Interreg Mediterranean

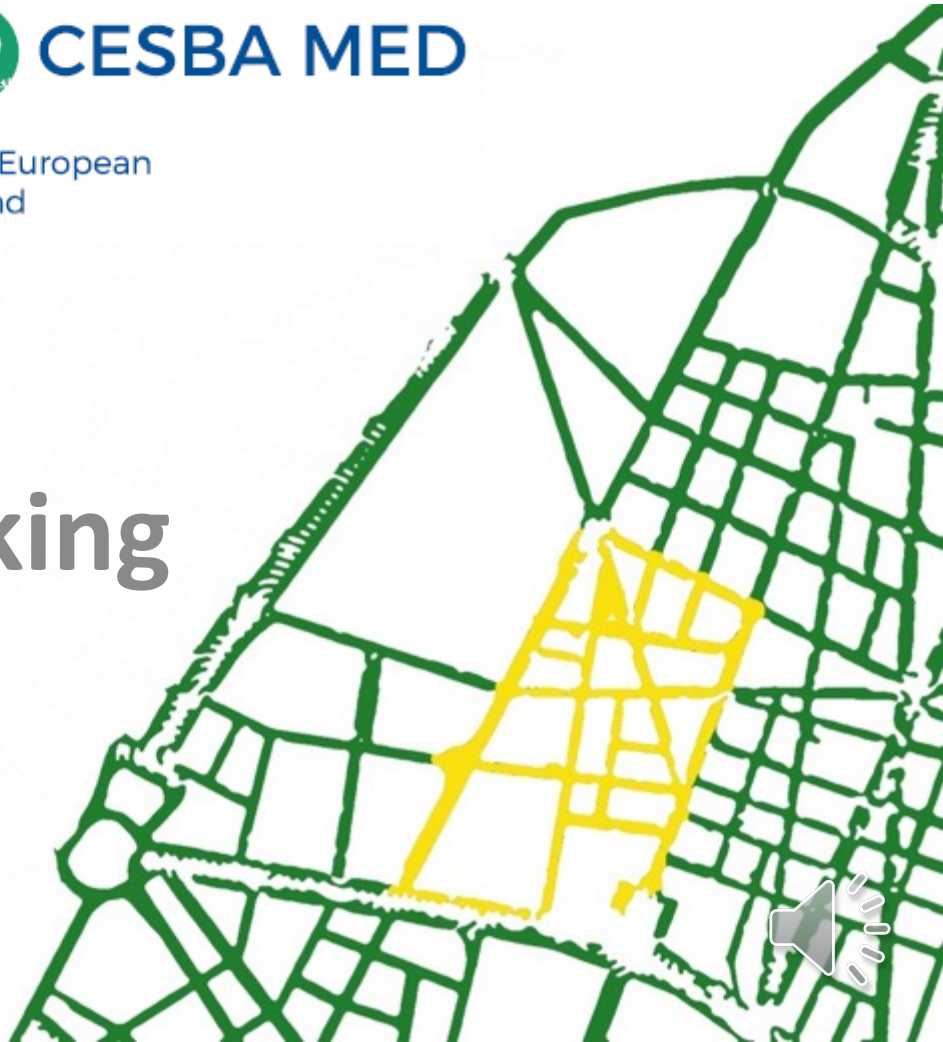
EUROPEAN UNION

CESBA MED

Project co-financed by the European Regional Development Fund

Training Module 2

The decision-making process



WP4 - ACTIVITY 4.2: CESBA MED TRAINING SYSTEM
DELIVERABLE 4.2.1

Decision Making Process

Integrated process for **selecting and prioritizing energy efficiency and sustainable retrofitting interventions** for significant performance improvements in the rehabilitation of public buildings and urban areas.

Decision Making Process

The model of the decision making process is intended to **support public administrations** in the definition of:

- ✓ the best retrofit concept for existing / new **urban areas**;
- ✓ the best retrofit/design concept for **public buildings** in the context of their urban area.

Decision Making Process

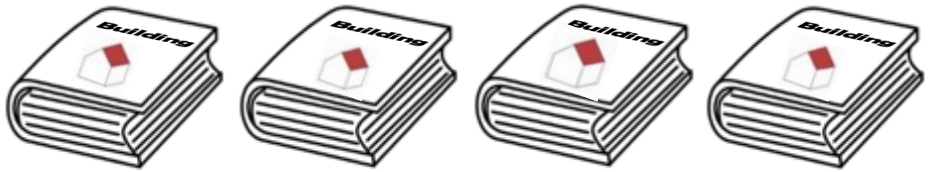
Decision Making Process is articulated in **6 phases**:

1. **Initiation**
2. **Preparation**
3. **Diagnosis**
4. **Strategic definition**
5. **Decision making**
6. **Retrofit/New development concept**

