

Nature-based and Innovation-led Urban Regeneration: Hypothesis of Greean District for the Metropolitan City of Reggio Calabria

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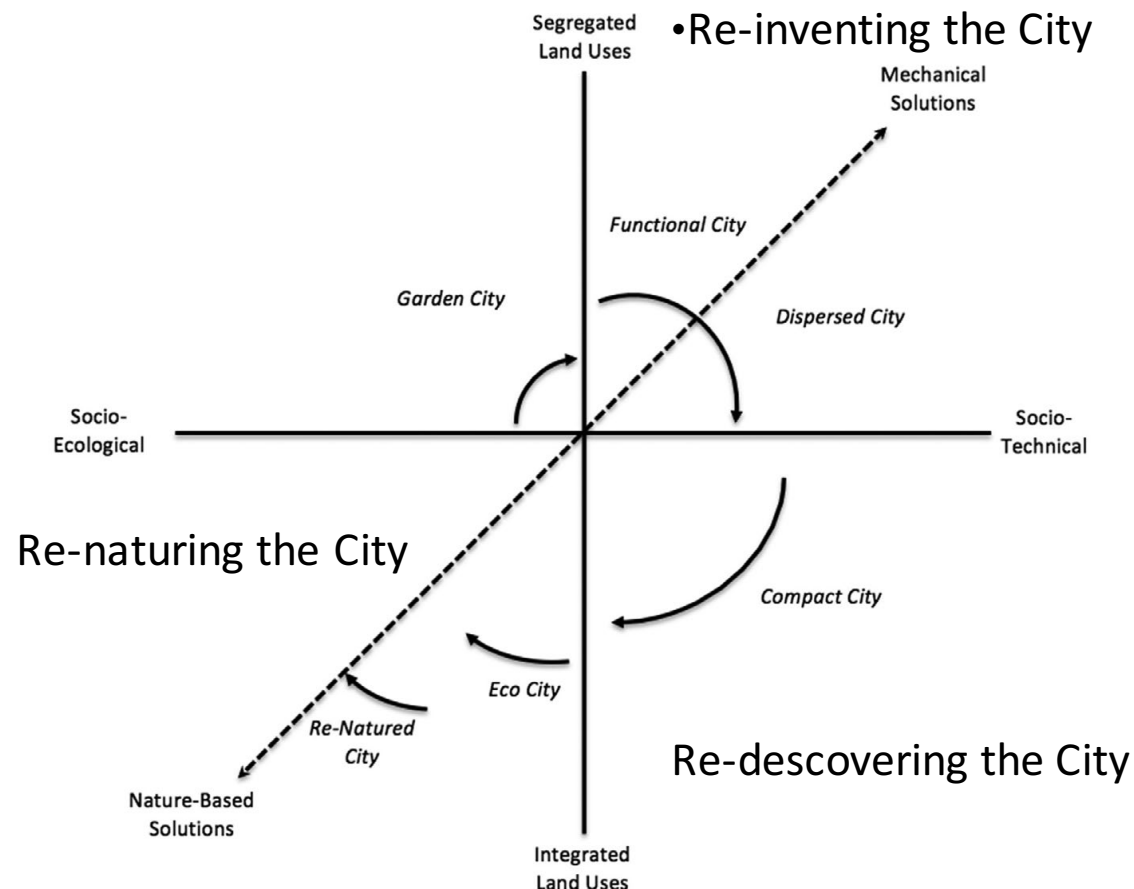
Conclusions

Background

- According with the UN estimations (2014), the 54 per cent of the global population live in urban areas with a potential increase to the 66 per cent in 2050. Urban areas are affected by the side effects of rapid urbanisation processes which need to be tackled quickly
- The awareness of establishing a new and balanced relationship between nature and human activities is no longer seen as just a constraint but as an opportunity for a sustainable and equitable growth
- The European Union recognised the importance of re-naturing cities and territories with the adoption of the Research and Innovation Policy Agenda for Nature-based solutions (EC, 2015). One of the research priorities focuses on nature based urban regeneration to enhance sustainable urbanisation.
- EU placed the nature-based urban regeneration topic on the top of EU research areas' priorities in order to improve the well-being in urban areas, increase the sustainable use of energy and boost carbon sequestration
- ***how the introduction of nature-based solutions in innovation-led urban regeneration can contribute to the realisation of a green district in a central neighbourhood of the Metropolitan City of Reggio Calabria***
- **The MAPS-LED Research Project (Horizon2020) helped in providing the policy framework for the integration of EU policies and tools with urban planning tools in a nature-base urban regeneration model**

I. Towards the Sustainable Urban Development: The relationship between city and nature from a planning perspective

- During the 20th Century the relationship between city and nature has been analysed through different theoretical approaches (Howard, LeCorbusier, Wright, McHarg, Mumford etc.).







