Beyond the Limits of the City

Strategies to Regenerate Fragile Territories

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NATO Advanced Research Workshop (ARW)
Achieving Sustainability in Ukraine through Military Brownfields Redevelopment
December 18-21, 2023
University of Oradea, Oradea, Romania

NATO OTAN
This workshop is supported by: The NATO Science for Peace and Security Programme

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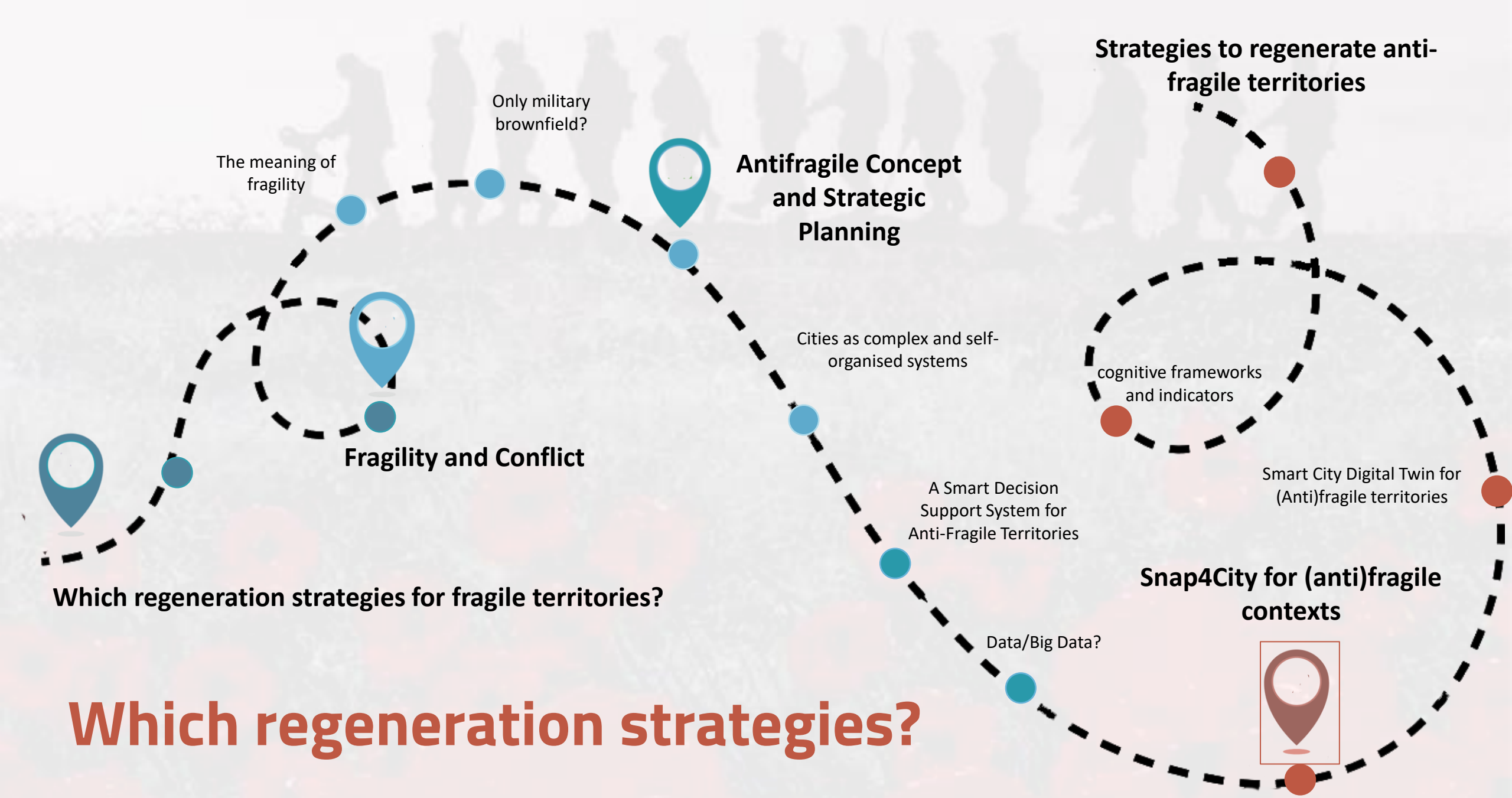
Strategies to Regenerate Fragile Territories

Teamwork



Which regeneration strategies?

Chiara Garau, Associate Professor, DICAAR, University of Cagliari (Italy)

Which regeneration strategies for fragile territories?

Fragility and Conflict

Approximately 40% of nations that have experienced war return to a state of civil war within ten years. This occurrence is well known as the "conflict trap" (Collier et al., 2008; Margalef, J., & Mueller, H., 2023).

Countries that have experienced war have two main challenges:
the need for economic restoration / the need to prevent the recurrence of armed conflict

Which regeneration strategies for fragile territories?

Fragility and Conflict

Post-conflict reconstruction is a comprehensive and multifaceted process that involves efforts to enhance various aspects such as military restoration, political governance, economic rehabilitation and development, and social conditions related to justice and reconciliation.

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Which regeneration strategies for fragile territories?

Fragility and Conflict: starting from what?

What does ‘Fragile’ mean?

The economic aspect of post-conflict reconstruction typically encompasses activities such as allocating relief aid, repairing physical infrastructure and facilities, reinstating social services, fostering conditions conducive to private sector growth, and implementing necessary structural reforms to ensure macroeconomic stability and sustainable development.

https://www.myartbroker.com/artist-banksy/articles/new-banksy-prints-for-ukraine-2022

Which regeneration strategies for fragile territories?

Fragility and Conflict: starting from what?

What does ‘brownfield’ mean?

The term brownfield is used to refer to an area of land in a town or city that was previously used for industry and where new buildings can be built (Cambridge Dictionary, 2023)

What is the applicability of the brownfield terminology in conflict zones?