Test results: retrofit strategy

DECISION MAKING METHODOLOGY → TEST PROTOCOLS

9 Retrofit concepts for pilot urban areas



CESBA LOCAL COMMITTEES

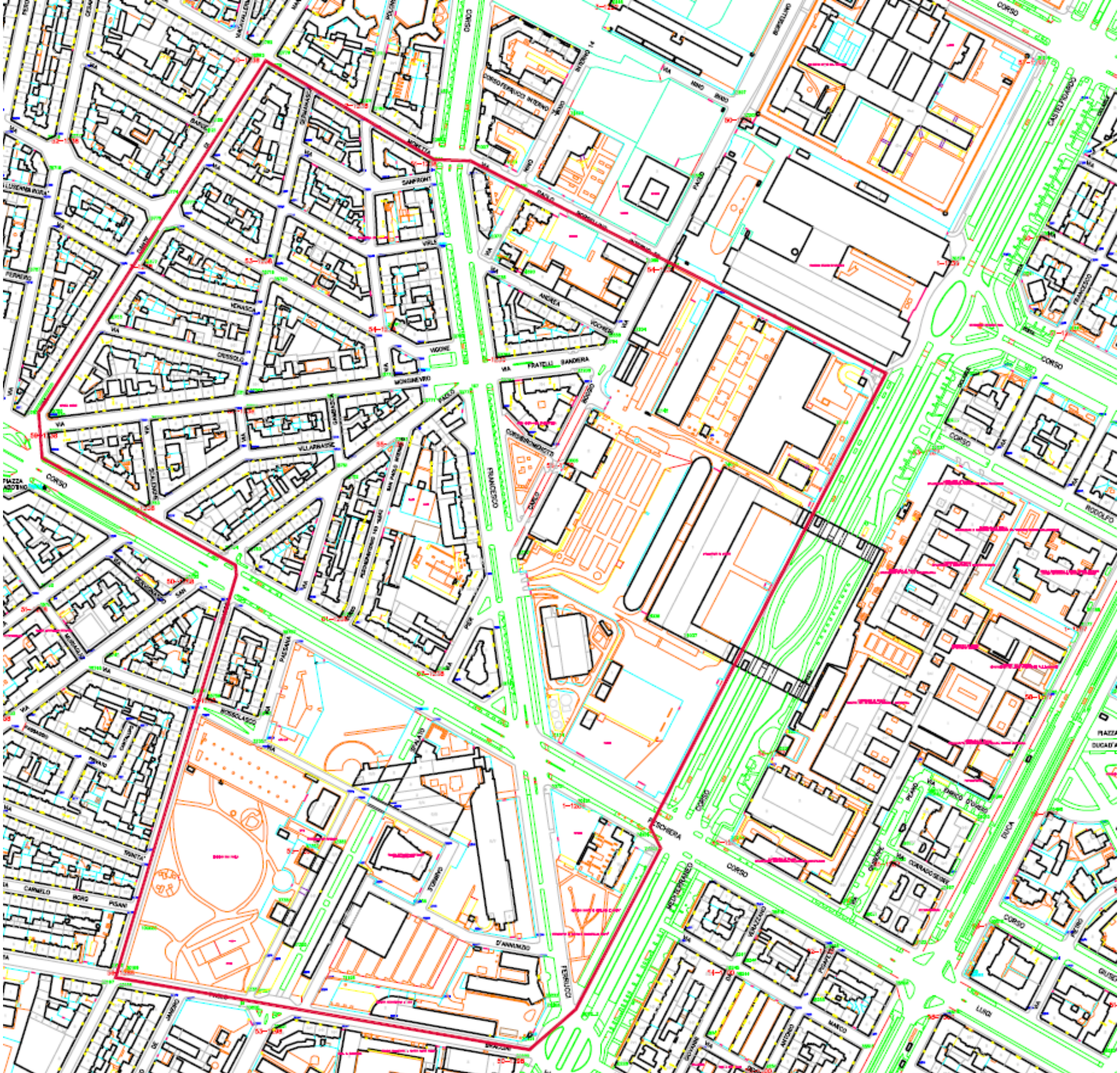
Decision Making Phases:

1- INITIATION

Selection of an urban area and two public buildings

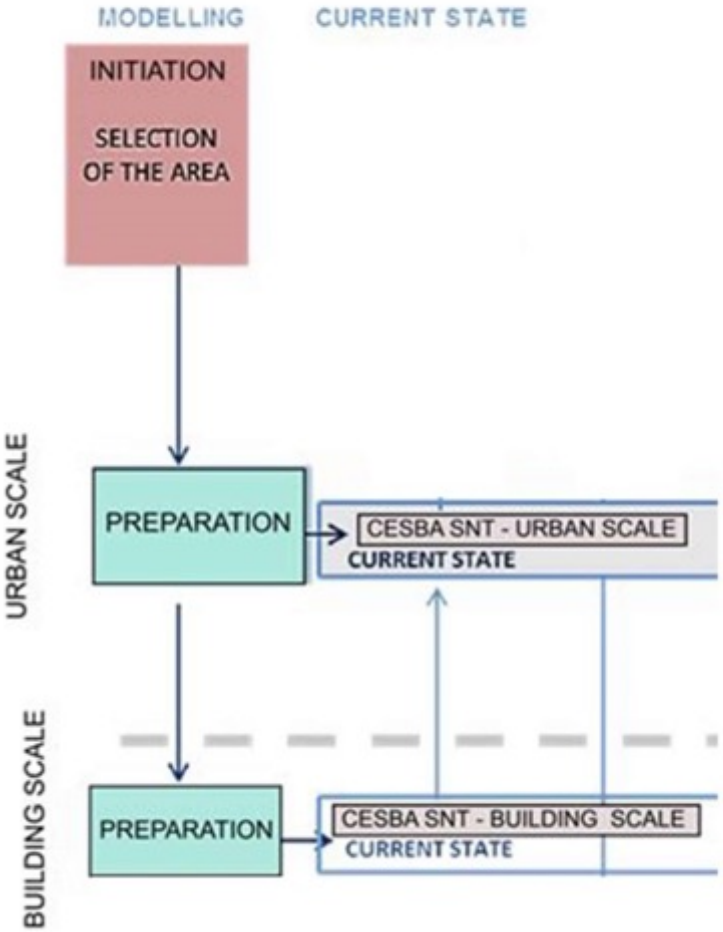
It is necessary to **set clearly the physical boundaries** of the urban area. Physical boundaries of the urban area may be derived using the following criteria:

- Geographical proximity
- Property ownership / occupier
- Social and Economic context
- Legal /administrative boundary lines
- Period of construction
- Energy supply infrastructure



CORSO
VIA
FRATELLI BANDIERA
MONGINEVRO
FRANCESCO
PESCHIERA
FERRUCCI
D'ANNUNZIO
LUIGI
PIAZZA

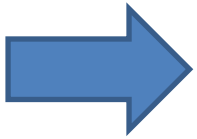
Decision Making Phases:
2 - PREPARATION



GENERIC FRAMEWORK CONTEXTUALIZATION

CRITERIA SELECTION

WEIGHT: PRIORITY FACTORS AND WEIGHT ADJUSTMENT BENCHMARKS



SNTool

SBTool

INFORMATION SOURCES IDENTIFICATION FOR EACH INDICATOR.

