NexusNet Stakeholder Engagement, Capacity Building, and the to Enhance Climate Change Adaptation in the Nexus Implementation

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FutureMed
TRANSDISCIPLINARY NETWORK

Structure

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Real Life Examples & Suggestions

Why is stakeholder engagement a crucial ingredient for the success of Nexus?

"By matching the interests of different stakeholders and economic sectors, Nexus offers opportunities for the design of shared solutions to control conflicts, achieve sustainability and reduce inequalities" (JRC, 2022).

Stakeholders in the nexus typically have **sector-specific goals** and make decisions in **silos** with a tendency to focus on **short-term outcomes** (Sterman, 2012).

The design of integrated policy can be challenging due to:

Divergent interests of relevant stakeholders

Lack of effective engagement between expert and non-expert stakeholders

Varying levels of knowledge and understanding amongst actors - who may prioritize different types of information and data

However, decision-makers and beneficiaries may have different opinions on where to draw this line, leading to conflicting views and actions.

Understanding the Stakeholders

At the most basic level, **stakeholders are the people who make up and run the 'system'**- they are not an audience which the project must simply inform.

Stakeholders can **collaboratively develop fresh approaches and potential solutions**.

An inclusive process enables them to make informed choices about the direction they want to take in the future.

Nexus has far-reaching effects; it is essential to include all sectors of society in stakeholder engagement activities.

We need to create space for dialogue amongst stakeholders

WHY?

Identifying the stakeholders **from grassroots participants to decision-makers in boardrooms**

We need to uncover the **dynamics of power struggles** that exist among the actors within the nexus chains.

WHY?

Who are the Stakeholders?

The stakeholders who should be involved are numerous and diverse, extending beyond a specific list to embrace a wide range of individuals and organizations.

- **Citizens** – consumers, workers, community members, activists, etc.
- **Community leaders** – particularly important for representing the vulnerable and marginalized population.
- **Businesses –** local and multinational bodies; producers, retailers, and logistic companies.

Stakeholders encompass both those **who can influence the project's outcome** and **those who may be impacted**.

Without this comprehension, a project risks failure, such as neglecting marginalized segments of society or the local community's requirements.

- **Utility agencies** – water and power providers are integral to showcasing supply chains and challenges in altering processes and infrastructure.
- **Academics** –researchers offer fresh and unique perspectives, exploring intricate details often overlooked by other groups; universities bridge research with policy
- **Resource management** – offer expertise in storage, distribution, maintenance, and related areas
- **Urban planners, designers, engineers, and policymakers.**

Source: JPI Urban Europe

Benefits of Participative Stakeholder Dialogue &Engagement

1) Stakeholders have **ownership over the project** if they are embedded in it and are more likely to assist and implement project recommendations.
2) Engagement beyond technical aspects and including **social, economic and political concerns** provide a space for negotiating development pathways (Johnson & Karlberg, 2017).
3) Critical stakeholders, can better **design interventions that are appropriate for the needs** and ensure that interventions address the underlying causes of problems
4) Engaging stakeholders facilitates the translation of research findings into **actionable policies and practices**., Stakeholder dialogue enhances the relevance and applicability of research outcomes
5) Stakeholder dialogue in Nexus research **promotes capacity building and knowledge transfer** among participants. It enables the sharing of expertise, experiences, contributing to the development of collective knowledge and skills to address complex Nexus challenges

Relevance for Nexus Research

Stakeholders & Nexus assessment tools

Numerous studies have highlighted the effectiveness of transdisciplinary approaches in fostering a collective comprehension, which in turn assists in devising suitable interventions

Stakeholders & Sustainability assessments,

Many of the resulting models rely on quantitative models involve stakeholders. However, by actively involving stakeholders in the process, the assessments can broaden their scope and encompass the diverse expectations, goals, and perspectives of various parties.

Stakeholders & optimization tools

facilitates the exchange of values and visions, which in turn supports the exploration of potential interventions. & enhancing the validity of the assumptions made

Visualisation techniques are critical to convey system state and dynamics, and communicate multidimensionality and interaction.

Inclusion of stakeholders enables a better understanding of the alternative pathways for action under conditions of uncertainty that characterise nexus challenges

(Hoolohan et al., 2018)

Steps of an Effective Stakeholder Engagement

STEP 1: Identifying Key Stakeholders

To avoid investing time and efforts in a nontargeted (or unfavorable) strategy, it is key to ensure that relevant stakeholders are engaged **from the beginning of the research activities**.

The first step in stakeholder engagement is to identify all relevant stakeholders including their roles and characteristics (i.e., Research, Industry, Policy, and Society).

An output of the process is **a stakeholder analysis matrix** that consists of key stakeholder information.

Table 1. Stakeholder Analysis Matrix

Stakeholders	Stake / Mandate	Potential Role in Project	Margina-lized?	Key?

Some of the key questions to identify the key stakeholders:

- How are the threatened project targets being used? By whom?

- Who is most dependent on the resources at stake? Is this a matter of livelihood or economic advantage? Are these resources replaceable by other resources?

- Who possesses claims – including legal jurisdiction and customary use – over the resources at stake? Are several government sectors and ministry departments involved?

- Who are the people or groups most knowledgeable about, and capable of dealing with, the resources at stake? Who is managing these resources?

- Are the stakeholders and their interests geographically and seasonally stable, or are there migration patterns?

- Are there major events or trends currently affecting the stakeholders (e.g., development initiatives, land reforms, migration, population growth)

- Has there been a similar initiative in the region? If so, to what extent did it succeed? Who was in charge and how did local stakeholders respond?

Source: Golder & Gawler (2005).

STEP 2: Collect Stakeholder Data (stakeholder register)

A stakeholder register is a tool that helps to document and track the relevant information about your stakeholders,

STEP 3: Categorize stakeholders into priority groups & Asses the influence and importance

A **stakeholder analysis** is a process, of **listing**, **classifying**, and **assessing** the influence of these stakeholders in a project is termed a stakeholder analysis.

The ranking is simply to assign to each stakeholder a "**low**" or "**high**" score for "**influence**" and "**importance**".

Then the stakeholders can be mapped in a stakeholder analysis grid according to their level of interest, influence and type of engagement in the project.

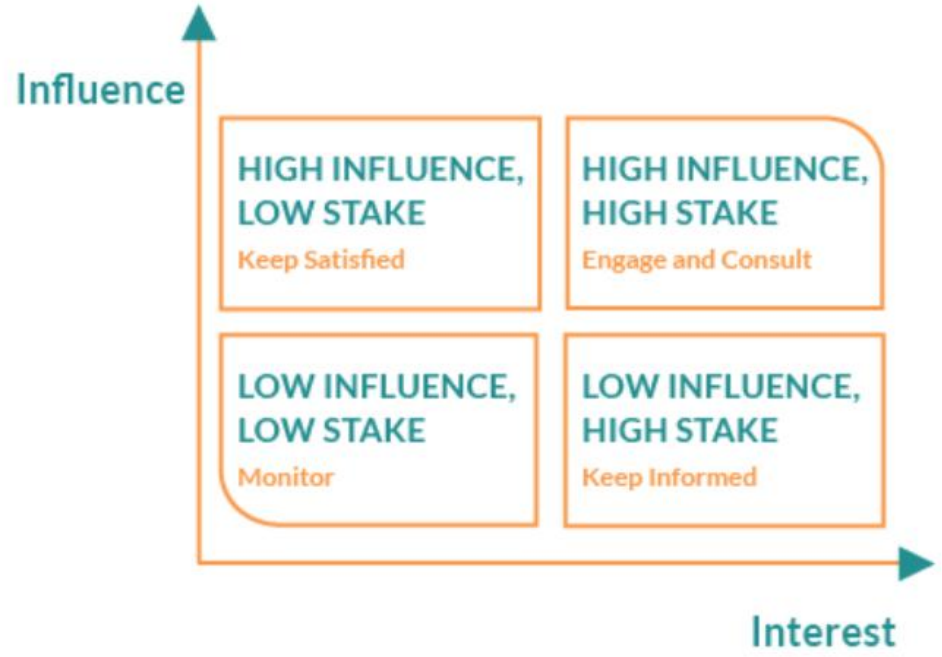


Figure 1. Influence vs Interest Grid used for stakeholder mapping (Adapted from Ginge, 2018)

STEP 4: Identification of the key relationships and profiling the stakeholders

It can be very valuable to know in advance about conflicts between individuals, organizations or groups, so that inflaming conflicts and disputes
can be either avoided or solved.