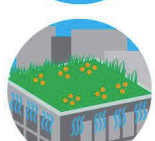


Source: Scott & Lennon, 2016

- The introduction of sustainable development principles during the 1970s has contributed to the review of the traditional regional and urban planning assumptions
- Sustainable Urban Development is a central element in the urban planning debate since the 1990s (Hall, 2014).
- Sustainability seemed to revitalise a new vision for planning through the “ecological modernisation”, according which sustainability can be achieved without impeding economic growth (Davoudi, 2000 in Hall, 2014: 463).
- Green design principles started to be integrated in city planning, shifting to a new and holistic approach which “seeks to work with natural processes through promoting the sensitive use and enhancement of green infrastructure” (Lennon & Scott, 2016: 274)
- The emerging “Socio-ecological systems” approach considers cities as “complex hybrid systems” functioning “at multiple interconnected spatial and temporal scales largely determined by natural processes, but frequently calibrated by society”***
- These elements remark the need to adapt urban policies, planning tools and practices -and research- for the implementation of suitable models aiming at a sustainable urban development.

I. The centrality of urban regeneration for the sustainable urban development

- Urban regeneration emerged during the last decades as suitable model for an integrated sustainable urban development.
- ***Regeneration is concerned with the regrowth of economic activity where it has been lost; the restoration of social function where there has been dysfunction, or social inclusion where there has been exclusion; and the restoration of environmental quality or ecological balance where it has been lost (Couch et al. 2003)***
- Thanks to its capability to intervene on all these dimensions, it represents the opportunity for cities to reach a Sustainable Urban Development in ensuring a smart, sustainable and inclusive growth
- The Need of an integrated approach able to include the social, economic and environmental perspective in a sustainable urban development perspective pushed urban regeneration at center of the European Policy action
- Among the EU initiative funded by the ERDF, Urban Innovative Actions (UIA) play a crucial role in identifying and testing innovative solutions for sustainable urban development. One of the topic selected by UIA is about the sustainable use of land and and nature-based solutions.
- EU selected Nature-based urban regeneration as one of the research priorities for the EU

3.1 The EU efforts for Nature-based solutions

| Research & Innovation Agenda on Nature-Based Solutions and Re-Naturing Cities | |
|---|--|
| Goals | Research & Innovation Actions |
| Enhancing sustainable urbanisation |  Urban regeneration through nature-based solutions  Nature-based solutions for improving well-being in urban areas |
| Restoring degraded ecosystems |  Establishing nature-based solutions for coastal resilience  Multi-functional nature-based watershed management and ecosystem restoration |
| Developing climate change adaptation and mitigation |  Nature-based solutions for increasing the sustainable use of matter and energy  Nature-based solutions for enhancing the insurance value of ecosystems |
| Improving risk management and resilience |  Increasing carbon sequestration through nature-based solutions |

- According with the EU (2015) three are the main interconnected **challenges about nature-based regeneration**:
- The first is related to **economic development measures**: improving sustainability in cities could bring to new business models that will empower economic growth and at the same time reduce nature resources exploitation.
- The second is related to **sustainable urban planning with nature-based solutions** in providing opportunities for the adaptation to climate change and increasing urban resilience.
- The third is related to the contribution of nature based solutions to the **social dimension of sustainable urbanisation**: the increasing of well-being conditions in the urban environment could improve the living conditions of people and reduce health risks for vulnerable groups of people.

3. Nature-Based solutions for city-renaturing

- Nature-based solutions are “actions inspired by, supported by or copied by from nature” aiming to “help societies address a variety of environmental, societal and economic challenges in sustainable ways” (EC, 2015: 24)
- nature-based solutions mediate the relationship between human activities and ecosystem processes in urban landscapes and, if developed appropriately, could mitigate human impact” (Haase, 2016: 279).
- Three main typologies (IUCN (2016: 9): (i) solutions that involve making better use of existing natural or protected ecosystems; (ii) solutions based on developing sustainable management protocols and procedures for managed or restored ecosystems; (iii) solutions that involve creating new ecosystems (e.g. establishing green building)”
- ***Eggermont et al. (2015: 245), in taking into consideration the example of greening roof and walls (3rd type) explain how these solutions alone “would hardly contribute to increase biodiversity and the delivery of other Ecosystem services” if they will be not integrated into an adequate urban planning approach at city scale.***