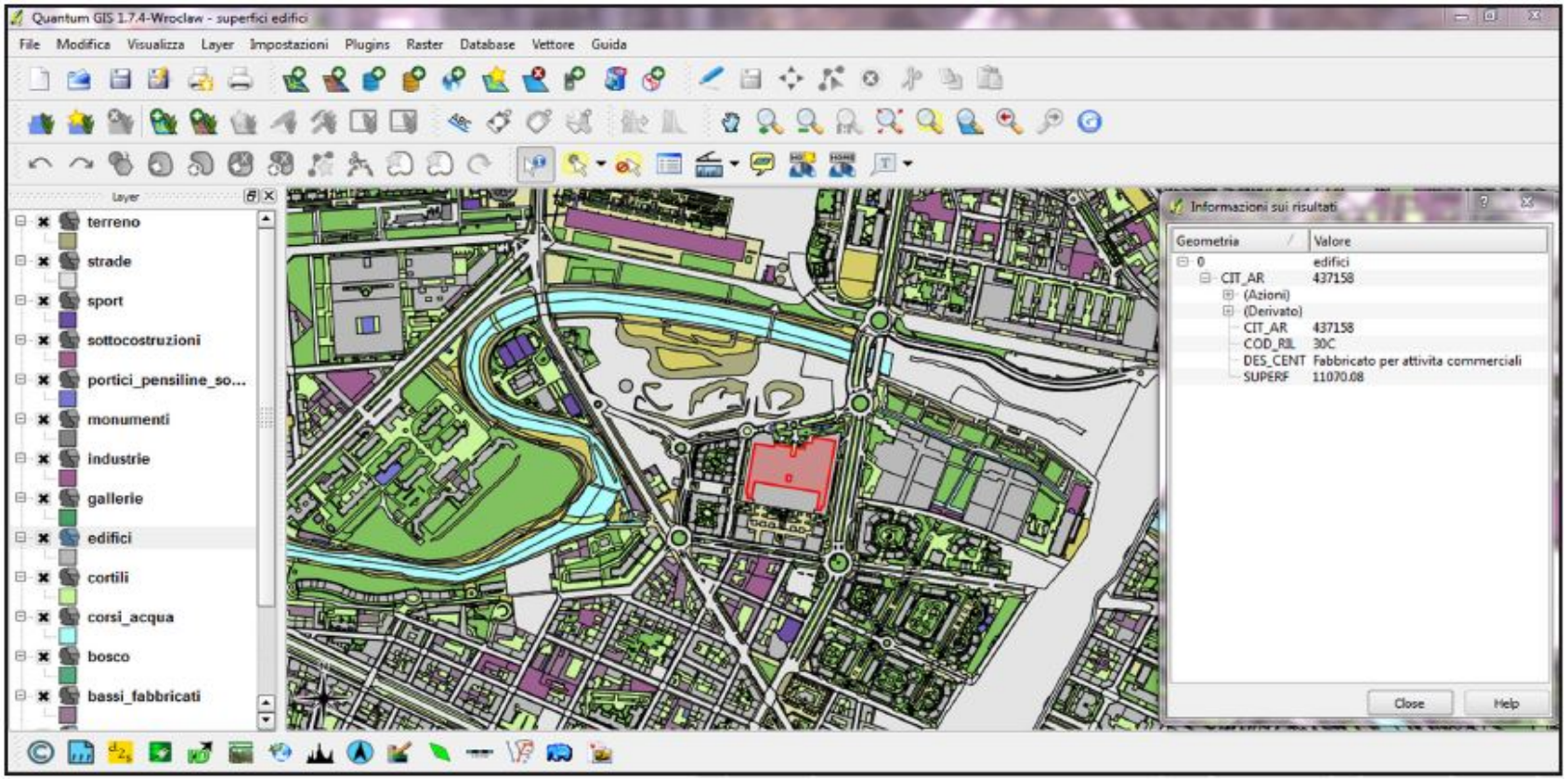
HIGH QUALITY RETROFITTING CONCEPT CAN ONLY BE ACHIEVED IF IT IS PLANNED ON A SOLID DATABASE.

- Administrative bodies of the municipalities (e.g. Building authorities, land surveying office, etc.)
- Building owners / tenants
- Existing Energy Performance Certificates
- Energy Supplying Companies
- Public accessible free source (e.g. Google Earth, Open Street Map)
- On-site inspection by the planners (assess as it, identify informations can't be deduced from cartography and inspect areas in different periods of year to have a more whole vision)
- Default Data Sources and databases (databases from R&D projects, etc.)

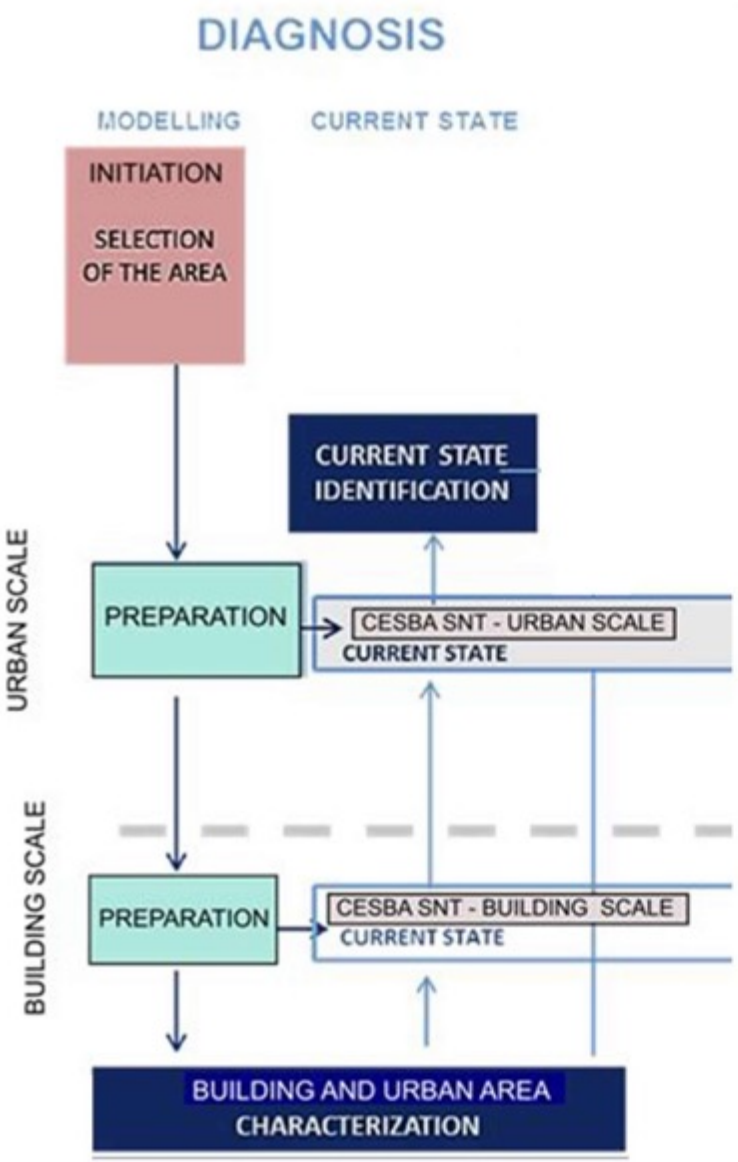
CONTACTS	DOCUMENTS
City Planning head office	Cadastral map, updated Numeric Cartography, Zoning Plan of the City of Torino
Infrastructure and Mobility head office	Site plan bicycle mobility, PUMS-Urban Sustainable Mobility Plan, Plan of accessibility, Plan detailing the type of homogeneous surfaces of flooring
CSI-Consorzio per il Sistema Informativo Piemontese	Census of Population, Census arboreal species
Green head office	Site plan of Green Areas, Urban Green Plan
Environment head office	Plan of waste management
AMIAT-Azienda Multiservizi Igiene Ambientale Torino	Updated Map of the points of door to door collection, Map of the location of the ecological islands
ARPA-Agenzia Regionale per la protezione ambiente **IREN Energia – IRIDE** **Direzione Edilizia Privata**	Energy Plan, Site plan of networks distribution of heat, Census of renewable energy systems in buildings, Registry of heating, cooling, street lighting, District Heating Plan, Map of monitoring stations
OICT-Osservatorio Immobiliare Città di Torino	Estimation of Real Estate values in the area