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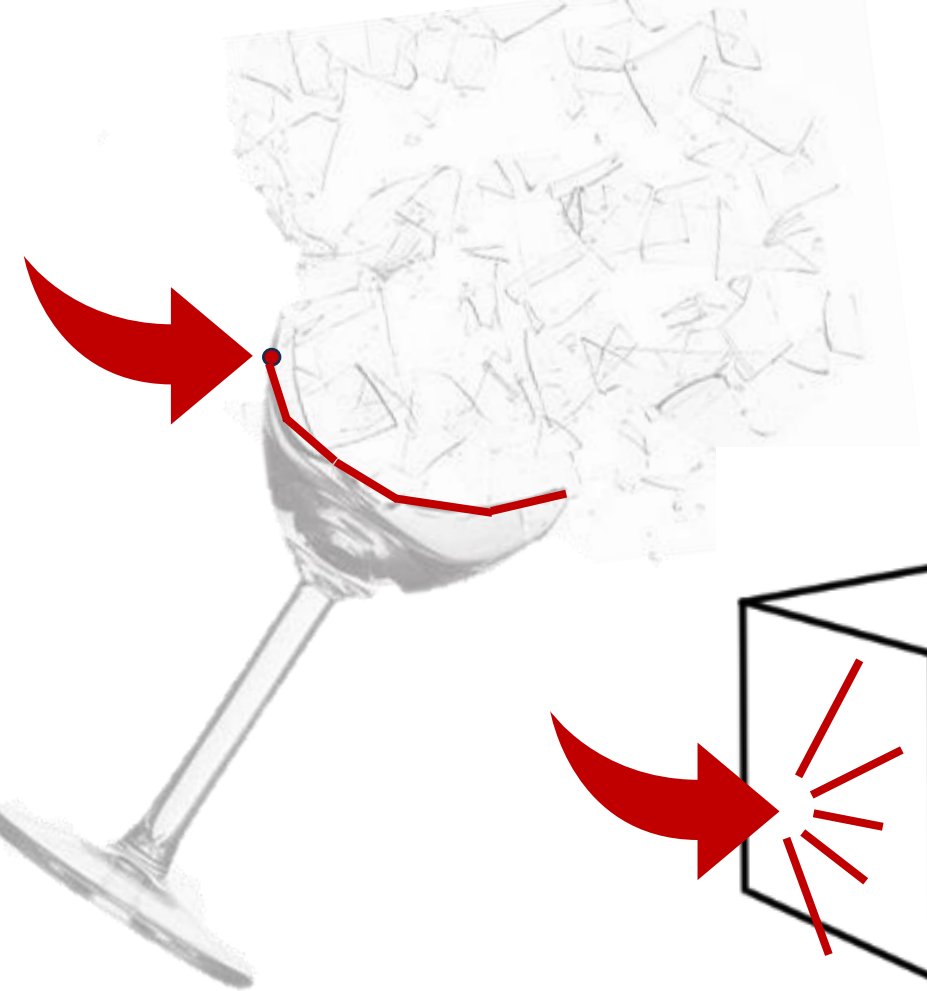
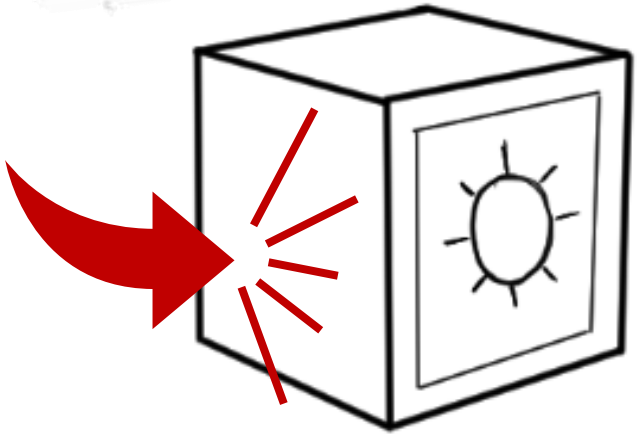
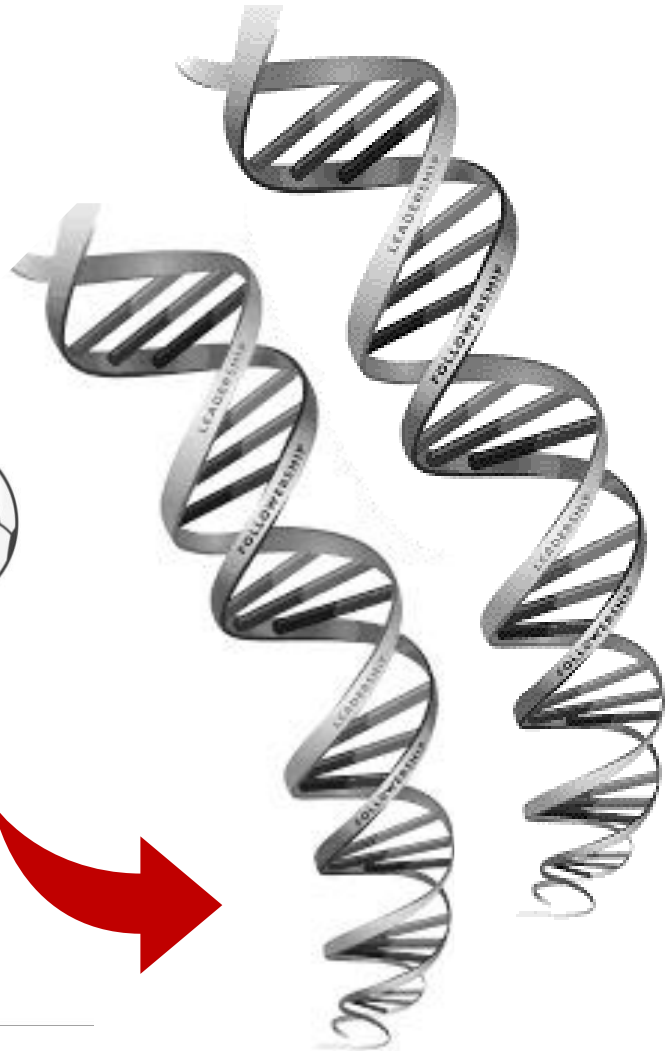






FRAGILE
(harmed by tension)
Damaged by disorder

Break

ROBUST
(Unaffected under tension)
Unaffected by disorder

Are unmoved

RESILIENT
(reply under tension)
Unaffected by disorder

Bounce back

ANTI – FRAGILE
(benefits from tension)
benefits from disorder

Grow

Chiara Garau, Associate Professor, DICAAR, University of Cagliari (Italy)

What does fragility or fragile mean applied in a territory?

