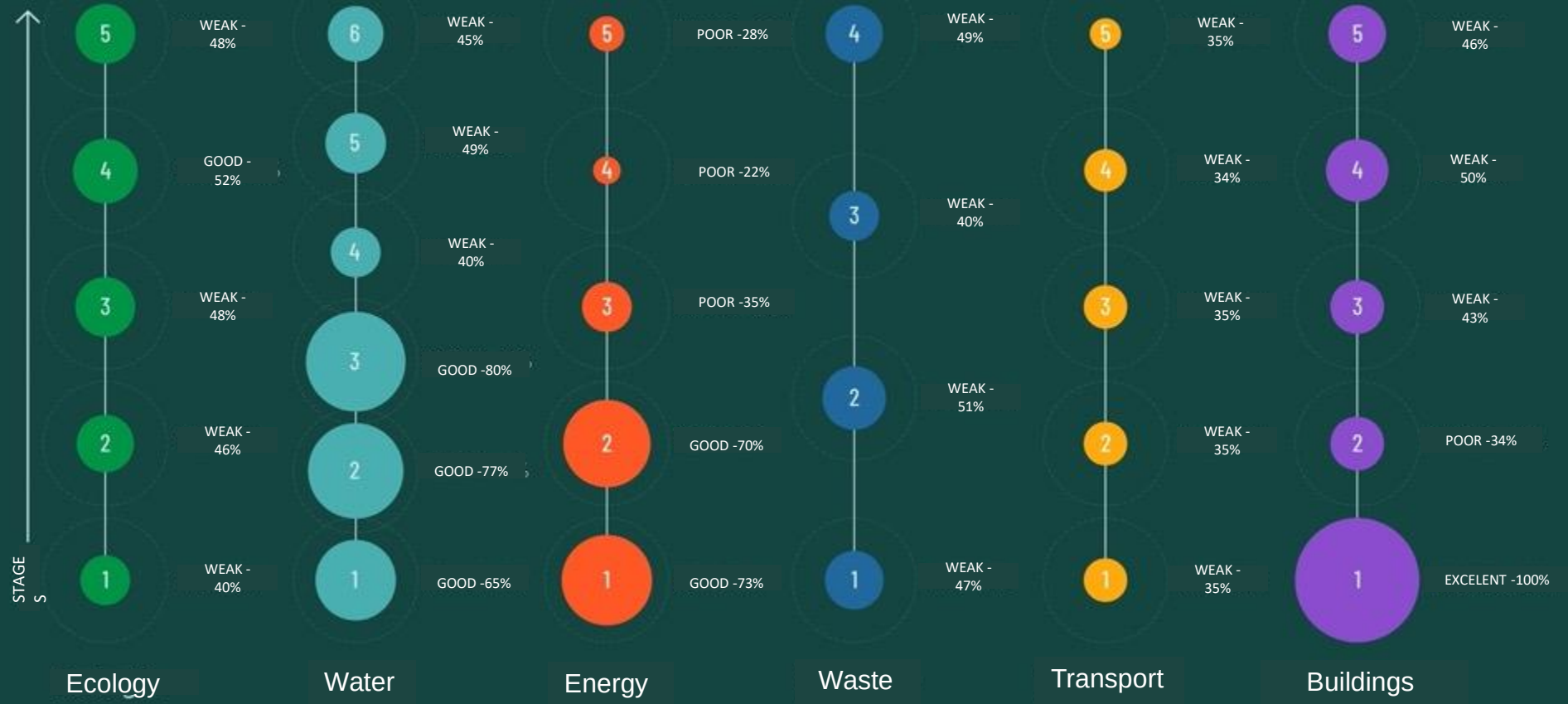
Más información: Informe Final Capítulo 6 Sección 6.1.6



CIUDAD VERDE / RESULTS OF INDICATORS BY SECTOR



CIUDAD VERDE / RESULTS OF INDICATORS BY SECTOR



Conclusions

RESULTS AND LESSONS LEARNED

CONCLUSIONS

1 RESULTS MIGHTBE COMPLEX, CONSIDERING...

- Methdology
- Application of indicators
- Evaluation of Mitigation Measurements

→ FOR ALL CASE STUDIES

2 BOTH CASE STUDIES ARE OF BIG INTEREST DUE TO THEIR DIMENSIONS AND URBAN IMPLICATIONS

Different Developments

Ciudad Verde en Soacha	Lagos de Torca en el Distrito Capital
• Final Phase • Social Macroproject • 1 Plan	• Long-term 30 years • Different type of inhabitants

3 IDENTIFIED OPPORTUINTIES

- CO_2 FOOTPRINT REDUCTION
- ACTIONS TO FACE CLIMATE CHANGE
- BETTER CONDITIONS FOR HABITABILITY

→ Can be conceived while planning

Improved and monitored during operation

Más información: Informe Final Capítulo 8

RECOMMENDATIONS/ MITIGATION MEASUREMENTS

Consider Phase of the Project

Consider new practices to use and handle water, energy, and waste

Promote decentralized systems with low footprint

- Distributed generation, district heatings, AMIs.
- SUDS.
- Scheduling waste recollection

Different options to improve mobility and public transportation

Consider Nature-based Solutions

Different materials in the construction

Involve community and make it aware of the commitments achieved

Regulations and politics for the use of new technologies that involve everyone in the process.

RECOMMENDATIONS/ ADAPTATION

Nature should be the most important factor

Green areas should be used to allow social distancing

Reconsider the effective green area indicator

Increase infrastructure modularity for the use of resources (e.g., water, energy)

Provide regenerative services

Review regulatory processes

RECOMMENDATIONS/ HABITABILITY

Urban Configuration:

- Interactions between buildings/
- Connect habitats with commerce and jobs.

For lower income inhabitants it is usually difficult to have access to public services.

Architectonic Configuration:

- Comfort (e.g., light(
- Flexibility in terms of spaces for different type of activities.
- Materials used to improve habitability and comfort.
- Use technology in public areas and consider sustainability.

Guarantee connection between elements (e.g., water) and planning

FINAL CONSIDERATIONS

CONCLUSIONS

1 **FOCUS OF THE STUDY** → RECOGNIZE THAT THE URBAN PROJECTS ARE DYNAMICAL AND SHOULD ADVANCE TO THE DESCARBONIZATION BY

- Good soil use
- Maximize ecosystem services
- Efficient use of resources and waste
- Sustainable infrastructure and mobilitys

2 USING INDICATORS DIVIDING THE WHOLE PROBLEM IN STAGES AND THE EVALUATION FOR MITIGATION, ADAPTATION AND IMPROVEMENT REQUIRE

- Being considered from the beginning
- Monitoring implementation

→ IN ORDER TO ACHIEVE **SUSTAINABILITY** OF URBAN DEVELOPMENTS

- DECREASE FOOTPRINT
- BETTER RESILIENCE
- BETTER CONDITIONS HABITABILITY

Gracias

https://electricayelectronica.uniandes.edu.co/es/ciudades-con-bajas-emisiones-de-carbono-en-colombia