GIS AS A TOOL TO ELABORATE DATA

It allows the acquisition, the analysis, the visualization, the restitution of **information deduced from geographical data (geo-referenced) directly questionable.**



Decision Making Phases: 3 - DIAGNOSIS



The diagnosis phase consists in the **evaluation of the actual performance** and relative level of sustainability of the urban area and buildings.

Identify the **strengths and key weaknesses** of the whole urban area and public buildings in terms of sustainability.

Set **the basis for the definition of the performance targets** for the retrofitting project of the urban area and public buildings.

In the diagnosis phase the CESBA MED Committees should be involved by having access to the results of the diagnosis phase. Especially the municipalities as well as the owners and tenants should participate in this phase.

At urban level the information provided by the assessment systems allows to develop a **SWOT** analysis.

A SWOT analysis is a study undertaken to identify its strengths, weaknesses, available opportunities, and possible threats.

Strengths

- **Geographical location (hub function)**
- Diversity (land, water)
- Naturally preserved areas
- Natural scenery maintained, low pollution
- Ecological assets
- Strong historical and cultural heritage
- **Human capital**
- Education center
- International cooperation and partnerships
- Medical provision and facilities
- **Established brand "Hue"**
- Economic growth in province (10%)
- Well-developed infrastructure (education, water supply, medical)
- Tolerance
- Political commitment
- International airport
- Transport connectivity (also rail)
- Security system
- Developed industries (tourism, textiles, construction materials, [sea]food processing, high tech, beverage)

Weaknesses

- Slow urbanization
- Lack of raw natural and financial resources
- Lack of infrastructure and outdated technologies (drainage, waste treatment, transportation)
- Encroachment into heritage site
- Low climate resilience
- Low capacity in environmental protection
- Lack of planning and preservation of open spaces/natural environment
- Low community awareness for environment
- Rate of deforestation
- "Laid-back" attitude inhibits thrive for development/ innovation
- Unemployment
- **Complexity of government system and management**
- Limited number of investors vis-à-vis potential
- Water bodies not well maintained, with negative impacts on citizens
- Lighting and signage system insufficient
- Dependence on external tourist operators
- Connectivity between tourist destinations

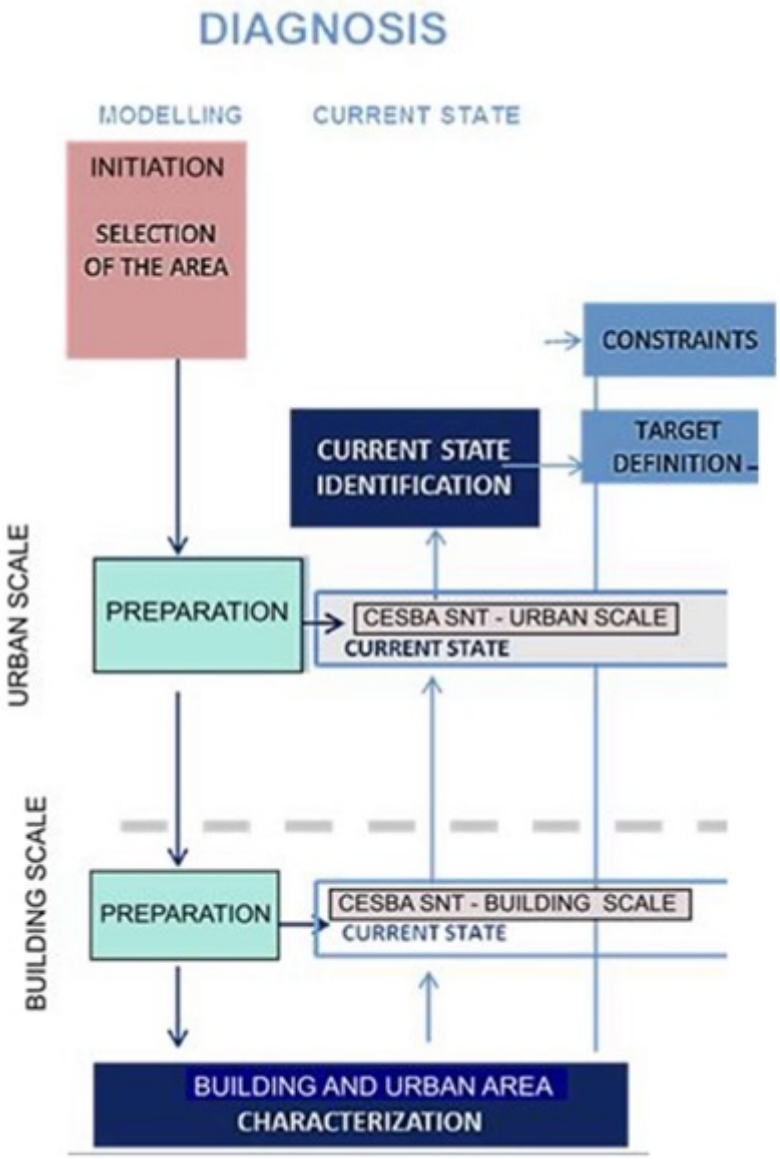
Opportunities

- Support from central government and external donors/investors
- **Tourism center** (and development in other locations)
- Vocational training and jobs in tourism, health care, and handicrafts
- (New) tourism niches (spiritual, etc.)
- Health center development
- Building on the brand
- **Heritage preservation strategy**

Threats

- **Effects of climate change (sea-level rise, etc.)**
- Disaster-prone geographical features
- High construction/ development
- Degradation of heritage sites and shortening of tourist season due to climate change
- Geographical separation of coastline
- Integration leading to intensified (inter-)national competition
- Growth of (facilities in) Da Nang
- Balance between economic growth and heritage preservation

Decision Making Phases: 4 – STRATEGIC DEFINITION



SETTING TARGETS

Before starting to create a sustainability retrofitting scenario for the urban area and the buildings it is necessary to define **clear and measurable targets** that should be achieved by the retrofitting concept.