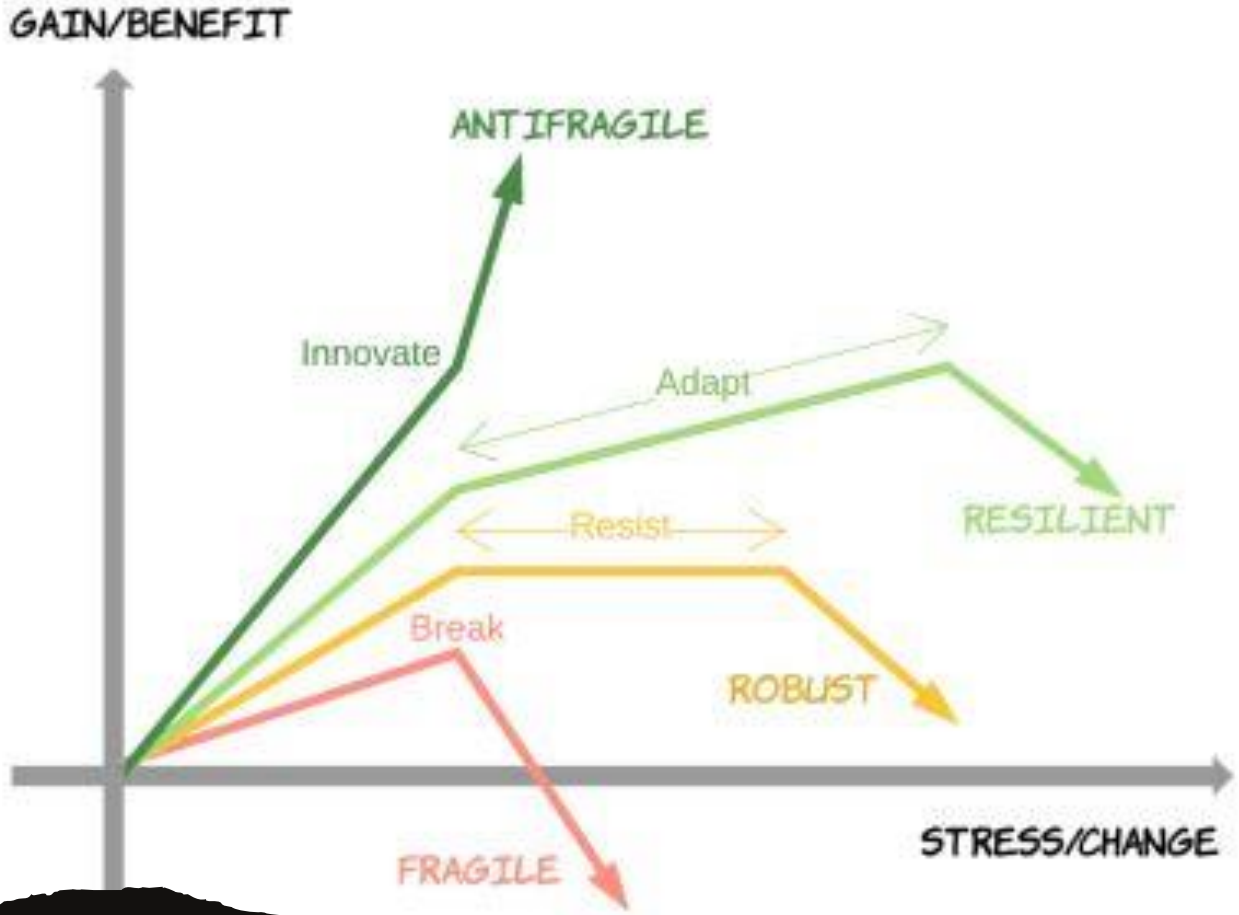
Fragility

According to the OECD, **a fragile state** is characterised by a limited ability to effectively administer its people and territory, as well as a lack of capability to establish positive and mutually beneficial relationships with society (OECD, 2011).

Fragility refers to the situation of being unable to fulfil two fundamental functions**: ensuring security** and **providing economic opportunities**.

OECD defines fragility as the combination of exposure to risk and insufficient coping capacity of the state, system and/or communities to manage, absorb or mitigate those risks (OECD, 2016).

Fragility is a complex topic, which is generally conceptualized in relation to five dimensions: **Political, Societal, Economic, Environmental, Security**



Which regeneration strategies for (anti)fragile territories?

Transitioning from theory to practice prompts us to contemplate methods for decreasing the average duration of adaption.

Chiara Garau, Associate Professor, Department of Environmental Civil Engineering and Architecture, University of Cagliari (Italy)

The key aspects of antifragility are:

1. its inherent connection with complexity and self-organization
2. A Smart Decision Support System for Anti-Fragile Territories
3. data, big data

Antifragile planning strategically enhances the antifragility of the city

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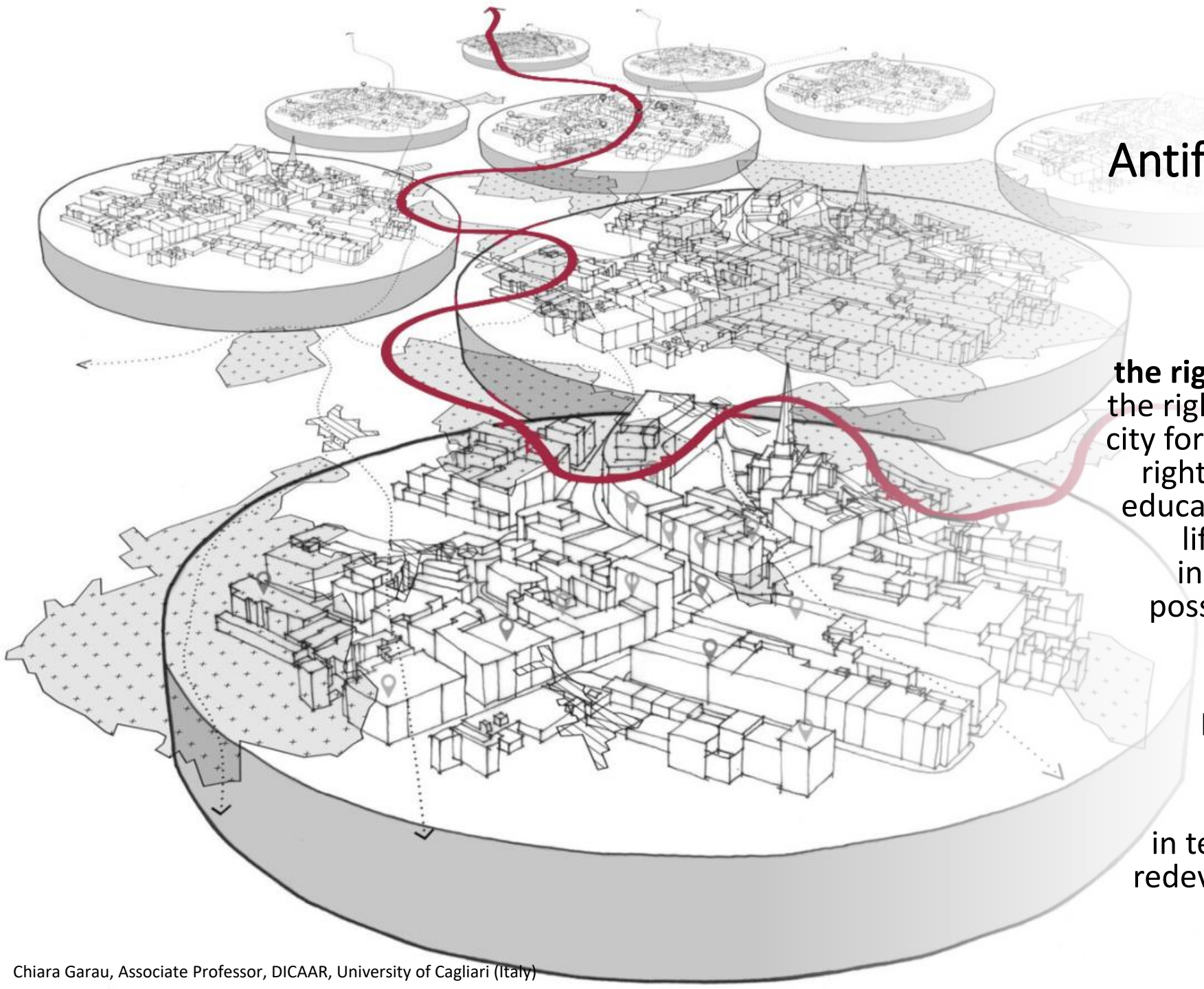


Antifragile planning could be articulated on:

the right to the city (Lefebvre 1968)
the right to the city manifests a freer city for all and freedoms concern the right to live, to move, to health, to education, to work, to choose one's life plan. Having a shared vision increases the opportunities and possibilities of acquiring skills and putting them into action

shared vision
It tends towards more desired scenarios

declination of freedoms
in terms of design possibilities for redevelopment and reconstruction