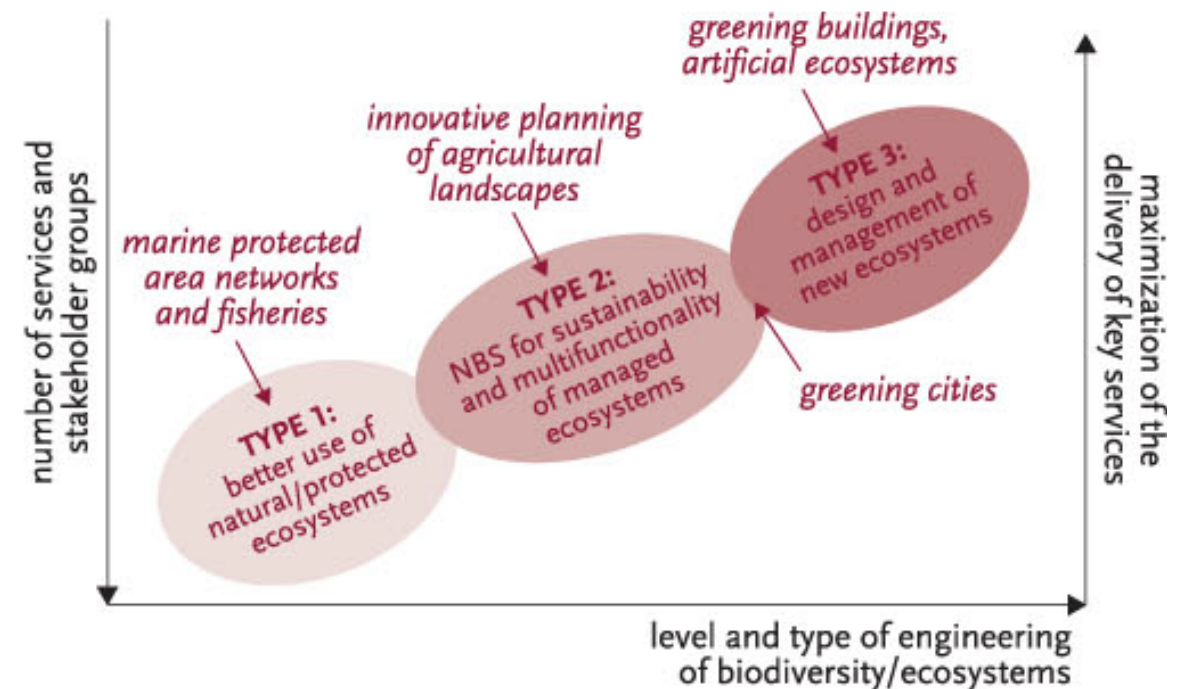


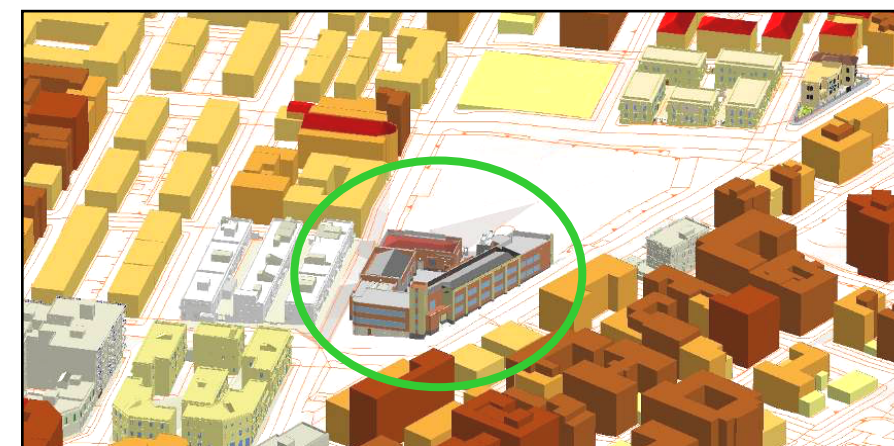
FIGURE 1: Schematic representation of the range of nature-based solution (NBS) approaches. Three main types of NBS are defined, differing in the level of engineering or management applied to biodiversity and ecosystems (x-axis) and in the number of services to be delivered, the number of stakeholder groups targeted, and the likely level of maximization of the delivery of targeted services (y-axis). Some examples of NBS are located in this schematic representation. Note that the y-axes could be shifted, and that type 3 cannot be viewed as “better” than type 1, the three types being complementary.