Seneca said 2000 years ago *"If one does not know to which port one is sailing, no wind is favorable".*

Targets must address all fields of sustainability like environment, economy and social aspects.

SETTING TARGETS

Environmental targets may address the following fields:

- Improve the energy performance
- Reduce Green House Gas emissions
- Increase the share of renewable energy sources used in the district
- Foster the use of sustainable materials
- Reduce soil sealing and increase available green spaces

SETTING TARGETS

Social targets may address the following fields:

- Avoid gentrification caused by energy retrofitting of buildings
- Improve district surroundings (green spaces, accessibility, heat island)
- Improve transport infrastructure and mobility
- Support participation and local activities (vs “dormitory” district)
- Improve safety and security

SETTING TARGETS

Economic targets may address the following fields:

- Affordability of housing rental
- Labor force participation
- Fostering value conservation
- Increase in property value

SETTING TARGETS

Targets need to be S.M.A.R.T. which means:

- Specific – target must be clearly defined (not vague but as specific as possible)
- Measurable – targets must be quantifiable
- Attainable – target must be realistic and achievable
- Relevant – are the targets relevant for energy retrofitting of urban districts
- Time-bound – specify when the result(s) can be achieved

SETTING TARGETS

To get a clear direction in which the sustainability retrofitting projects for the urban area and the buildings should be developed, the target issues have to be transformed into measurable performance targets.

A target value for each indicator must be fixed in SNTool and SBTool to reflect the environmental, social and economic targets.

Indicator	Current State	TARGET Value
Permeability of land	15%	25%
Availability of safe bicycle routes	8 m/inhabitant	12 m/inhabitant

SET CONSTRAINTS AND RESTRICTIONS

The main constraints that occur in district and building sustainability retrofitting projects:

- Legal constraints (e.g. Building Codes, Cultural Heritage Protection)
- Technical constraints (e.g. Architecture, Systems)
- Financial constraints (e.g.Investment Cost, ROI)
- Environmental condition constraints (e.g. Climatic conditions, morphology of the district)
- Stakeholder based restrictions

Legal constraints

- regulations for energy savings in buildings
- laws on cultural heritage protections

Legal constraints may give restrictions to many retrofitting technologies that are theoretically available on the market.

i.e. keeping the cultural value of the buildings and districts could be a restriction that will not allow the achievement of improvements to insulation of the building envelope or to installations of photovoltaics that in theory could be technically feasible.

Technical constraint

Restrictions for the use of technologies in building energy retrofitting projects. Each retrofitting technology needs special requirements for its implementation which may not always be given by each building or the district.

i.e. if the planners want to use a geothermal heat pump with ground collectors the property on which the building is located must have enough space for laying the ground collectors. According to the needed output of the heat pump the space may not be available in dense urban areas.

The use of renewable energy supply systems like biomass boilers needs enough space to store the biomass.

Financial constraints

Often the largest obstacles in energy retrofitting projects on building and district level.

Planners often have to consider the financial situation of the building owners as well as the tenants in order to avoid negative social impacts like gentrification.

Depending on the type of the owners (private, public) also the economic efficiency of the retrofitting technologies is a big issue.

Environmental constraints

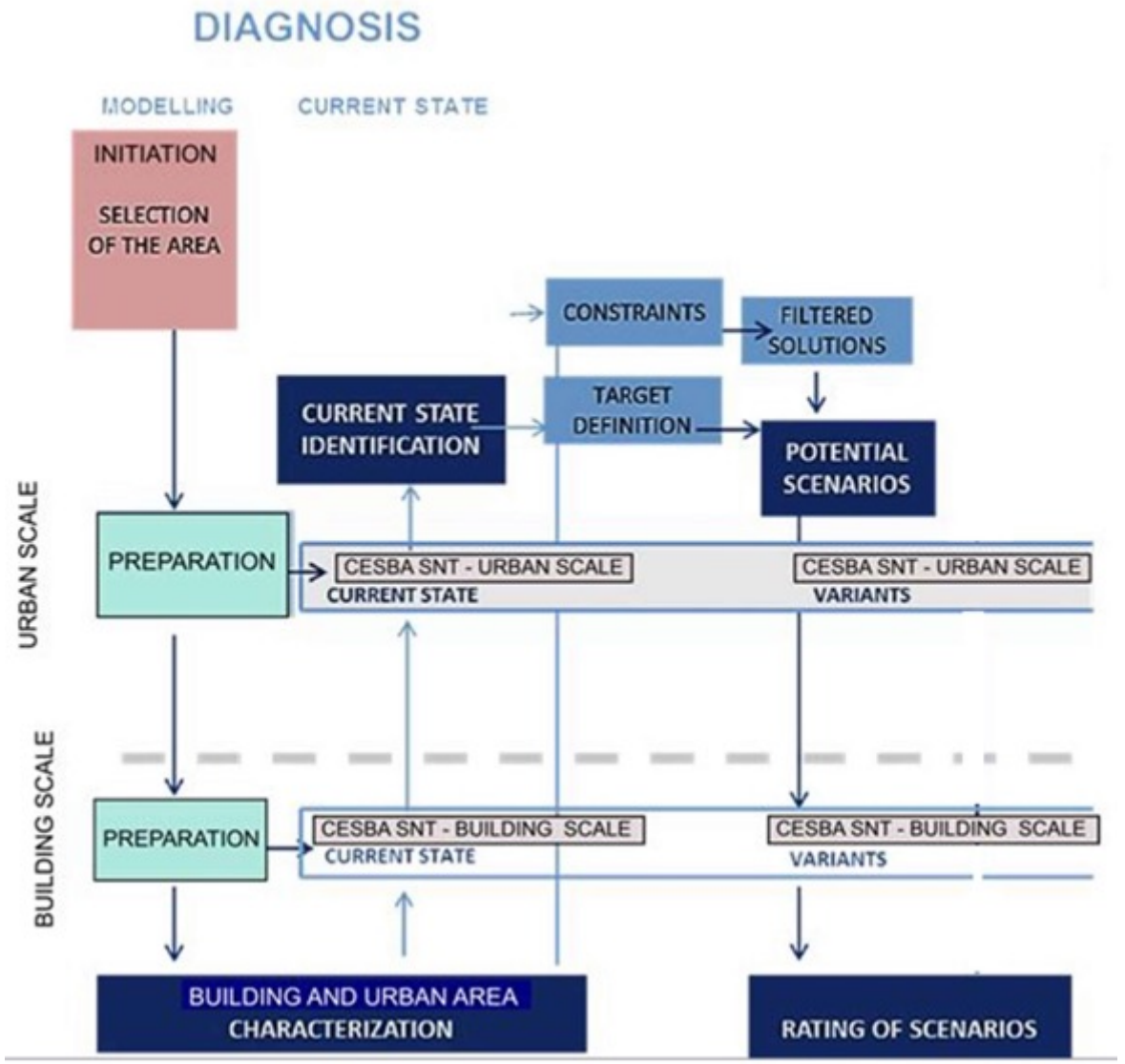
Most common are climatic conditions which are not suitable for the use of certain technologies like solar energy systems or wind power.