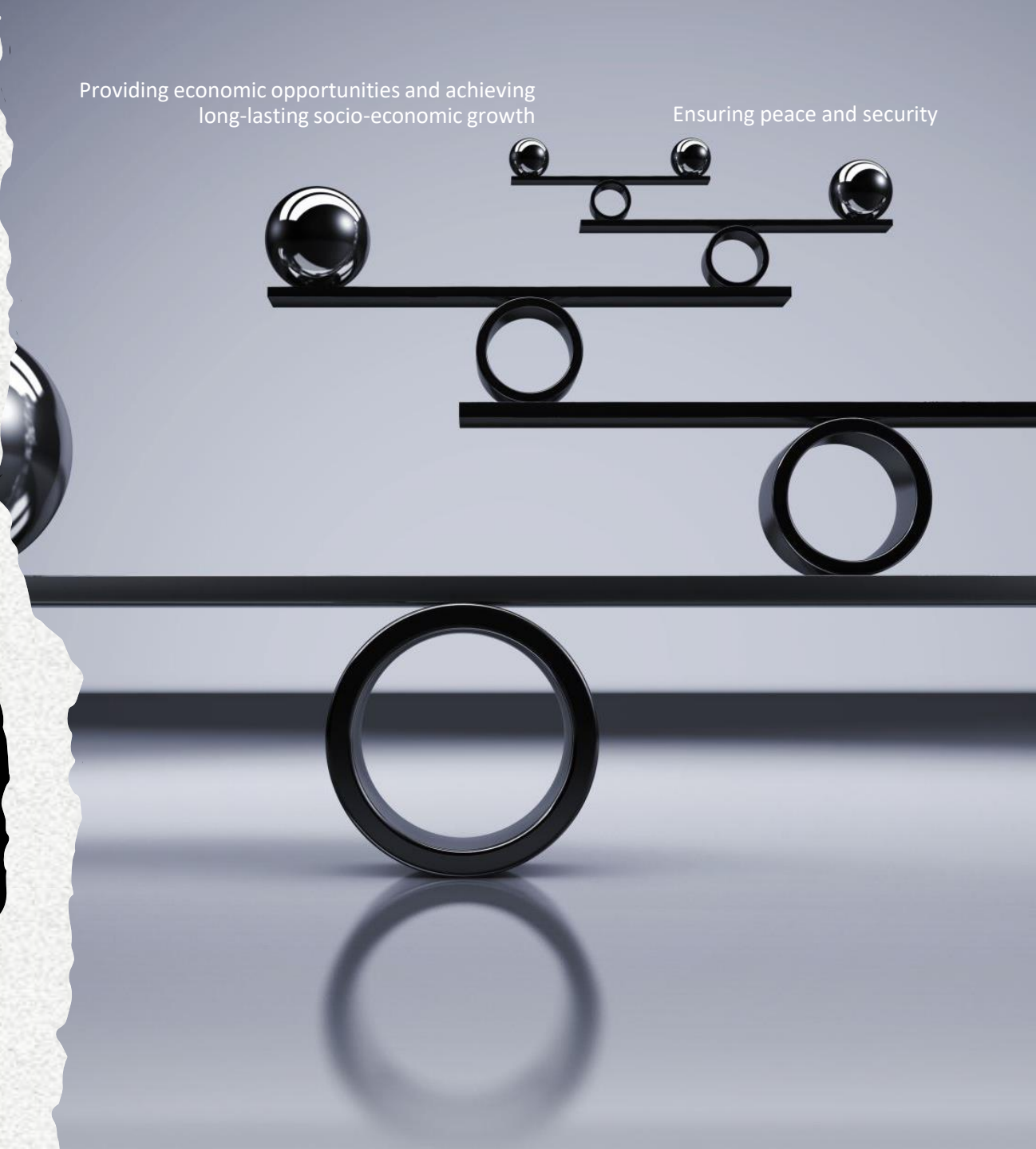
Chiara Garau, Associate Professor, DICAAR, University of Cagliari (Italy)

Which regeneration strategies for fragile territories?

Fragility and Conflict

Providing economic opportunities and achieving long-lasting socio-economic growth

Ensuring peace and security



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Which regeneration strategies for thinking about a better future?

Chiara Garau, Associate Professor, Department of Environmental Civil Engineering and Architecture, University of Cagliari (Italy)

Which regeneration strategies for thinking about a simple normality?

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Smart Solutions and Decision Support Systems

100% OPEN SOURCE

Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

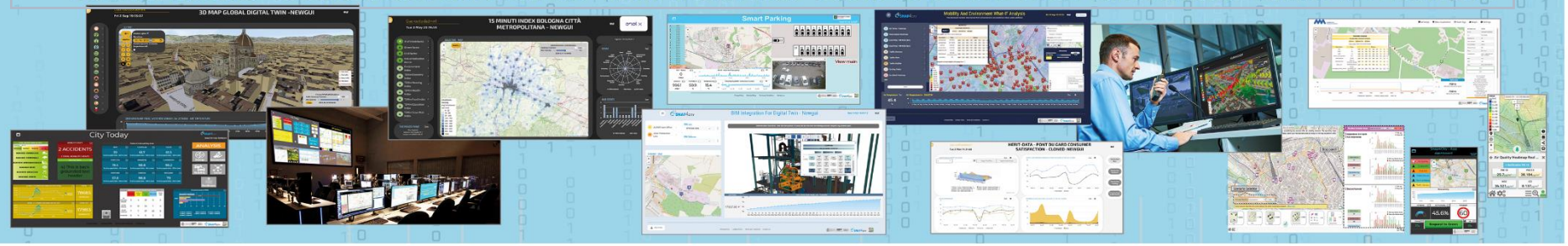
Node-RED

JS Foundation

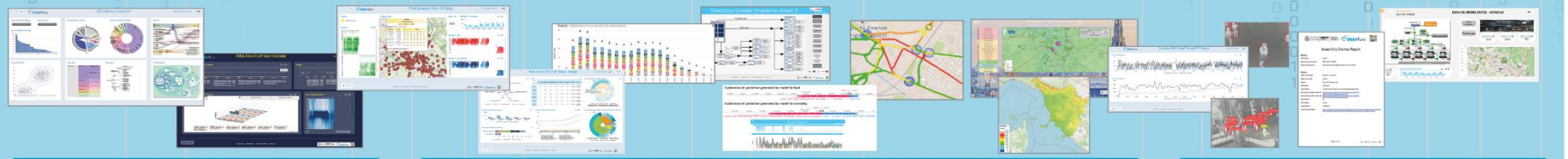
E015 digital ecosystem

NVIDIA

CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - BUSINESS INTELLIGENCE - SIMULATIONS - SMART APPLICATIONS



DASHBOARDS - VISUAL ANALYTICS - SYNOPTICS - DIGITAL TWIN - GRAPHICAL WIDGETS - ANALYTICS - GUI CUSTOM STYLES - VISUAL PROGRAMMING

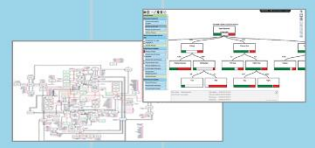


DASHBOARDS, WIDGETS
TEMPLATES

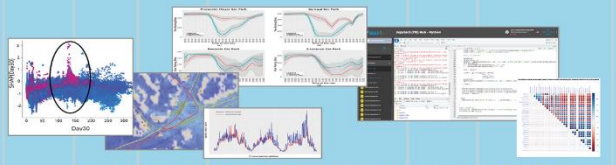
PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW
PEOPLE FLOWS - SDG - 15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - ETC...

API - MICROSERVICES - GIS - BPM
VIDEO - REPORTS - MAPS - 3D ...

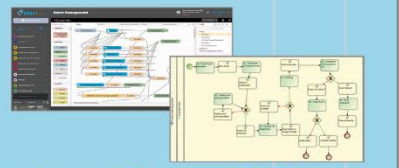
ANY: DATA, BROKER, NETWORK AND VERTICAL



EXPERT SYSTEM, KNOWLEDGE BASE
SEMANTIC REASONING
SMART DATA MODEL
IOT DEVICE MODELS, STORAGE



BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING
OPERATIVE RESEARCH, STATISTICS



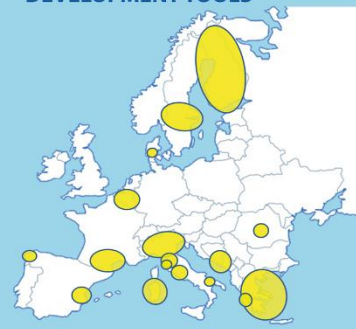
VISUAL PROGRAMMING, ADAPTERS
DATA FLOWS, WORKFLOWS
PARALLEL DISTRIBUTED PROCESSING
EVENT DRIVEN

Native and External Smart Applications

- Mobility & Transport
- Light & Energy
- Waste
- Environment
- Building
- Tourism
- Asset Management
- Security and Safety
- Social Media

...