4. Nature based urban regeneration proposal for the city of Reggio Calabria: Methodology

- The paper methodological framework is centred on the application of nature based solution used for building energy retrofitting through green building techniques (GevaulLab).
- The idea derives from the research and experimental activities held by the Università Mediterranea of Reggio Calabria (IT) in the field of Smart Specialisation Strategies (MAPS-LED Project – Horizon 2020 – Cluds Lab) and on energy building retrofitting strategies (Gevaul Lab).
- A comparative scenarios analysis on a small scale (building) experiment has been conducted in a central urban area of the Metropolitan City of Reggio Calabria (IT).
- The first step relates to the comparison of two scenarios for the building scale experimental activity: Business as Usual (BAU) and eco-sustainable (ECO).
 - The first is based on the application of traditional solutions. The second is based on the application of nature based solution in greening construction technique finalised at the building energy retrofitting. The results deriving from the experimental activity at building level will be then scaled up and estimated for the entire district using 3D GIS mapping techniques.
- The last step is to frame a nature based urban regeneration scheme consistent with the Europe Cohesion Policy objectives and applicable through local urban planning tools.

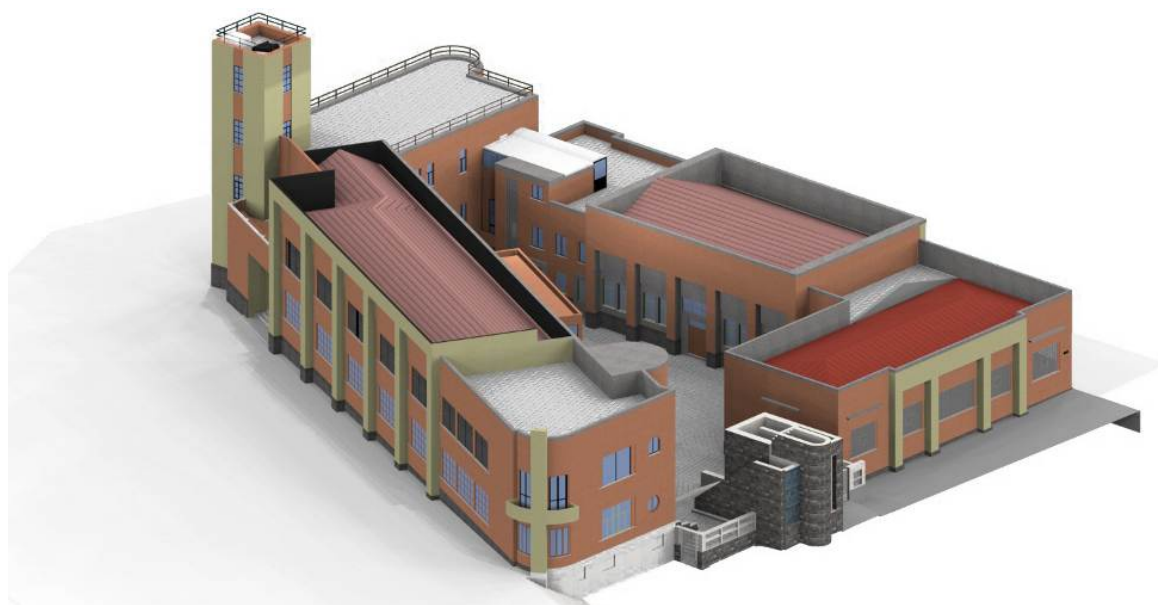
4. . THE EXPERIMENTAL PHASE ON BUILDING PROTOTYPE

- The experimental activity is based on the valorisation and use of local natural elements such as cork. Its application in greening construction techniques for walls and roofs insulation allow to consider it as nature based solution according with Eggermont et al (2015: 245). Cork is a natural element present in the regional natural landscape as well as in different areas of the Mediterranean basin.
- The experimental phase has been conducted on a Public building within an urban block of a central neighbourhood of the City of Reggio Calabria (see Figure 1) located in the area of intervention for the proposed green district



| | BAU Scena rio | Eco Sustai nable Scena rio | Q | Tot costs BAU | Tot costs ECO Sustainabl e | D |
|-------------------------|---------------------|--|-------|------------------|-------------------------------------|-----|
| Interventions | €/sqm | €/sqm | sqm | € | € | % |
| Plaster renovation | 60 | 80 | 2.675 | 160.500 | 214.000 | 33% |
| Windows replacement | 400 | 500 | 554 | 221.600 | 277.000 | 25% |
| Pitched roof renovation | 130 | 180 | 505 | 65.650 | 90.900 | 38% |
| Flat roof renovation | 105 | 140 | 500 | 52.500 | 70.000 | 33% |
| Total amount | | | | 500.250 | 651.900 | 30% |