The condition of the ground also can set restrictions on the use of geothermal systems.

The availability of biomass sources near the district can also be a limiting factor for the use of biomass boilers.

The feasibility of solar energy systems on roofs and facades is also dependent on the solar radiation exposure of the area.

Decision Making Phases: 5 – DECISION MAKING



This phase consists in the study of possible alternative retrofit scenarios for the pilot urban area and the two public buildings and in the identification of the best one in terms of cost-efficiency.

It is articulated in two steps:

- Creation of retrofitting scenarios

- Retrofit concepts assessment and ranking

CREATION OF RETROFITTING SCENARIOS

The goal of each concept is to optimize the performance of the urban area as a whole considering all buildings as a global system connected by the following process:

- Selection and optimization of energy intervention package at urban level
- Selection and optimization of energy intervention package on building level
- Addition of non-energy related interventions (Traffic / Mobility, Green Spaces, Infrastructure)
- Inclusion of business models and financing schemes
- Approval of design variant

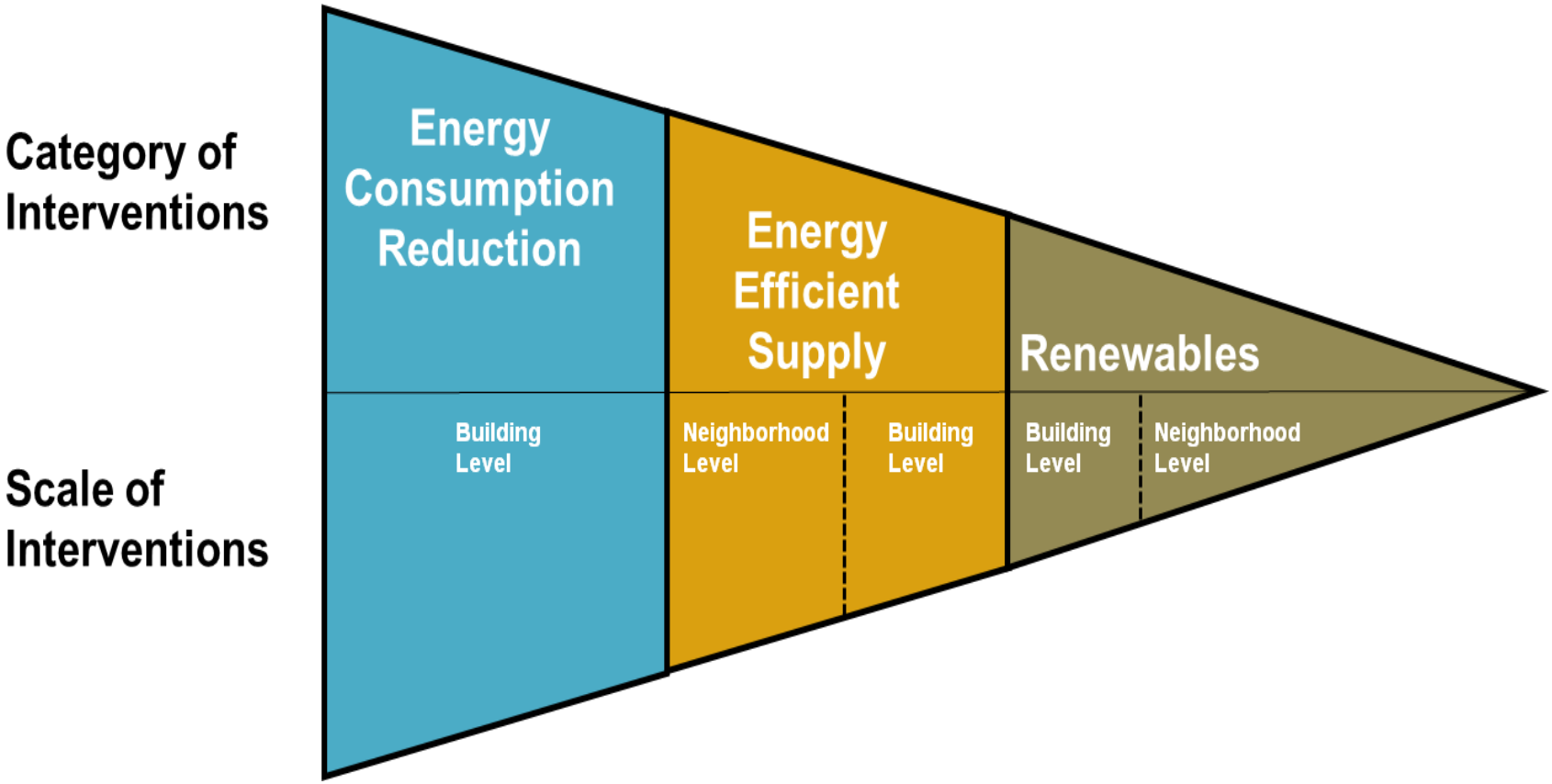
CREATION OF RETROFITTING SCENARIOS

Chronological sequence to create a complete energy retrofitting concept:

1. Reduction of energy consumption (consumer-driven)
The reduction of the energy consumption is the basis for the creation of sustainable energy concepts and to achieve the set sustainability goals. For that reason, the reduction of the energy consumption must be the first priority for planners.

2. Increasing the efficiency of the energy supply
District solutions should be preferred over individual solutions.

3. Inclusion of renewable energy production
By increasing the share of climate-neutral and renewable electricity in a district the primary energy consumption can be reduced significantly.