METHODOLOGIES
LIVING LABS
COURSES AND COMMUNITY
DEVELOPMENT TOOLS



Antifragile planning in practice could be articulated on:

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declination of freedoms
in terms of design possibilities for redevelopment and reconstruction

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What was there before the war, how to rebuild it and identification of previous problems via a digital twin by considering the main priorities such as **transport networks** (Main means for rescue teams, food, water, etc.), **Energy networks**, **Communication**, (power supply for health, cyber systems, etc.), **Hospitals networks, etc..**

shared vision
a shared digital twin also through the memories of all people involved

declination of freedoms
design phase

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Smart City Digital Twin for (Anti)fragile territories and Antifragile planning in practice could be articulated on:

shared vision

a shared digital twin also through the memories of all people involved

declination of freedoms

design phase

Antifragile planning in practice (step 1):

Pre-war conditions, reconstruction strategies, and identification of previous problems via a digital twin by considering the main priorities

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Smart City Digital Twin for (Anti)fragile territories

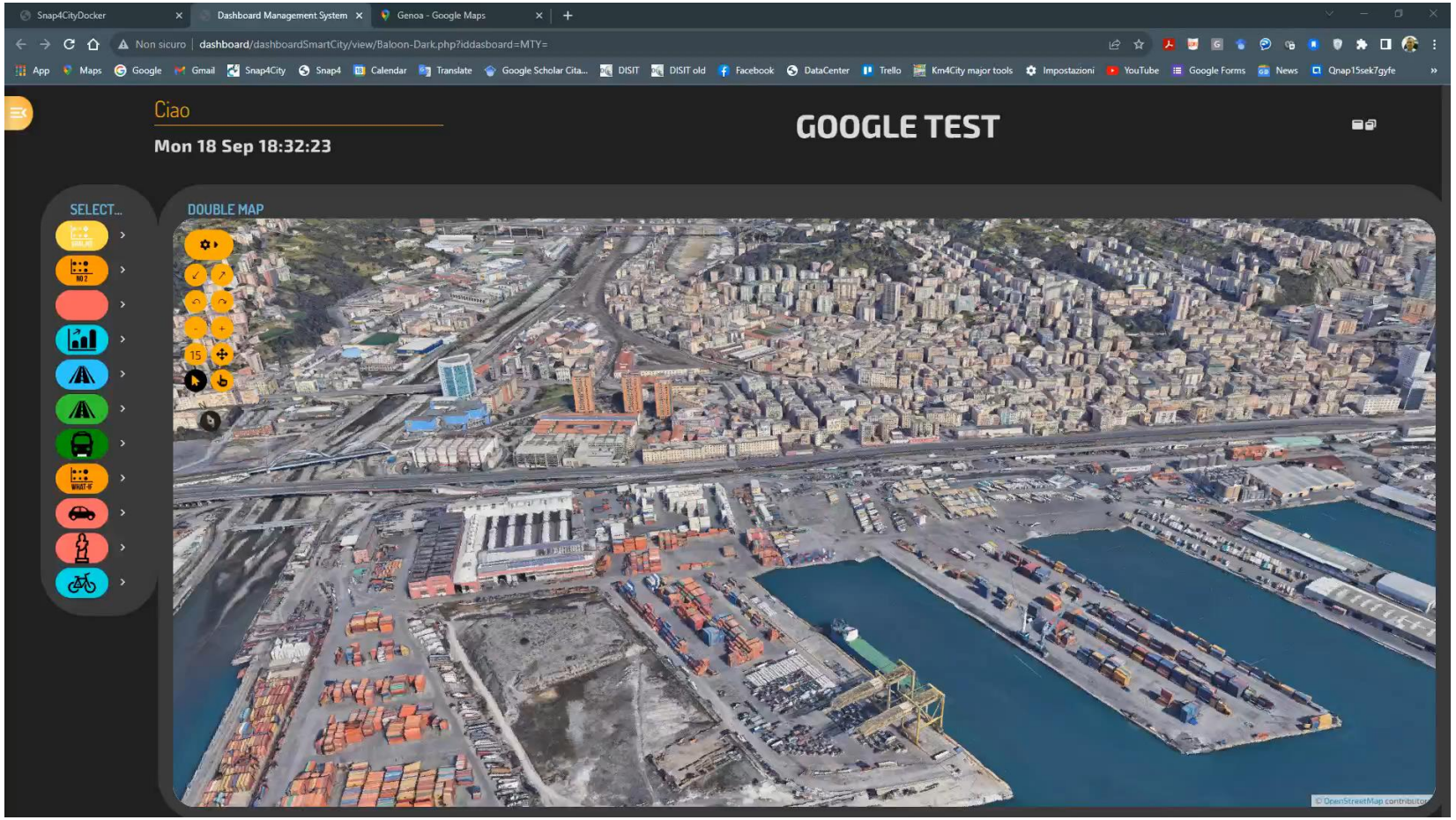
Digital representation of the city with…

- Intuitive platform
- Any Data TYPE, any data source, any protocol
- Data storage seamless
- Data analytics –> artificial intelligence, AI/XAI
- Data Ethics, AI Ethics, GDPR
- Data Representation
- Key performance Indicators
- What-IF analysis – Simulation, prediction, 2D/3D
- Operation, planning tactic and strategic
- Collaborative and shared representation
- Sustainable, shared, open source 100%

Complex and heterogeneous information, interoperability

- GIS, ITS, AVM, IoT, BIM, CKAN, etc.
- Satellite services
- MaaS, last-mile delivery HUBs
- etc.

Genoa



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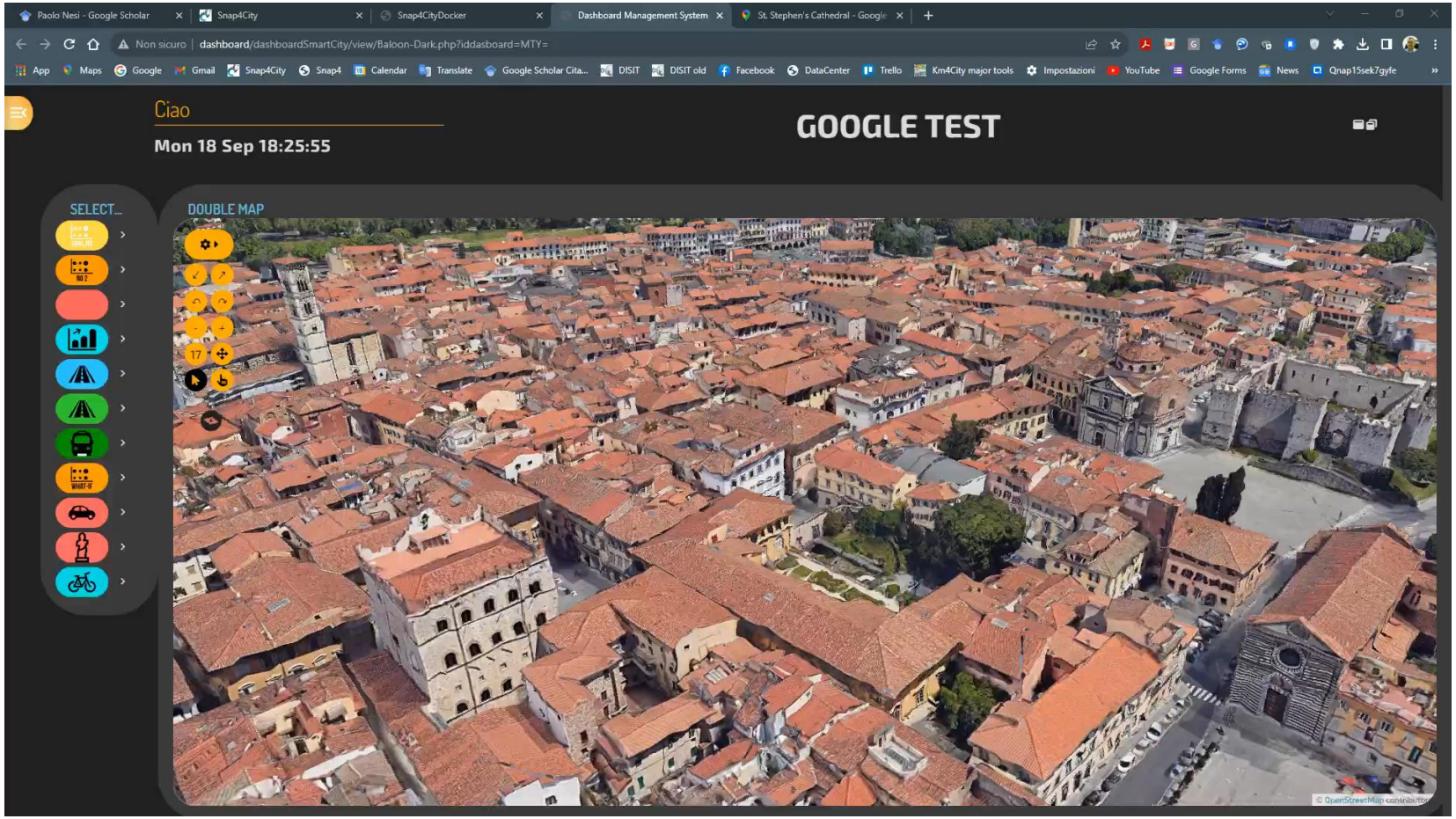
SNAP4CITY