4. . THE EXPERIMENTAL PHASE ON BUILDING PROTOTYPE



- BAU

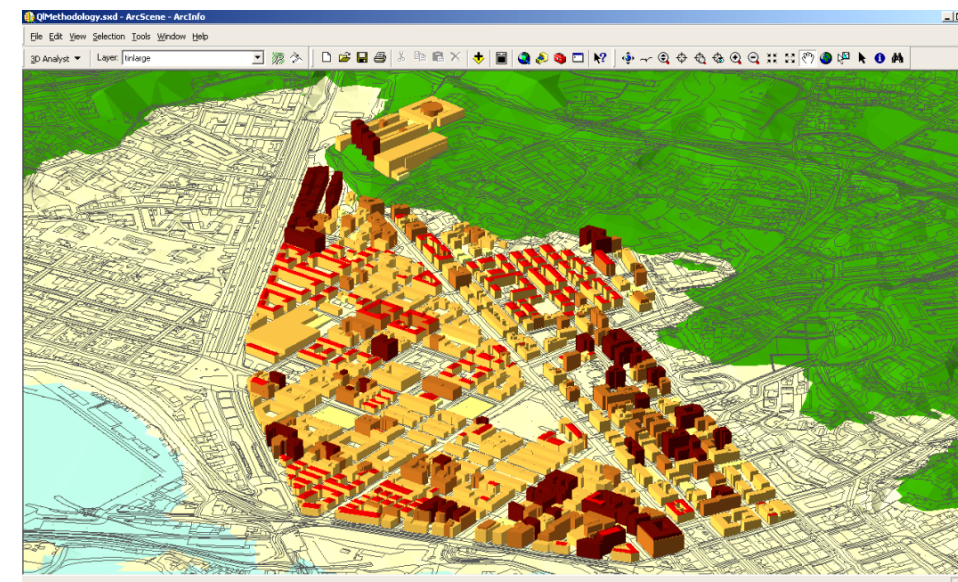
| | EPGI | Net area | EPGI Tot | Energy cost | Management cost |
|---------|---------|----------|----------|-------------|-----------------|
| | kWh/sqm | sqm | kWh/year | €/kWh | € |
| Heating | 142 | 1.300 | 184.600 | 0,115 | 21.229,00 |
| Cooling | 102 | 1.300 | 132.600 | 0,195 | 25.857,00 |
| Total | | | 317.200 | | 47.086,00 |

- Eco-sustainable

| | EPGI | Net area | EPGI Tot | Energy cost | Management cost |
|---------|---------|----------|----------|-------------|-----------------|
| | kWh/sqm | sqm | kWh/year | €/kWh | € |
| Heating | 57 | 1.300 | 74.100 | 0,115 | 8.521,00 |
| Cooling | 45 | 1.300 | 58.500 | 0,195 | 11.407,00 |
| Total | | | 132.600 | | 19.929,00 |