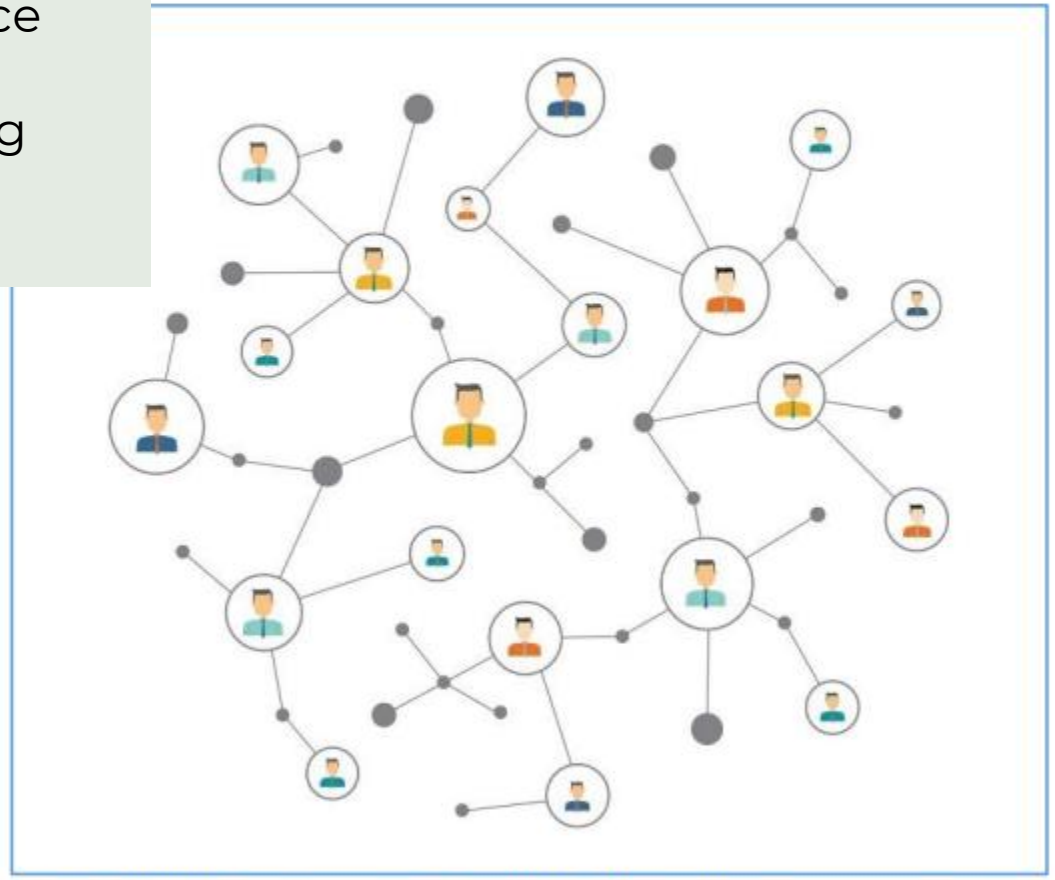


Figure 1. An example of Stakeholder mapping. The Stakeholders with many connections and the Stakeholders which connect smaller groups to the main group are considered as Key Players.

Key questions for assessing the influence and importance of stakeholders

- Who is directly responsible for decisions on issues important to the project?

- Who holds positions of responsibility in interested organizations?

- Who is influential in the project area (both thematic and geographic areas)?

- Who will be affected by the project?

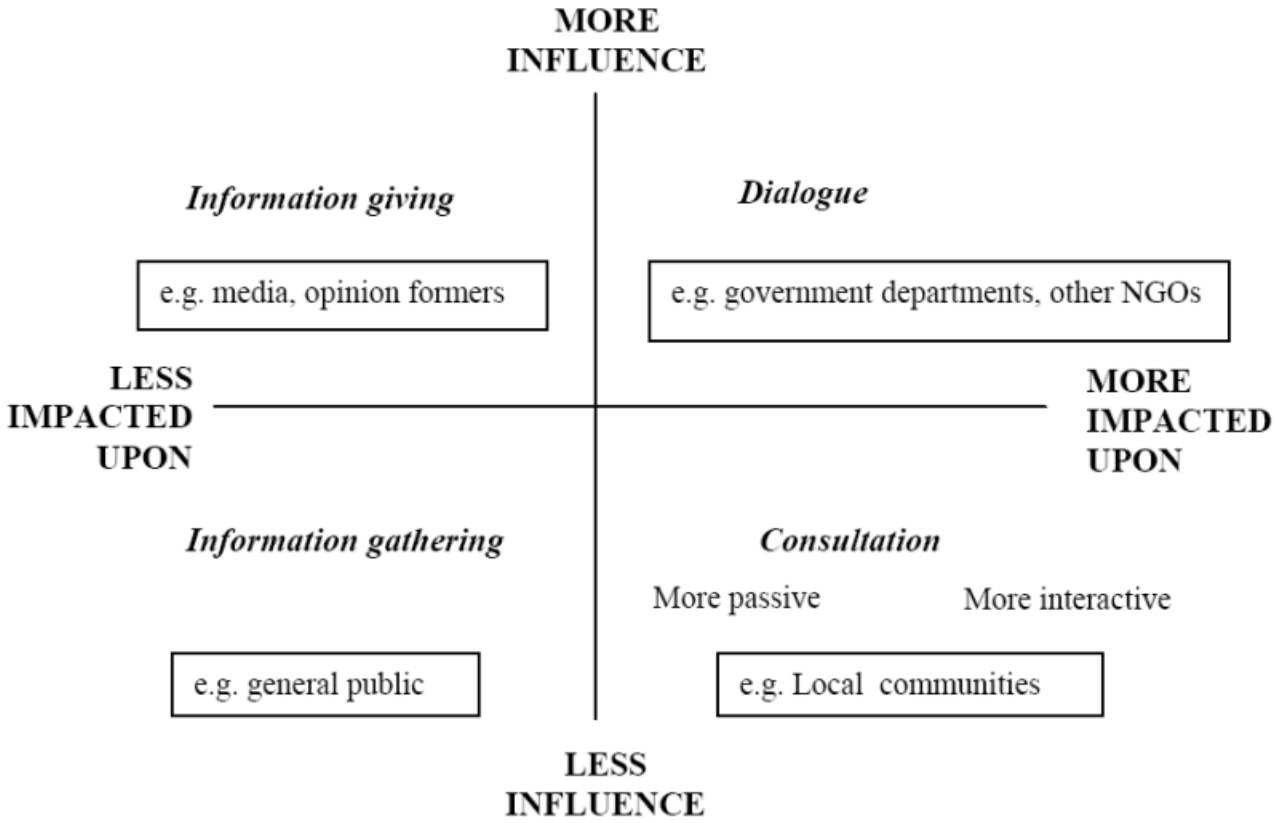
- Who will promote/support the project, provided that they are involved?

- Who will obstruct/hinder the project if they are not involved?

- Who has not been involved up to now but should have been?

Figure 1. Stakeholder Analysis Grid

Note that the lines of the grid are not hard and fast boundaries – they are for guidance only.



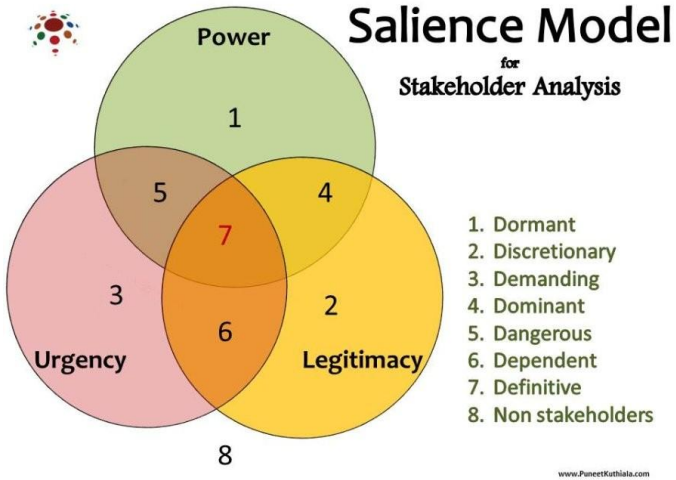
Source: Golder & Gawler (2005)