KM4CITY

Prato



Orodea

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SNAP4CITY

KM4CITY

The post-conflict reconstruction process should be treated as a proactive and multi-disciplinary approach towards the dynamics of rebuilding social, political, economic and spatial systems in a more holistic and systemic way.

An effective antifragile planning process requires not just focusing on design decisions but also on constructing **cognitive frameworks and qualitative and quantitative indicators**.

Indicator of reconstruction (I_r):

Material Category
Architectural Heritage (private and public); Progress of Expenditure; Socio-Economic System

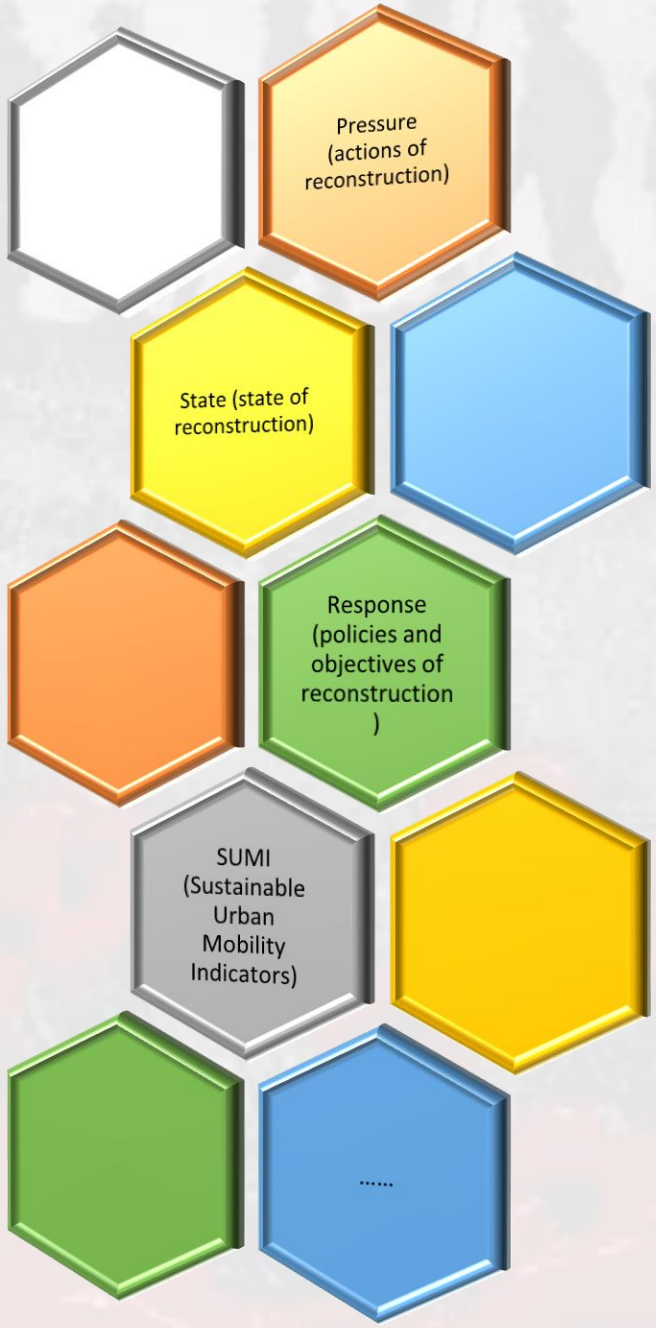
Immaterial Category
Demographic Attractiveness; Economic Dynamism; Social Welfare.

strategic objectives of the reconstruction

Features of actions
responsiveness; transparency; timeliness; Resilience/antifragility; Reliability

Priorities and Importance of actions

strong (●), moderate (□) or weak (◊) action



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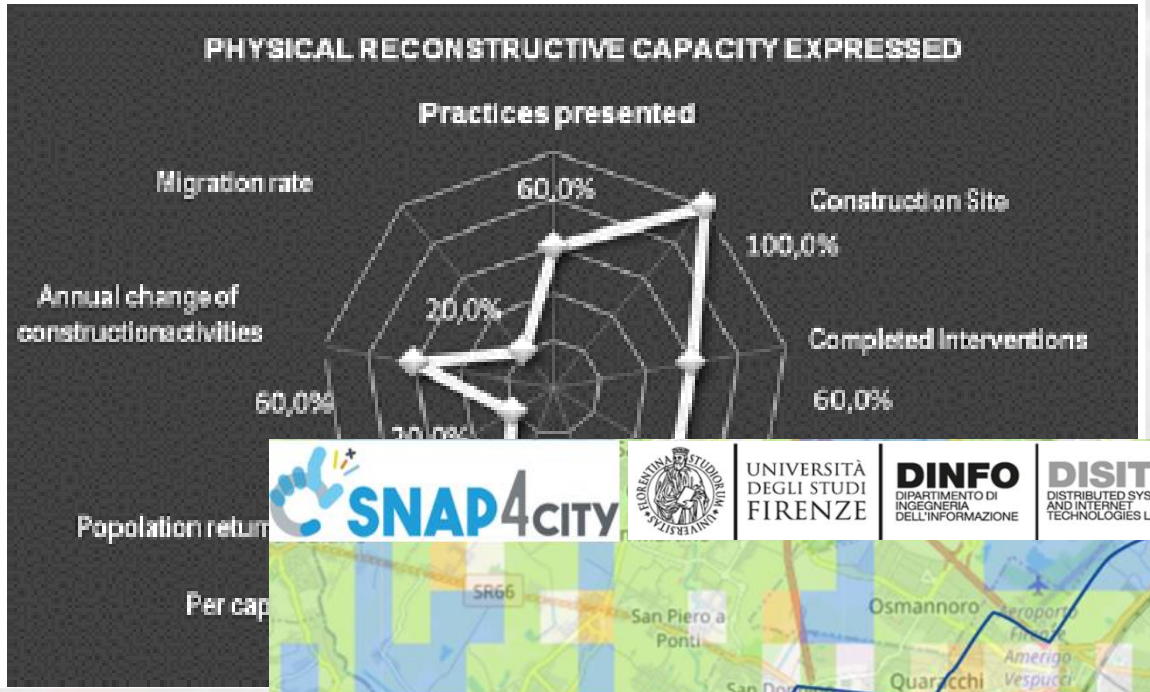