Category of Interventions
Energy Consumption Reduction
Energy Efficient Supply
Renewables
Scale of Interventions
Building Level
Neighborhood Level
Building Level
Building Level
Neighborhood Level

CREATION OF RETROFITTING SCENARIOS

Analysis and evaluation to find the most optimum solutions for the district:

1. Assessing the energy weak points of buildings

In order to prioritize different retrofitting measures to reduce the energy consumption and to increase the energy efficiency of a building it is necessary to know which represent the weakest points of buildings, from an energy view .

2. Assessing the feasibility of energy networks

The use of synergies between buildings is one of the most promising and useful key strategies for urban district retrofitting projects. One of the main advantages of the district approach compared to individual retrofitting measures on single buildings is the use of heat-related synergies by the connection of buildings.

CREATION OF RETROFITTING SCENARIOS

3. Assessment of electricity related synergies and interactions between buildings

Renewable energy sources are climate dependent, and the electrical consumption is not. Thus, more often a mismatch between the supply and demand occurs and the generated energy can't be fully used when the demand is there, which in turn has a negative effect on the reliability and the efficiency of the whole network. To overcome this challenge, planners need to be able to predict the electrical demand and production by renewables energy systems for the investigated district, so to introduce appropriate energy storage systems and/or smart grids.

4. Financial Planning and selection of financing mechanisms for implementation

For each retrofitting concept, adequate business models and financing have to be selected in order to implement it in practice. Moreover, financial metrics like investment cost, Return on Investment and Payback need to be calculated to ensure the financial feasibility of each concept

FINANCIAL PLANNING

Grants

Grants may be available at all stages for feasibility studies, proposal development, capital investment and maintenance expenses. They offer a subsidy to the total costs but exist only because governments or other organizations wish to see particular innovations develop that would otherwise not be economically attractive.

Loans

Loans imply debts that must ultimately be repaid, and on-going interest charges. Retail and commercial banks will generally lend, but at a price that depends upon perceived risks.

Loan Guarantees

This is an ancillary financial product that can reduce the cost of debt finance. Essentially it involves another stakeholder to the project investment team, namely a loan guarantor. The loan guarantor is usually a public body created to lower the cost of energy efficiency loans, back acting as a final guarantee that defaults will be avoided.

FINANCIAL PLANNING

Energy Performance Contracting

Energy Performance Contracting is usually undertaken by an Energy Service Company (ESCO), through a contractual obligation to implement the energy savings initiatives in return for a flow of payments from the building owner or end-user.

Co-Investment

There are several initiatives around the world whereby municipalities or energy utilities assume the capital cost of retrofitting and place the charge on the property, to be recovered through the regular property tax-, or utility bill assessment and collection.

FINANCIAL PLANNING

Tax benefits

Fiscal measures are an important class of support and can relate to a reduced rate of tax for the owners, properties and / or contracting organisations, as well as specific tax and VAT benefits on the various cost or revenue elements. Evidently, they are idiosyncratic to individual EU member states, but are widely used as part of the business models.

Embedded revenue contributions

Many countries now encourage residential, commercial and industrial consumers to install solar, wind, biomass, micro-hydro and other renewable sources of electricity generation to reduce consumption of grid supplied energy and for sale back to the local distribution company, or, in the case of larger industrial units, to the wholesale market. These feed-in tariff (FiT) arrangements vary according to technologies, vintage, length of term and size of connection. District level solutions have a lot to offer here as there are economies of scale in the provision of generating facilities and transaction costs.

SCENARIOS ASSESSMENT AND RANKING

SNTool and SBTool allows the planners to compare the different retrofitting scenarios that have been created and to find the best suiting one for the local preferences.

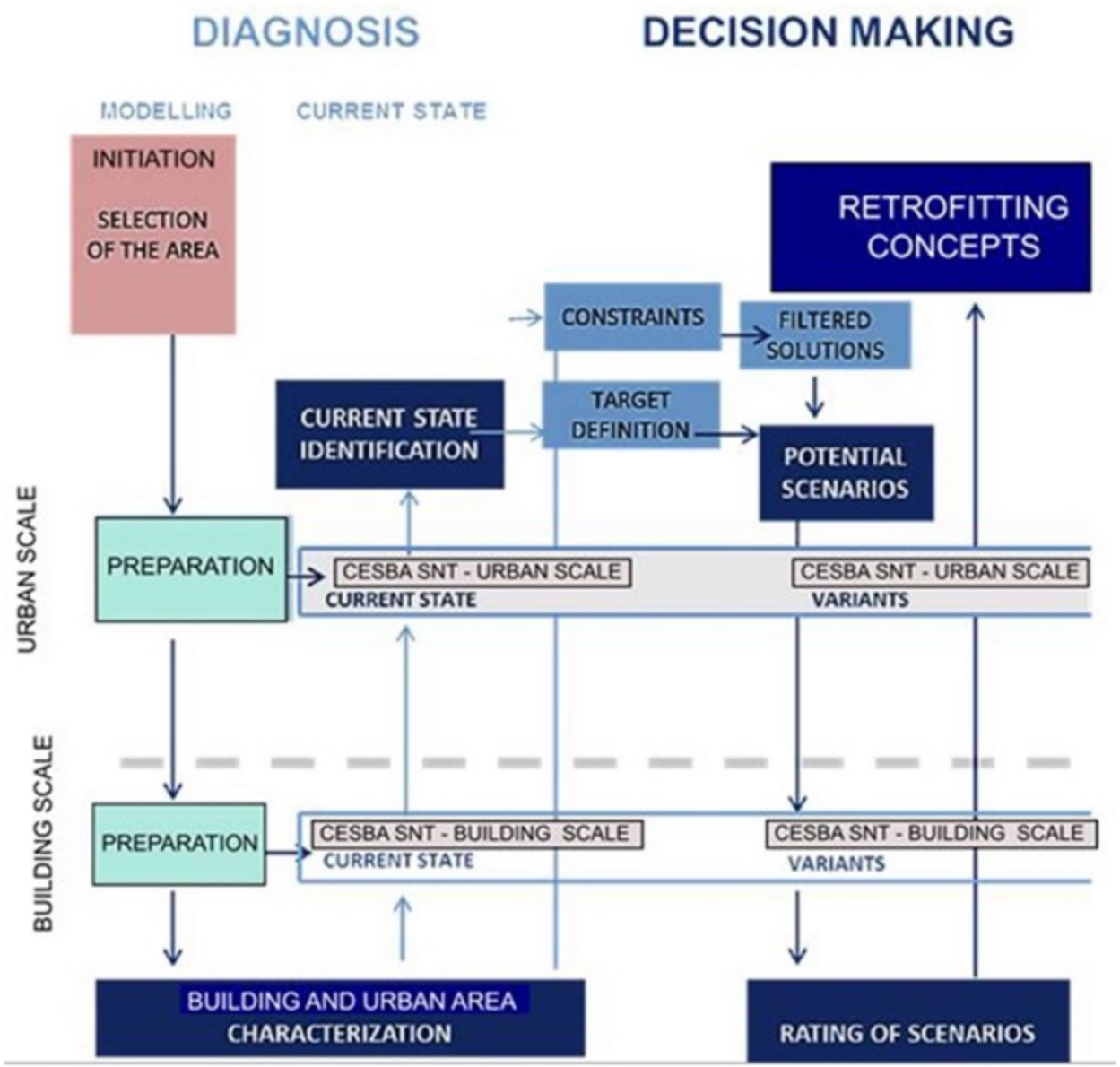
CESBA MED Tools assessment system have to be applied to each retrofitting scenario at urban scale and, interactively, at building scale to evaluate the performances reached.