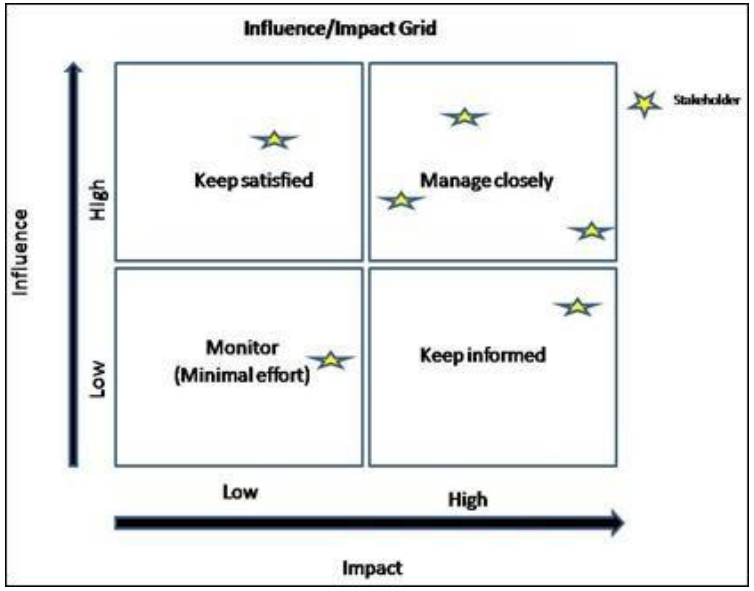
STAKEHOLDER MAPPING

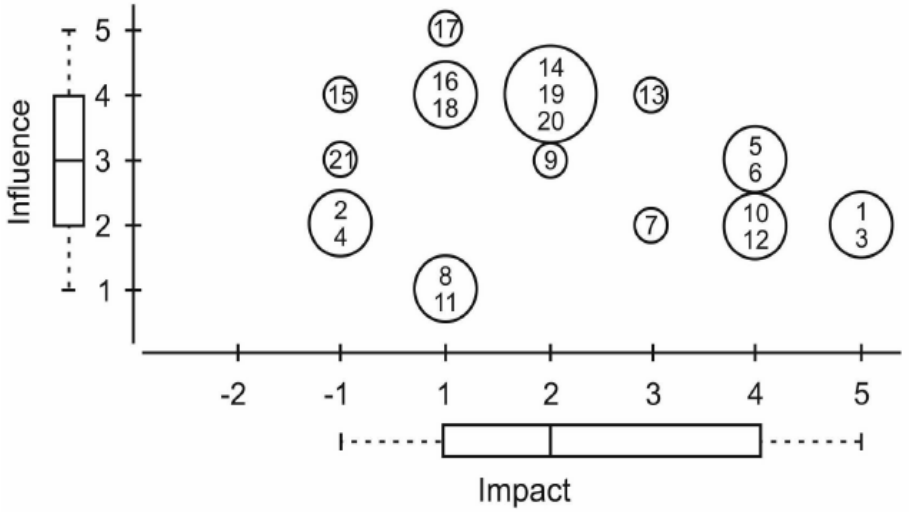
You can use different frameworks, such as the power-interest grid, the influence-impact matrix, or the salience model, to plot your stakeholders on a chart and group them into segments.

Figure 2. Template Power/Interest Grid

Step II. Through analysis of existing institutional framework on national and regional levels and communications with Directors of CAREC Country Offices, map of stakeholders and classification them by their power and interest in WEF Nexus related issues was developed. For this purpose, the Power/Interest Grid tool (Figure 2) used.







Step 6: Evaluate stakeholder feedback

Considering stakeholder responses is not a passive task, but an assessment activity

Assessment of the Stakeholder engagement process is necessary to ensure that the chosen approach is successful. One of the tools to prepare the assessment of the Stakeholder engagement process is the Evaluation Form. These Evaluation Forms should be analysed to assess the Stakeholder engagement process.

Table 5. Proposed indicators to measure the Stakeholder engagement process]

Assessment	Proposed indicator
Commitment and integration	Planned Stakeholder commitment (how much they provide input to the process) versus actual Stakeholder commitment
Purpose, scope and Stakeholder participation	Planned number of participants versus the actual number of participants
Process	Planned process versus actual process
Outputs and outcomes	Planned outputs versus actual outputs
Reporting	Planned reporting versus actual reporting

A Success Case: SIM4NEXUS

SIM4NEXUS applied the Nexus concept in 12 case studies, implemented at different scales: regional, national, transboundary, European and global.

The science-policy participatory and iterative process established has successfully led to policy recommendations.

SIM4NEXUS

Key achievements

- Stakeholders involved from 14 different countries, covering all 5 Nexus domains
- Stakeholders gained knowledge on the Nexus and their countries' Nexus issues.
- Stakeholders actively participated in the identification of Nexus challenges, the data collection and scenarios development, and the formulation of policy recommendations.
- Stakeholders mobilized through a diversity of means: workshops, interviews, surveys, Serious Game tests or field trips in an iterative process with SIM4NEXUS researchers.

Let's hear more from Dr Floor Brouwer https://www.youtube.com/watch?v=p4cRmSELLMo

Key facts

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Climate-resilient regions through systemic solutions and innovations

41	15	9	15	48
Partners coordinated by the University of Thessaly	European countries	Case studies in Europe	Million Euros	Months (October 2021 – October 2025)

Objectives

1. Facilitate a **fundamental transformation** of economic, social and financial systems that will trigger an exponential change in decarbonization rates and strengthen climate resilience
2. Support recovery from the COVID-19 crisis and climate resilience
3. **Support communities and scientists** in efficiently evaluating the environmental and economic effects of climate change
4. Offer **advanced Environmental Intelligence** services and tools
5. Quantify, model and manage **climate risk** in a systematic way through resilience
6. Facilitate **knowledge transfer and exploitation** for start-ups and SMEs

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The ARSINOE Concept – 3 tier approach

SYSTEMS INNOVATION APPROACH

The Systems Innovation Approach addresses the growing complexity, interdependencies and interconnectedness of modern societies and economies. It focuses on the functions of the cross-sectoral system "as a whole" and on the variety of actors.

CLIMATE INNOVATION WINDOW

The Climate Innovation Window is the EU reference innovations marketplace for climate adaptation technologies. It facilitates the market exploitation of validated tools and technologies by interested parties.

CLIMATE CHANGE ADAPTATION SOLUTIONS IN THE INNOVATION PACKAGES

Pathways to solutions are co-created and co-designed by stakeholders to form an innovation package for resilience to climate change.

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9 Case studies in Europe

CS#1: Greening the Athens metropolitan area

CS#2: Mediterranean Ports

CS#3: Main River

CS#4: Ohrid/Prespa lakes

CS#5: Canary Islands

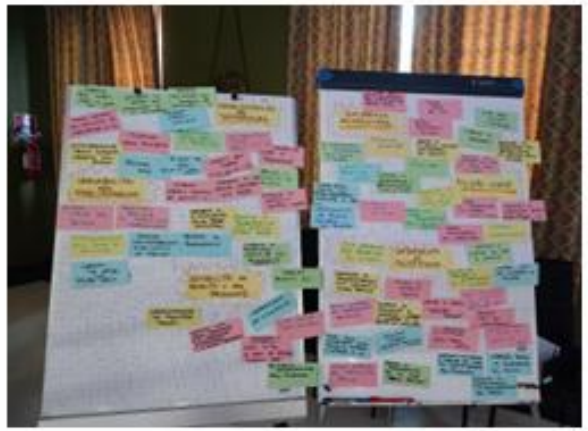
CS#6: Black Sea

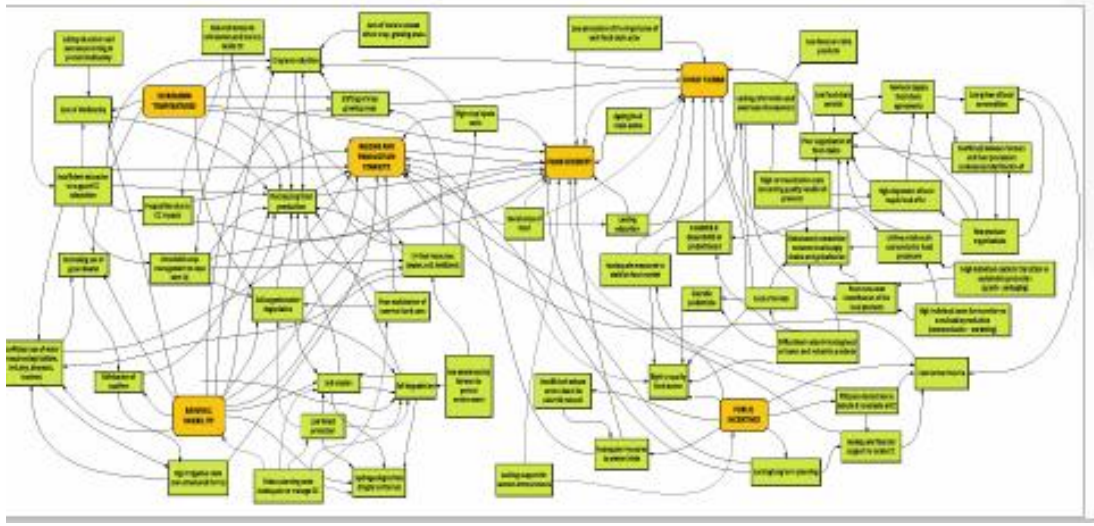
CS#7: Southern Denmark

CS#8: Torbay and Devon county

CS#9: Sardinia

Living Labs





...it is the first time we locally work on comprehensive resilience challenges...