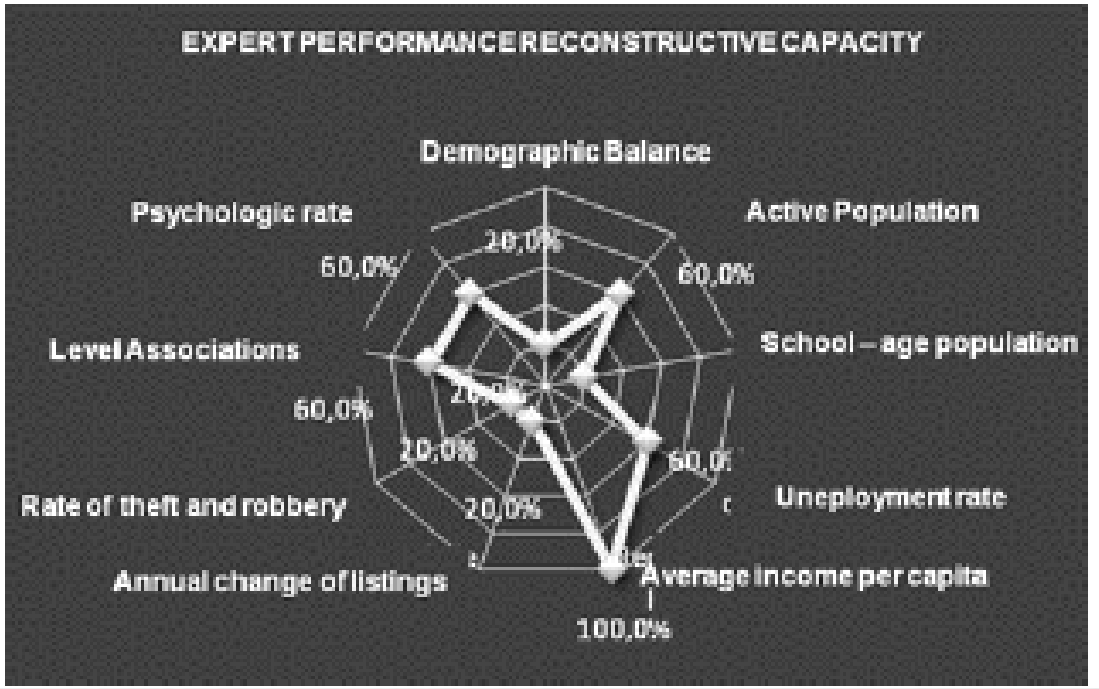

Immaterial Category
Demographic Attractiveness;
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2. shared vision
a shared digital twin also through the memories of all people involved

3. declination of freedoms
design phase

Dal global al Local Digital Twin vs BIM

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SNAP4CITY

KM4CITY

The process of antifragile reconstruction should be able to:

construct a shared, an in-depth and detailed knowledge base for each sector through an integrated analysis (political, economic, social, urban, environmental, cultural, etc.);

facilitate understanding and memories of the local context;

prepare objectives shared by all local actors;

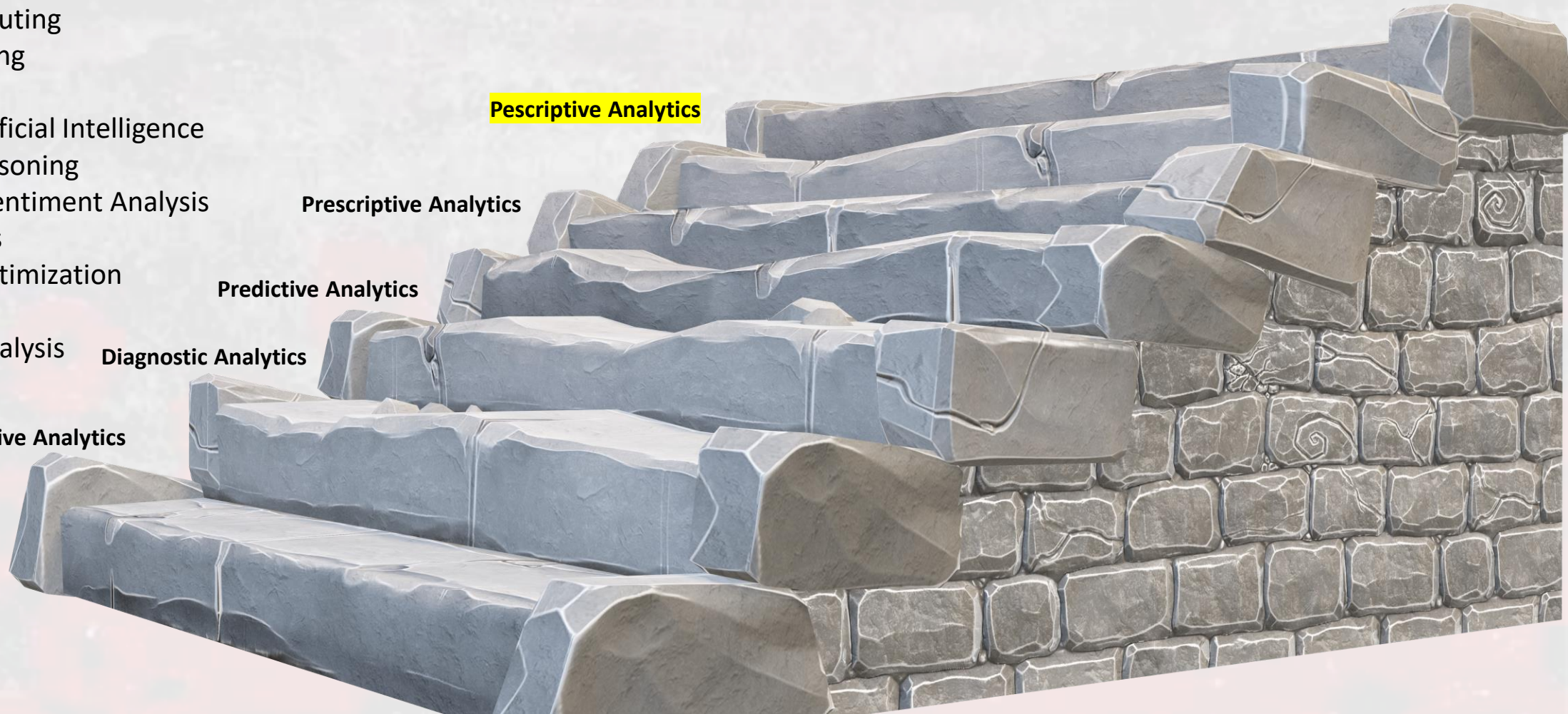
− divide objectives into obtainable and define programs and projects;

− have a continuous follow-up process (periodic and scheduled inspections).

After the declination of freedoms?