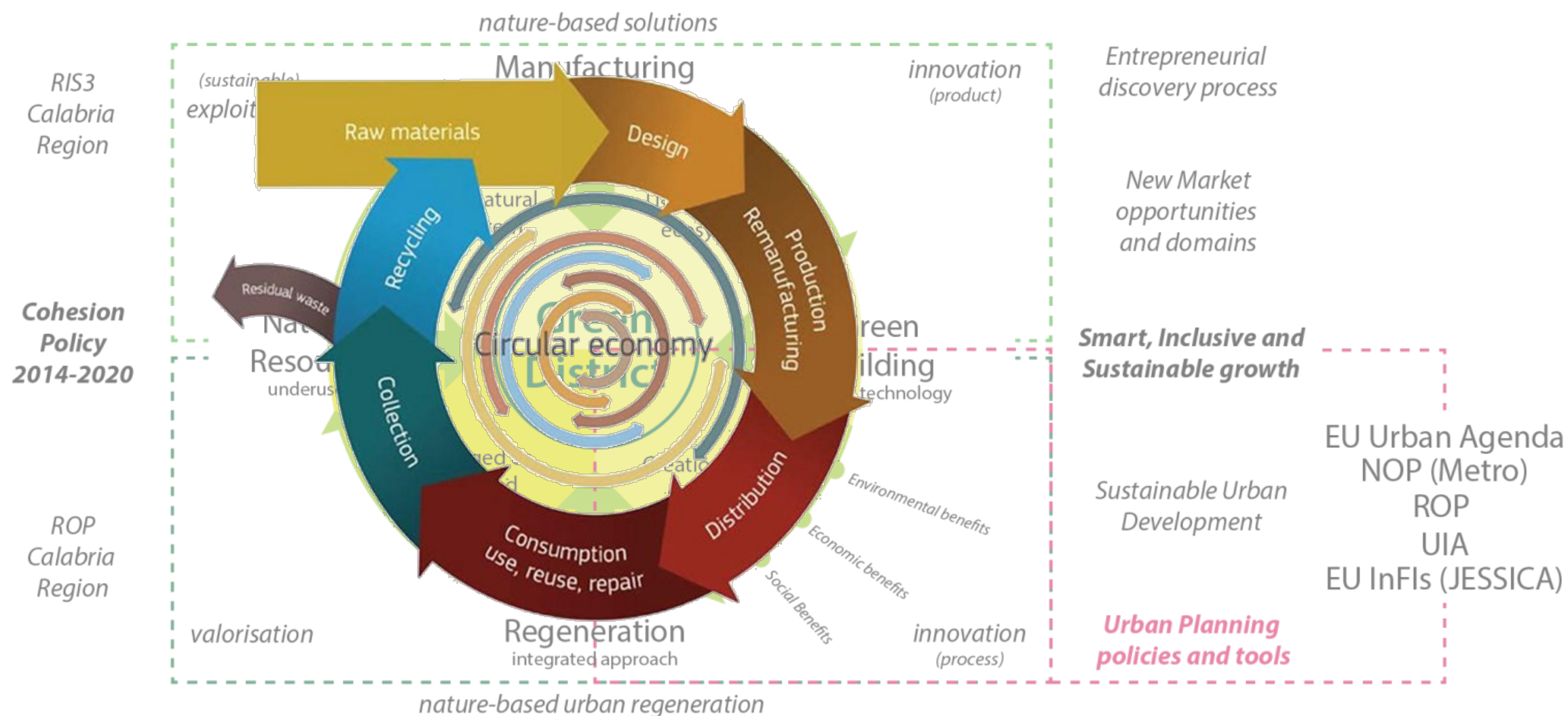
4. SCALING-UP PHASE

- An estimate of the overall cost provides in the medium-long term an obvious convenience of the "eco-sustainable" scenario not only in terms of maintenance interventions, energy consumption, pollution abatement, indoor quality and general environmental protection, but also a better financial result. In addition to significant energy savings it is also possible to get high health, lower environmental impact and reduction of CO₂ emissions into the atmosphere



| | | BAU | Sustainable | D | D |
|-----------------------------------|-----|--------|-------------|----------|------|
| | | x 1000 | x 1000 | x 1000 | % |
| Investment work cost | € | 64.400 | 85.600 | +21.200 | + 24 |
| Energy needs per Year | kWh | 83.000 | 50.000 | - 33.000 | - 40 |
| Management costs per Year | € | 12.450 | 7.500 | - 4.950 | - 40 |
| CO ₂ emission per Year | kg | 16.000 | 9.500 | - 6.500 | - 40 |

4. THE LOCAL SUPPLY CHAIN VALORISATION THROUGH EU POLICY AND



CONCLUSIONS

- Why Nature-Based Solutions Urban Regeneration?
- at urban level
 - New uses for abandoned areas
 - New opportunity for business
 - Innovation driven by sustainability
 - Healthy environment for local communities
- at territorial level
 - local supply chain valorisation (entrepreneurial discovery)
 - ecosystem enhancement and restoring
 - jobs creation

CONCRETE IMPLEMENTATION (NEXT STEP)



Identify and test innovative solutions for sustainable urban development

Urban Innovative Actions (UIA) is an Initiative of the European Union that provides urban areas throughout Europe with resources to test new and unproven solutions to address urban challenges. Based on article 8 of ERDF, the Initiative has a total ERDF budget of EUR 372 million for 2014-2020.

Next UIA topics



Air quality



Climate
adaptation



Digital
transition



Housing



Innovation
and responsible
public
procurement



Sustainable
use of land
nature based
solutions



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Thank You!

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