On the basis of the assessments' outcomes (scores) provided by the CESBA MED assessment system, it will be possible to rank the different retrofitting scenarios according to the preferences of different stakeholders and decision-makers.

SCENARIOS ASSESSMENT AND RANKING

	Current state	Scenario 1	Scenario 2
TOTAL SCORE	0.0	2.1	1.4
A – Built Urban Systems	0.2	0.5	0.3
B – Economy	0.8	1.2	1.0
C – Energy	-1	3.2	1.5
D – Atmospheric	-1	2.5	2.0
E – Non-renewable sources	0.8	2.2	1.8
F - Environment	0.5	2.4	1.9
G – Social aspects	1	3.5	2.0

Decision Making Phases: Retrofit/New development

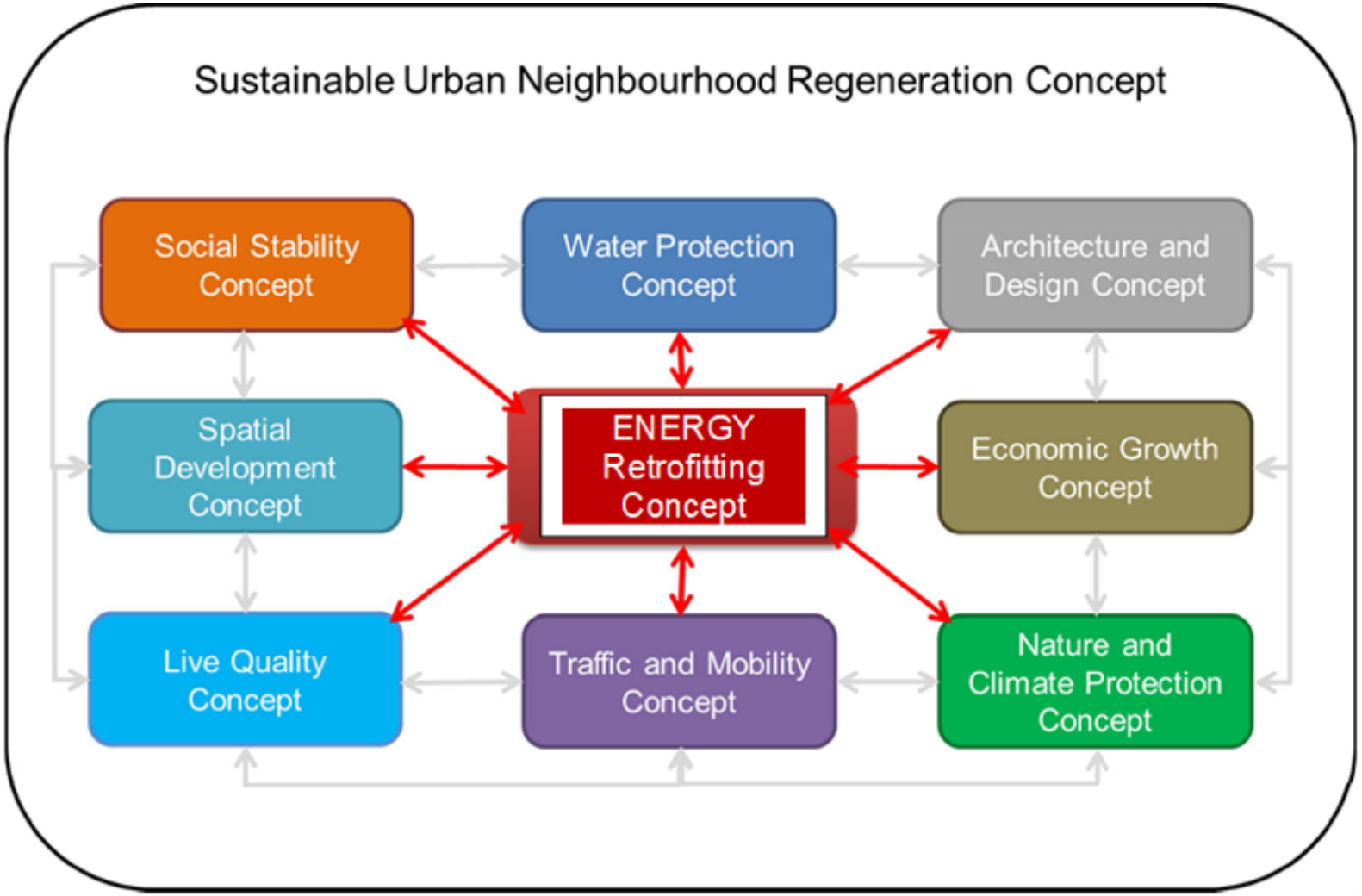


RETROFIT CONCEPT

This phase consists in the description of the retrofit concept for the pilot urban area and the two public buildings based on the best ranked scenarios.

The concept will further specify the solutions taken in account by the best scenario. The concept will be ready to be implemented in future when the conditions will allow to transform in a project.

The concept will mainly illustrate the retrofit strategies, the performance improvement that will be achieved and the cost benefit analysis.


Sustainable Urban Neighbourhood Regeneration Concept
Social Stability Concept
Water Protection Concept
Architecture and Design Concept
Spatial Development Concept
ENERGY Retrofitting Concept
Economic Growth Concept
Live Quality Concept
Traffic and Mobility Concept
Nature and Climate Protection Concept