ARSINOE Collective Intelligence Data Hub

- **Web Data Catalogue** accessible through a web user interface, where the users as members of a specific Case Study can login and upload their datasets, accompanied by a set of specific metadata.
- The catalogue is available at the following address: https://catalogue.arsinoe-project.eu/
- **Transformation Service** which allows users to transform any tabular (CSV or TSV format) dataset to a new form by performing a set of operations on top of the original dataset and creating a new file. The transformation service has been integrated with the catalogue, to allow easy access of it.
- A web service named: **Data Management Service** supporting the machine-to-machine interaction between the Data Hub and any possible service client.
- Detailed documentation of the data management service can be found at: https://arsinoe-data-management-service.readthedocs.io/en/latest/#

ARSINOE Collective Intelligence Data Hub (home page)

ARSINOE EU Project Zenodo Community

Sardinia Case Study
Cagliari Region

Cagliari is an Italian municipality the capital and largest city of the island of Sardinia

- its metropolitan city (including Cagliari and 16 nearby municipalities) has about 420.000 inhabitants
- Its natural resources have always been its harbour, the salt from its lagoons, and from the hinterland, wheat from the Campidano plain and silver

Source: ARSINOE project, https://arsinoe-project.eu/

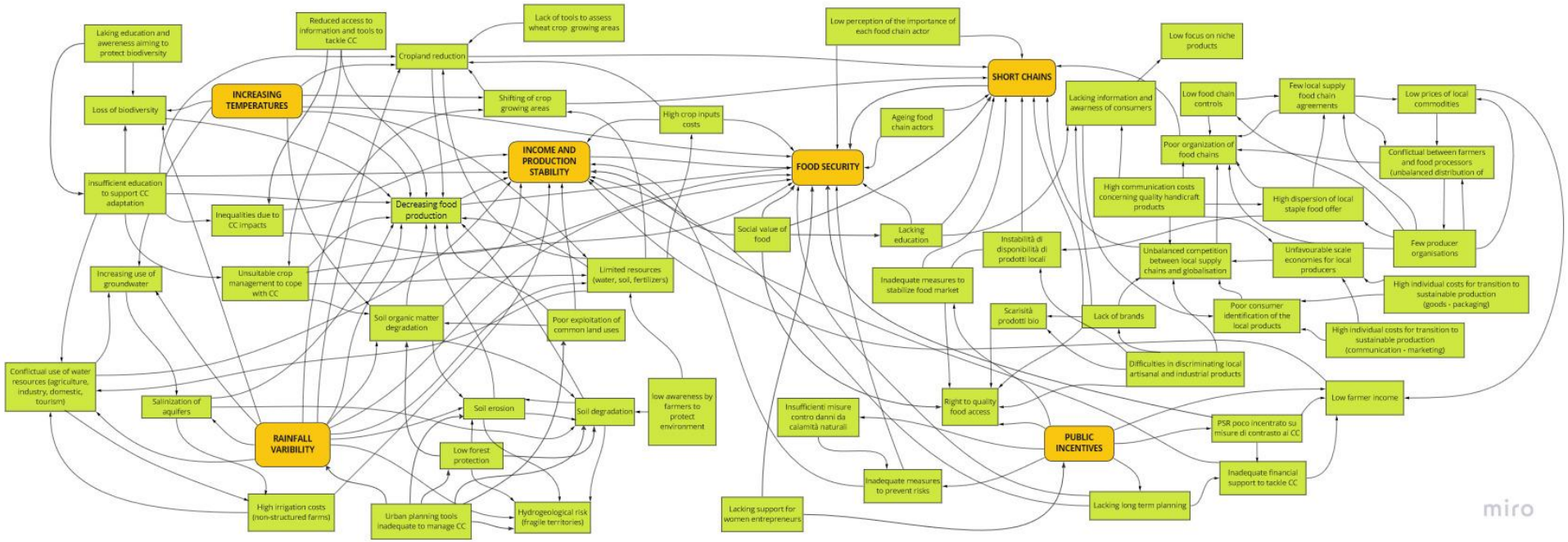
Sardinia Case Study
Cagliari Region

- An ancient city with a long history
- Today the city is a regional cultural, educational, political and artistic center, known for its diverse architecture and several monuments.
- It is also Sardinia's economic and industrial hub, having one of the biggest ports in the Mediterranean

Source: ARSINOE project, https://arsinoe-project.eu/

Sardinia CS, Cagliari Region

Living Lab, stakeholders input



Source: ARSINOE project
https://arsinoe-project.eu/

Sardinia CS, Cagliari Region

Source: ARSINOE project, https://arsinoe-project.eu/

Highlighted stakeholder's issues

- Climate change impacts (increasing temperature, rainfall variability)
- Lack of awareness on food literacy and climate issues
- Income and production stability
- Food security
- Shorten the food chain

Fields for intervention/ challenges

- food chain component within the Water-Energy-Food-Ecosystems (WEFE)
- Key Performance Indicators (KPIs) in the Food Chain Component
- Certification Branding and Consumer Awareness - Ecolabels