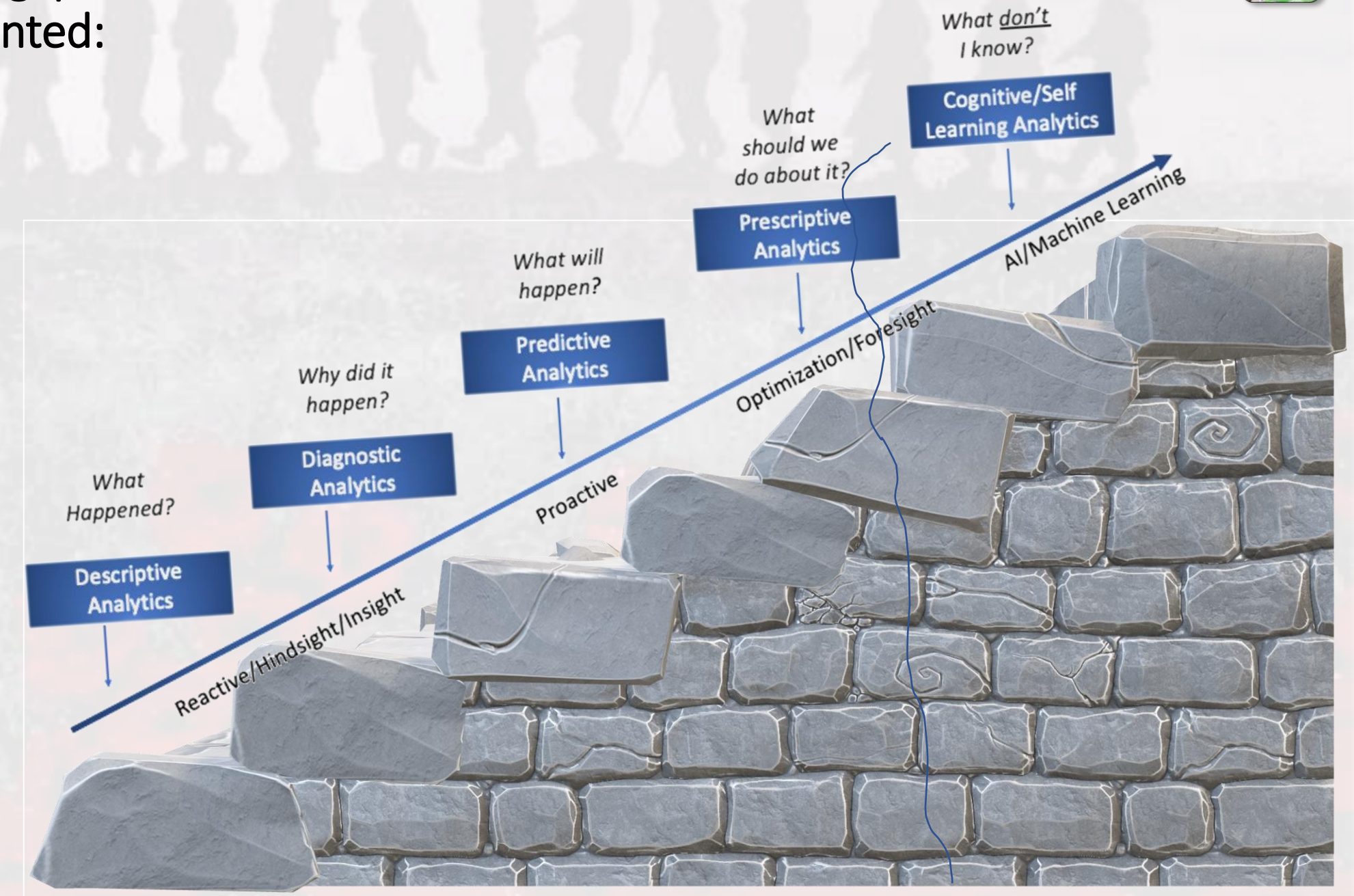
Antifragile planning practice could be implemented:

- Big Data Analytics
- neuro-symbolic
- Semantic Computing
- Machine Learning
- Deep Learning
- Explainable Artificial Intelligence
- Geo Spatial Reasoning
- Text Analysis, Sentiment Analysis
- What If Analysis
- Simulations, Optimization
- Visual Analytics
- Engagement Analysis
- ….



Antifragile planning practice could be implemented:

Sentient and active processes with antifragile materials



What-If Analysis

Available data and techniques	What happened	What is going on now	What is going to happen	What-If: what is going to happen if a scenario occurs in the future	Which is the best solution
Historical Data, HD	Yes	No	No	No	No
Real Time Data, RTD	No	Yes	No	No	No
HD + RTD + Short term Predictions, STP(.)	Yes	Yes	Yes	No	No
HD + RTD + Analytical Model, AM(.) + Scenario Model, SM(.)	Yes	Yes	Yes	(Yes)	No
HD + RTD + Short and Very Long Term Predictions, SVLTP(.) + AM(.) + SM(.) + Simulation, S(.)	Yes	Yes	Yes	Yes	No
HD + RTD + SVLTP(.) + AM(.) + SM(.) + S(.) + KPI(.) based Decision	Yes	Yes	Yes	Yes	Yes

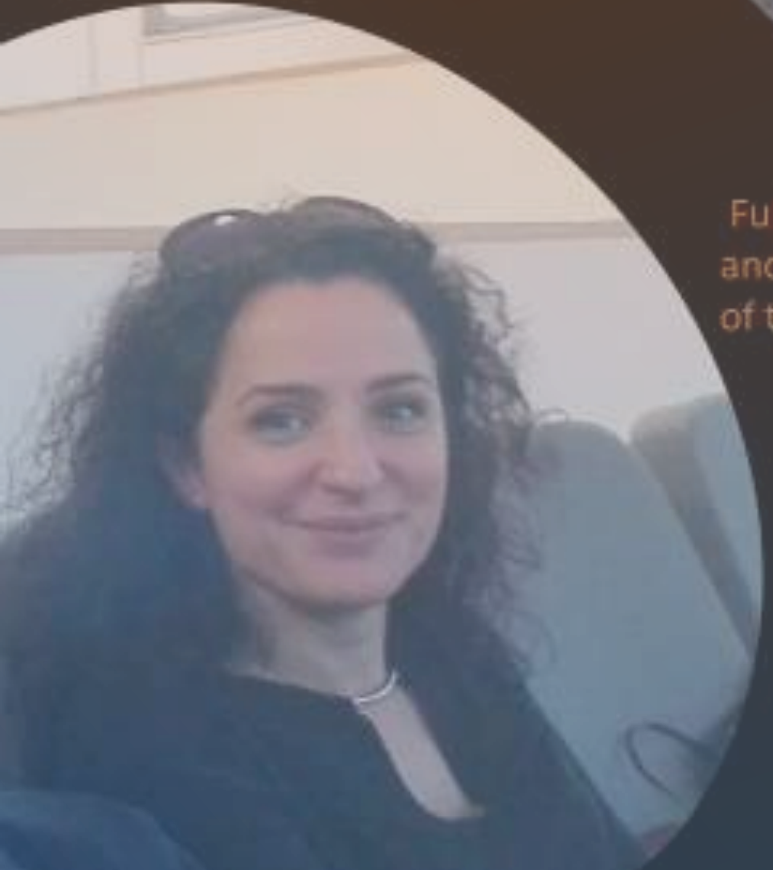
Conclusions

Fragility is a complex topic, which is generally conceptualised in relation to five dimensions: Political, Societal, Economic, Environmental, Security

The Antifragile approach could be extremely useful for post-conflict reconstruction settings

Snap4City is the most adaptive tool for Smart City Digital Twin applied in (Anti)fragile territories

It is probably impossible to produce universal answers, it's necessary to find commonalities amongst different post-conflict reconstruction settings to better deal with the reconstruction planning in a more dynamic, proactive, and sustainable manner.



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