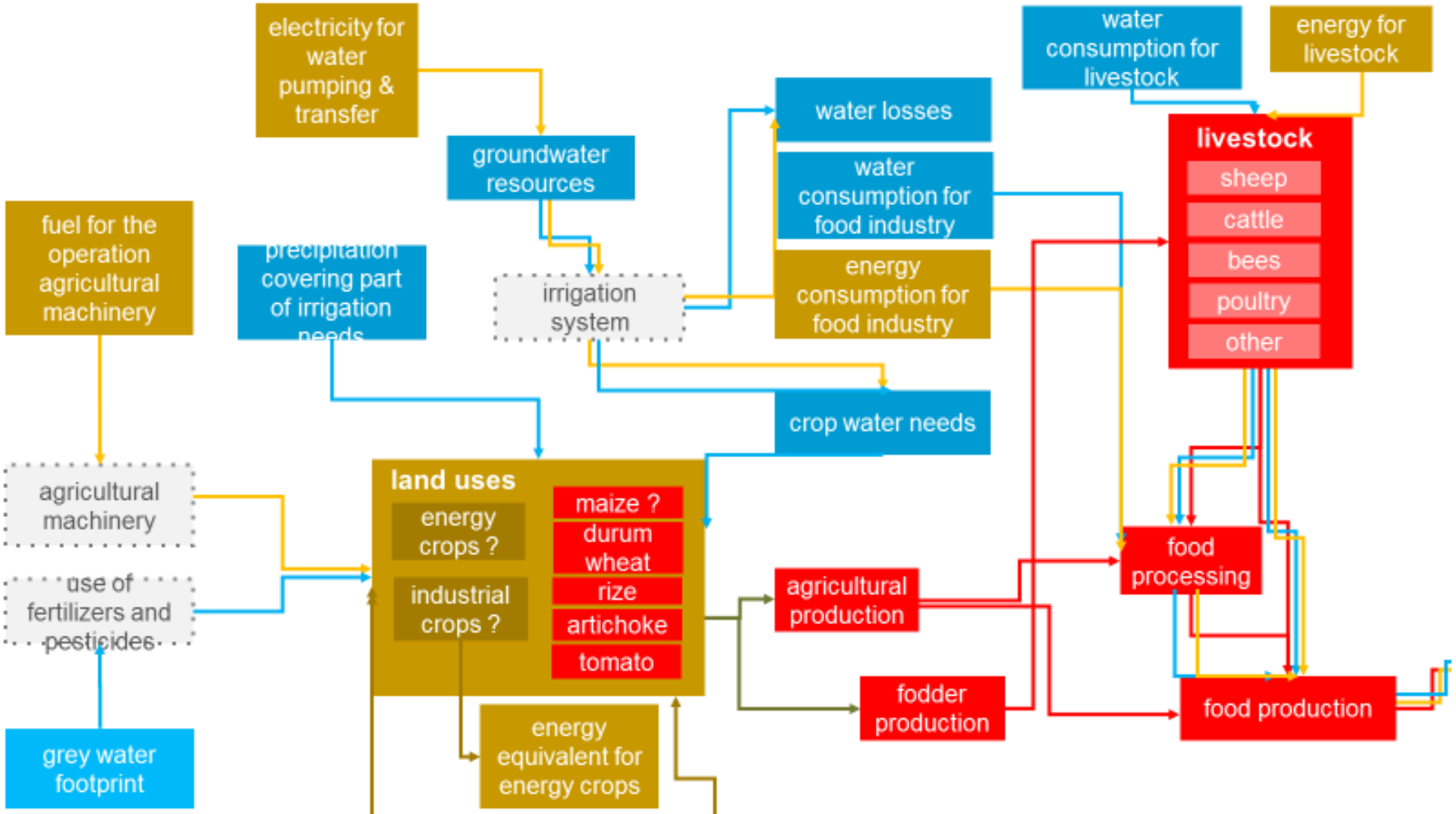
Sardinia CS, Cagliari Region

- The main extensive crops of the area are **durum wheat** and other cereals (barley and oats), legumes (fava bean), forage (clovers and lucerne) and artichoke and potato in the most fertile areas.
- This crop fuels several upstream activities, such as seed production, as well as downstream ones such as milling, bread- and pasta making.
- However, durum wheat production and yield stability are seriously threatened by **climate change**, thus jeopardizing **food security** and social stability in the whole Mediterranean basin.
- Concerning Sardinia, a decreasing production trend has been registered due to **low profitability** and unfavorable **growing conditions** caused by climate change

- Source: ARSINOE project,
- https://arsinoe-project.eu/

Sardinia CS, Cagliari Region

Conceptual map



Sardinia CS, Cagliari Region

Challenges

- ✓ To further develop the FOOD component/food chain
- ✓ To develop KPIs that will assess the process
- ✓ To develop an example of a model that is capable to quantify the impact of innovative technology that will be showcased through the use of ecolabels in the packaging industry
- ✓ To develop Key Performance Indicators (KPIs) and their quantification methods

SustainGraph: A Knowledge Graph for Tracking Progress and Interlinking of the Sustainable Development Goals

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CLIMATE-RESILIENT REGIONS THROUGH SYSTEMIC SOLUTIONS AND INNOVATIONS

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NETMODE

NETWORK MANAGEMENT & OPTIMAL DESIGN LAB

This project has received funding from the European Union's Horizon 2020 innovation action programme under grant agreement 101037424.

The ARSINOE SustainGraph: Knowledge graph database

- **Unifies** and **interconnects** siloed data
- **Semantically aligned** data based on well-defined entities and relationships (Alignment between the UN and EU SDG datasets)
- **Track** the progress towards the achievement of SDG targets in **national, regional** and **local** level
- Facilitate **analysis** from interdisciplinary scientists
- Identification of **hidden relationships**, considering both the temporal and spatial scale

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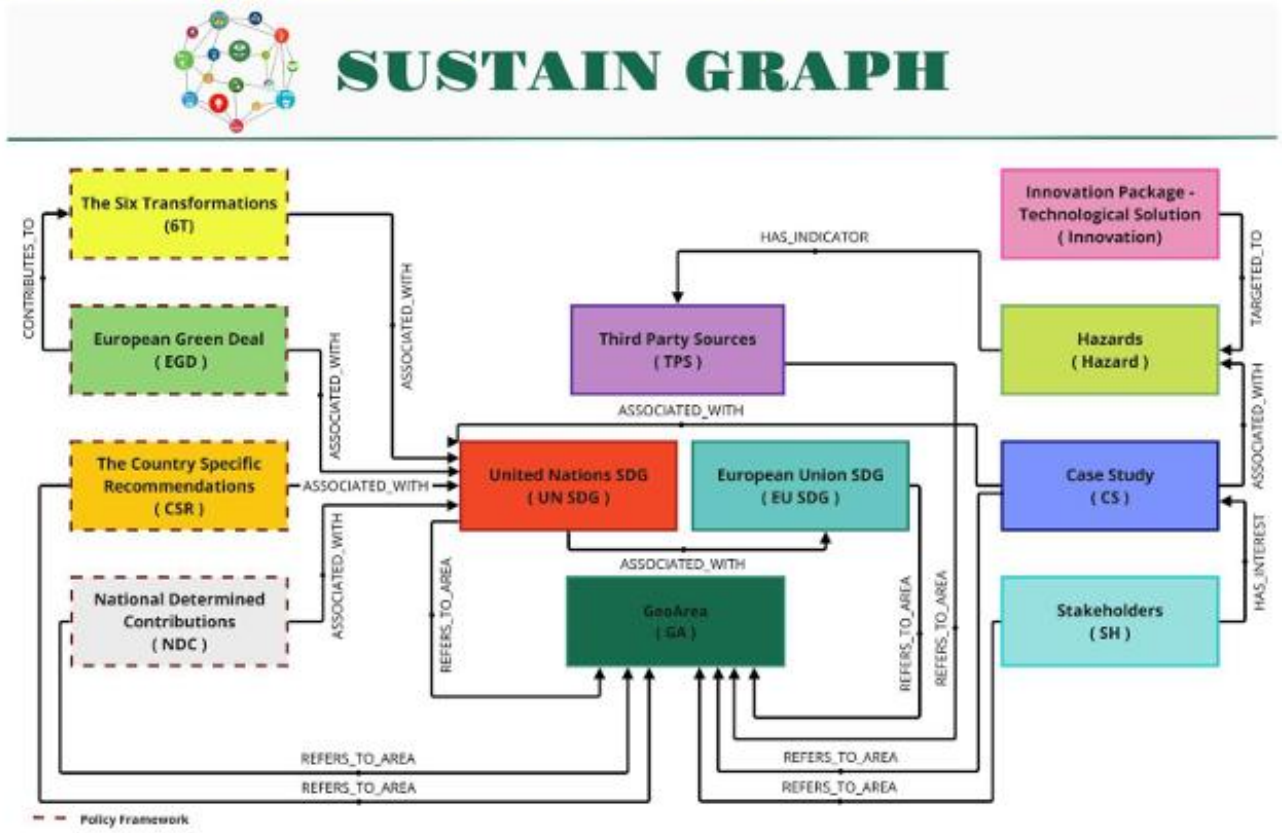
SustainGraph Schema Overview



169
Targets

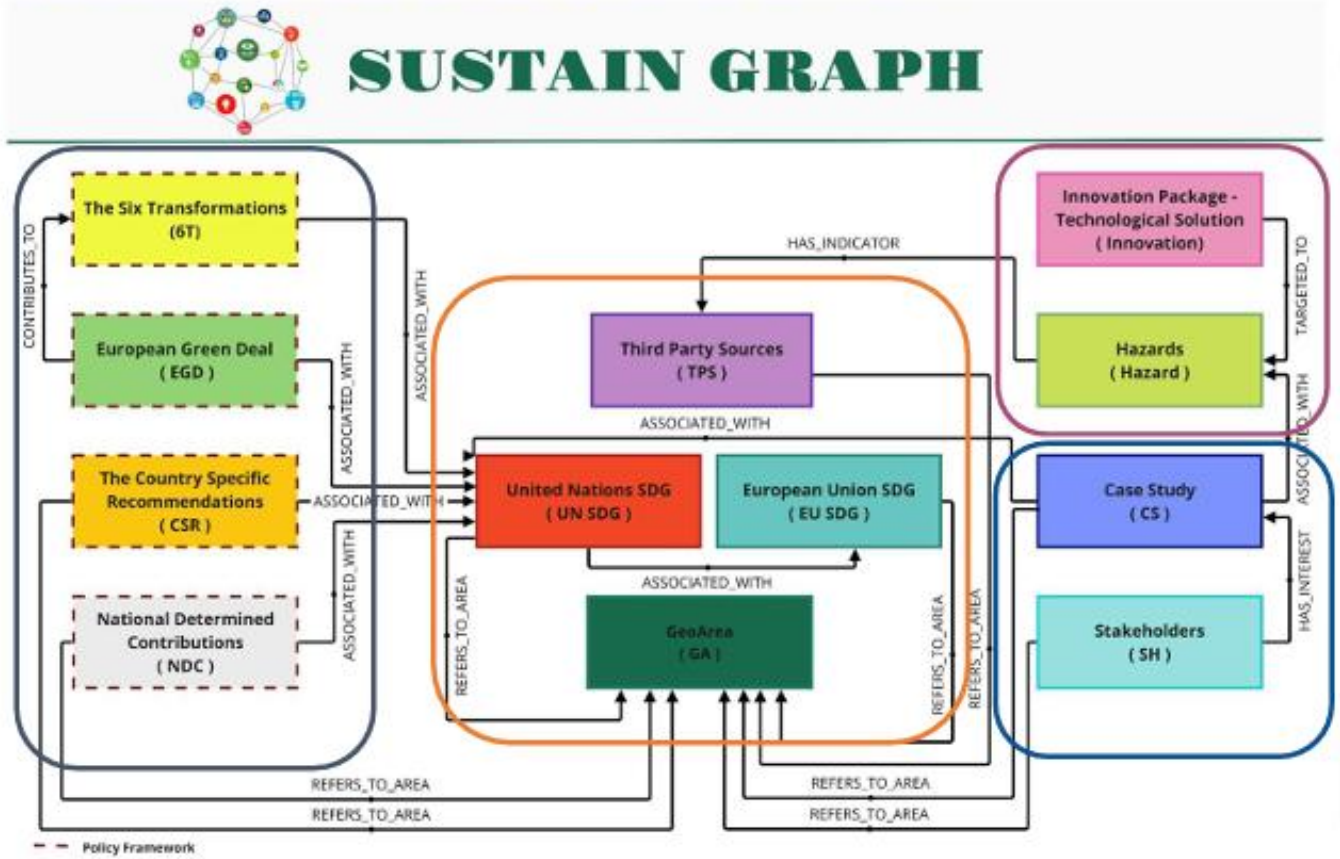
248
UN SDG Indicators

102
EU SDG Indicators

Publication:

[SustainGraph: A knowledge graph for tracking the progress and the interlinking among the sustainable development goals' targets]

SustainGraph Schema Overview



169
Targets

248
UN SDG Indicators

102
EU SDG Indicators

Highlights

- Alignment between UN and EU SDG datasets
- Integration of data from third-party sources
- Mapping of policy documents to the SDGs
- Tracking of hazards and associated innovations
- Stakeholders mapping per Case Study

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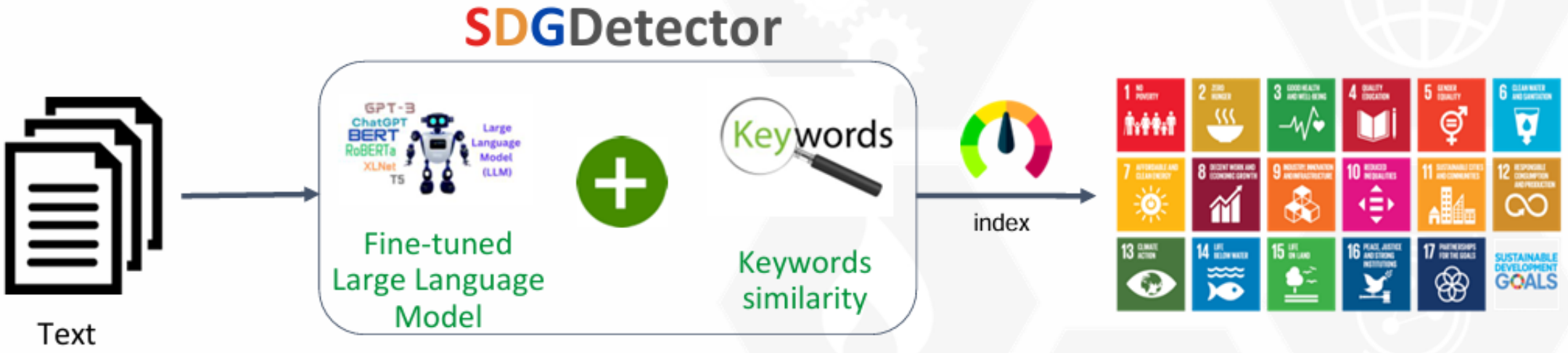
Mapping text to the SDGs using Natural Language Processing

Python Library SDGDetector

SDGDetector is an open-source python library, that aims to map texts with the SDGs.



Gitlab Repository : https://gitlab.com/netmode/sdg-detector/

Read more:
Knowledge graph data enrichment based on a software library for text mapping to the Sustainable Development Goals

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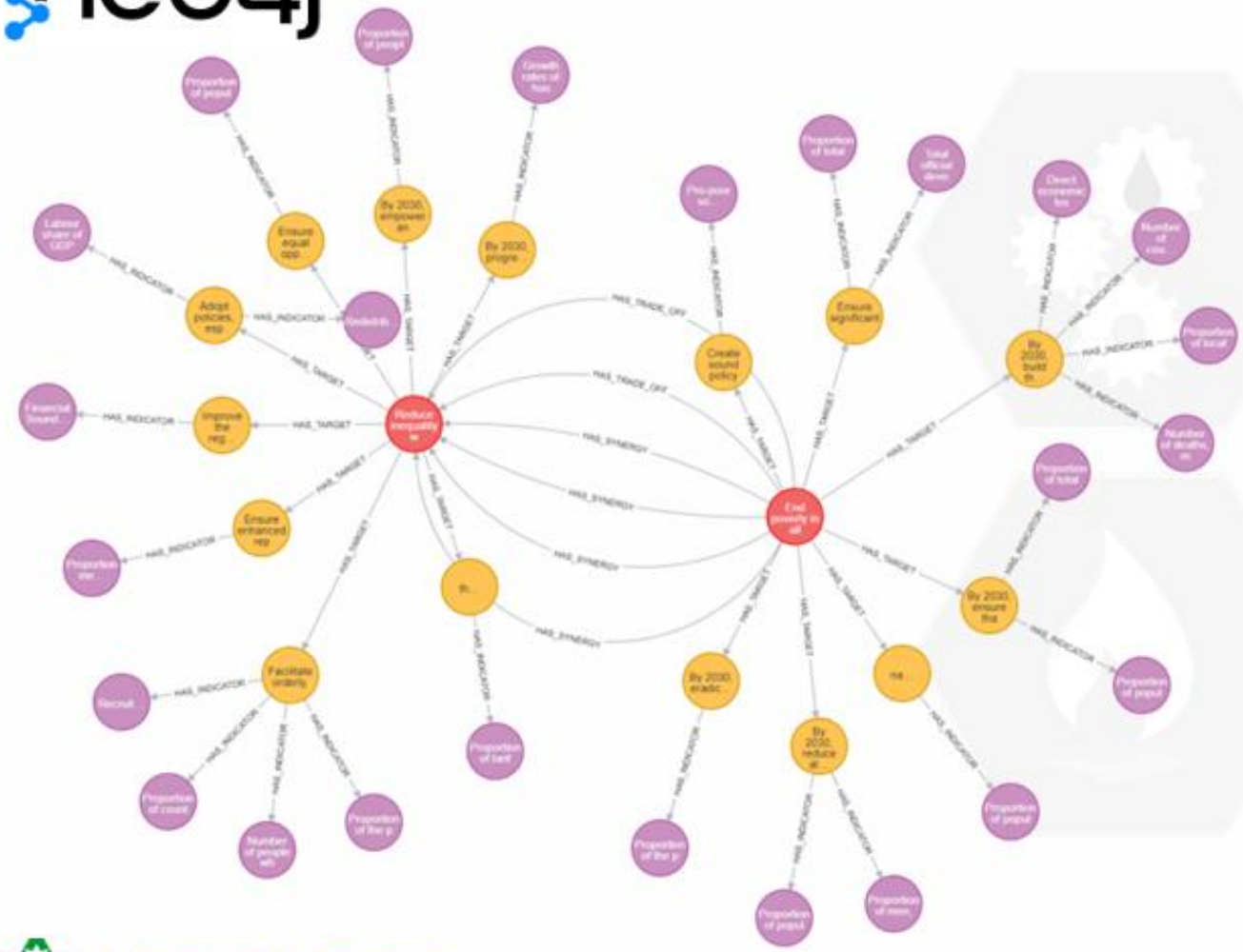
neo4j



3 697 881

nodes

7 492 329

relationships

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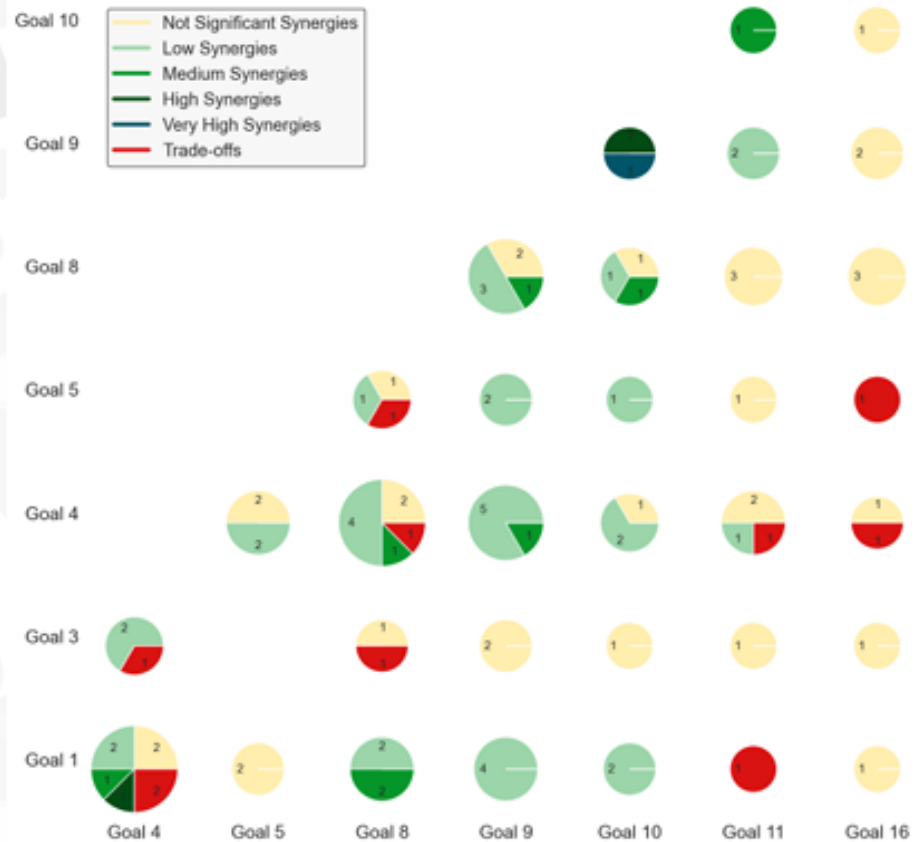
Analyses performed over the SustainGraph data

Synergies - Tradeoffs among SDGs based on UN and EU SDG Indicators

- Interconnected Nature of SDGs
- Semantically aligned and homogeneously represented SDG data in the SustainGraph
- Interlinkages among indicators of the same SDG (UN statistical commission & Eurostat)
- Interlinkages among indicators of various SDGs
- Correlation analysis
- Synergies and Trade-offs among SGDs
- Applied in country and regional levels



Synergies and trade-offs - NUTS 2 scale based on EU SDG Indicators

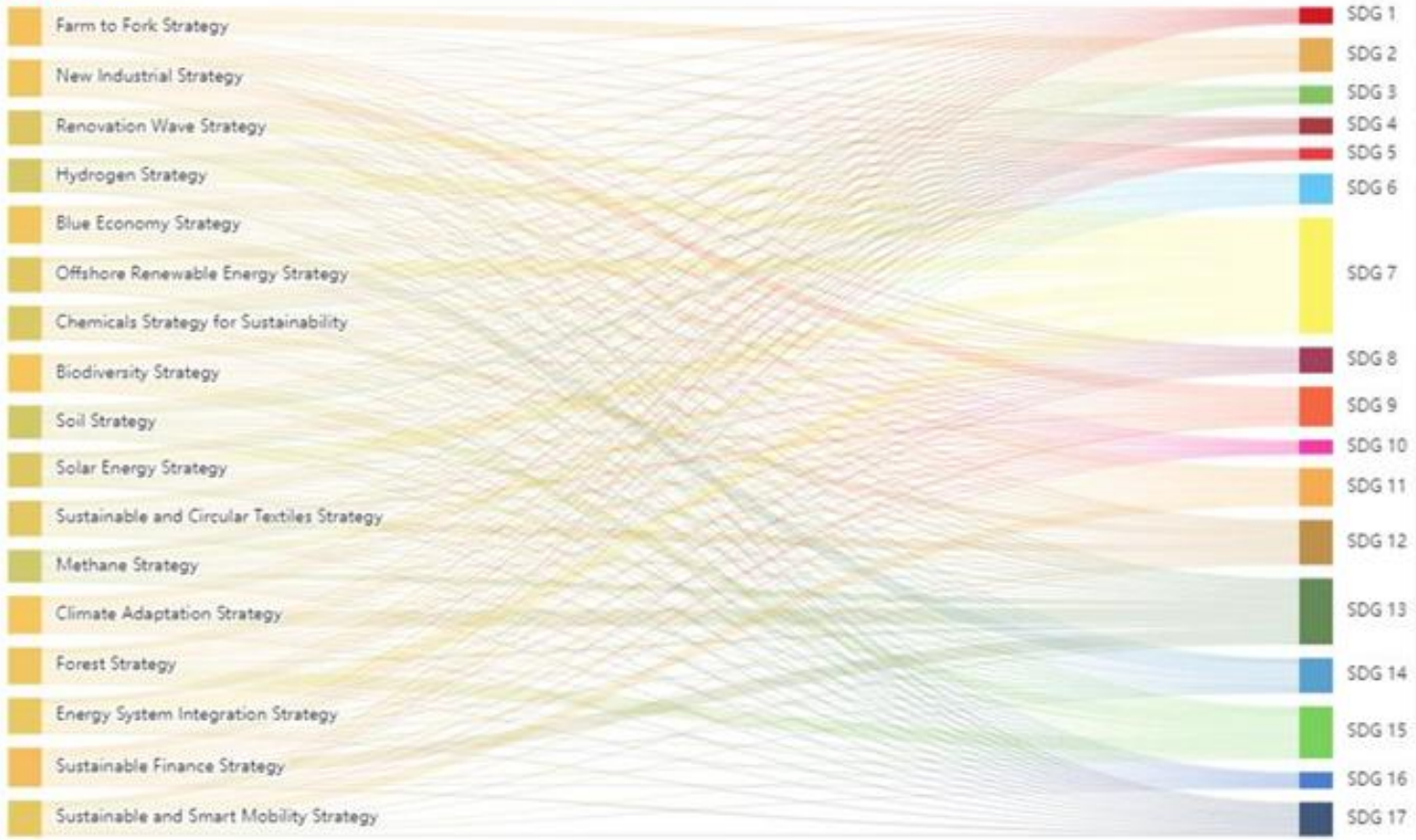
Analyses performed over the SustainGraph data

Mapping of EGD Strategies with the SDGs

SDGDetector

The **strongest** connection with various strategies.

The **weakest** connection with various strategies.



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Analyses performed over the SustainGraph data

Climate Change Vulnerability Analysis

Indicator Based Vulnerability Analysis

Different Geographical Scales (national, regional, local)

Multi-Dimension Vulnerability

Final Cross-Scale Vulnerability

Index per geographical area

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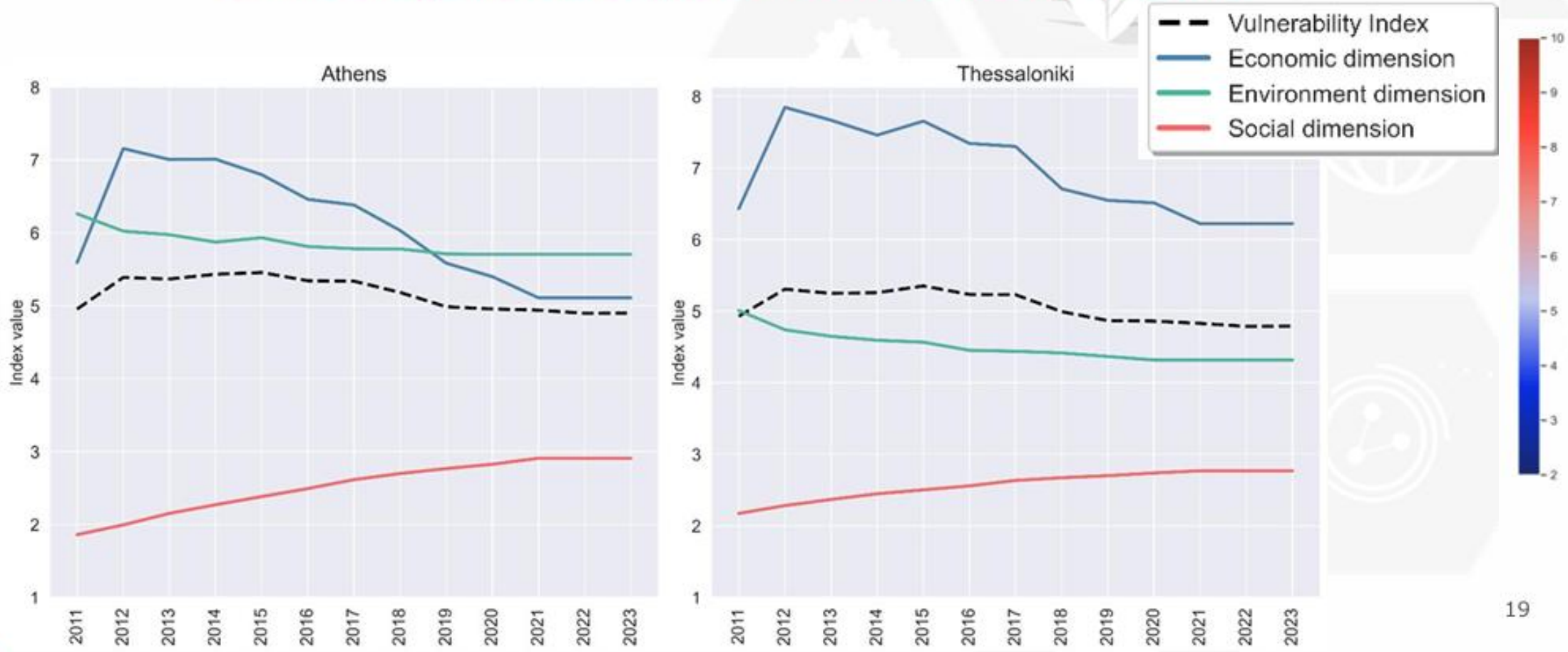
Analyses performed over the SustainGraph data

Analyses performed over the SustainGraph data

Analyses performed over the SustainGraph data

Climate Change Vulnerability Index at Functional Urban Areas level




Interreg
Euro-MED
Co-funded by
the European Union
Making
the Mediterranean
Green Transition
happen

4 interconnected and complementary missions to reach climate-neutral and resilient society

Interreg Euro-MED

Co-funded by the European Union

Sustainable tourism

A project labelled by the UfM

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

9 Partners from 8 countries

24 Associated Partners from all the Mediterranean basin and Brussels

2 Ministries, 2 Regions, 1 Municipality, 1 University, 1 IGO

Community 4 Tourism

Dialogue 4 Tourism

Junta de Andalucía
Consejería de Turismo, Cultura y Deporte

Fundación Pública Andaluza
El legado andalusí

EPLO

RÉGION SUD

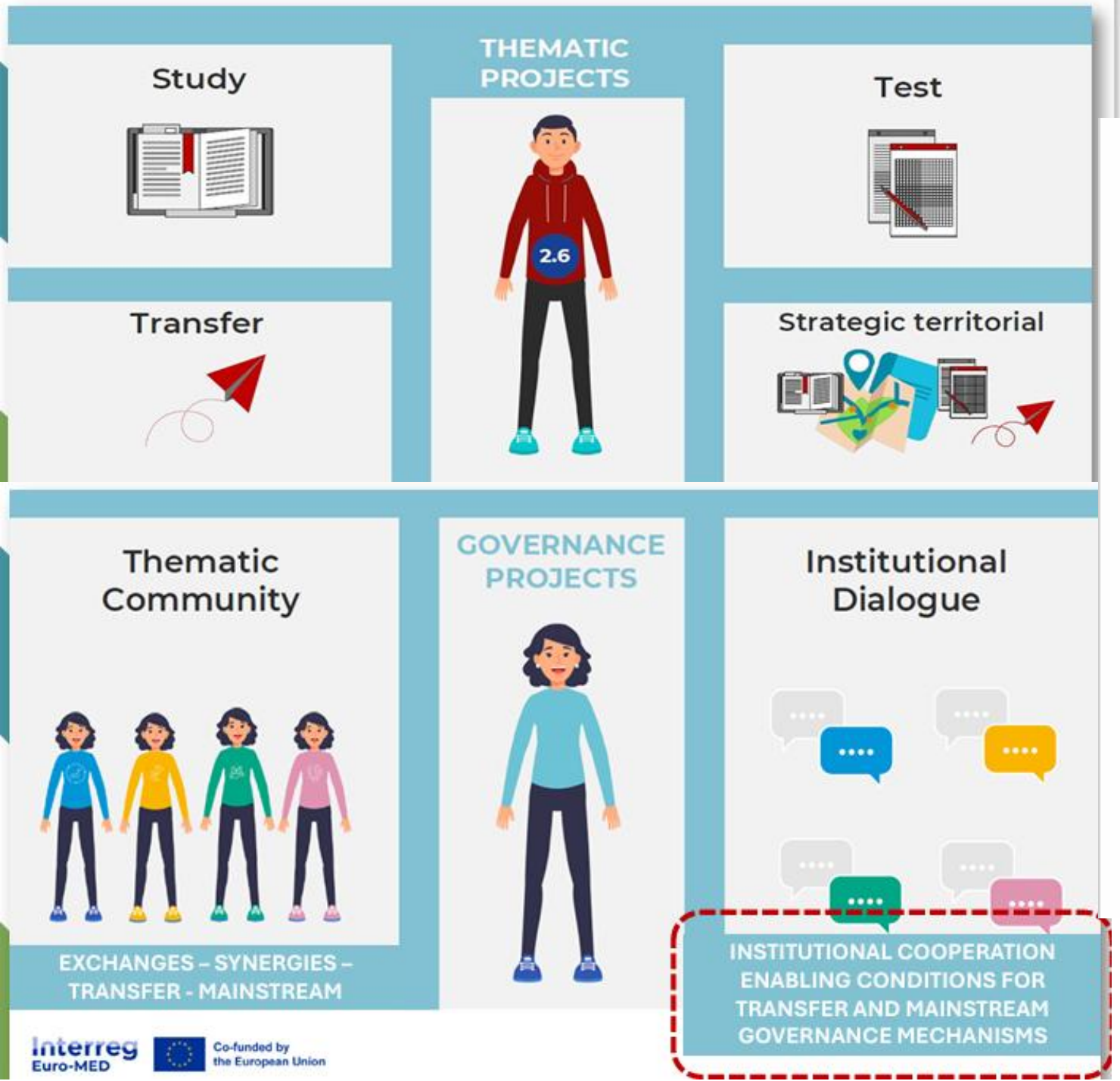
REGIONE LAZIO

Institute of Agriculture and Tourism

DEPARTMENT OF PUBLIC WORKS

ascame

GREENING THE ISLANDS



Governance implications

- Tourism leadership
- Tourism; the main economic driver
- Tourism absence in key-strategies
- Tourism and the nexus: together or opposite?
- Resistance of transformation
- Residents VS visitors

Sustainable tourism

Interreg Euro-MED

Co-funded by the European Union

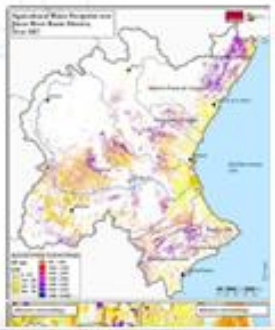
A project labelled by the UfM

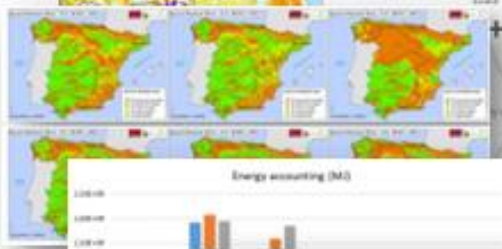
Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

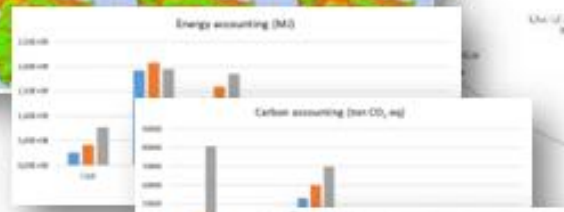
How are we addressing these issues

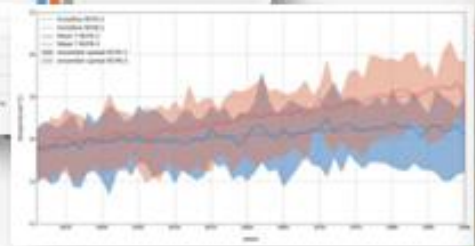
- Network of Sustainable Tourism Observatories NSTOs
- Sustainable Tourism Policy Labs
- Cross-Network Alliance

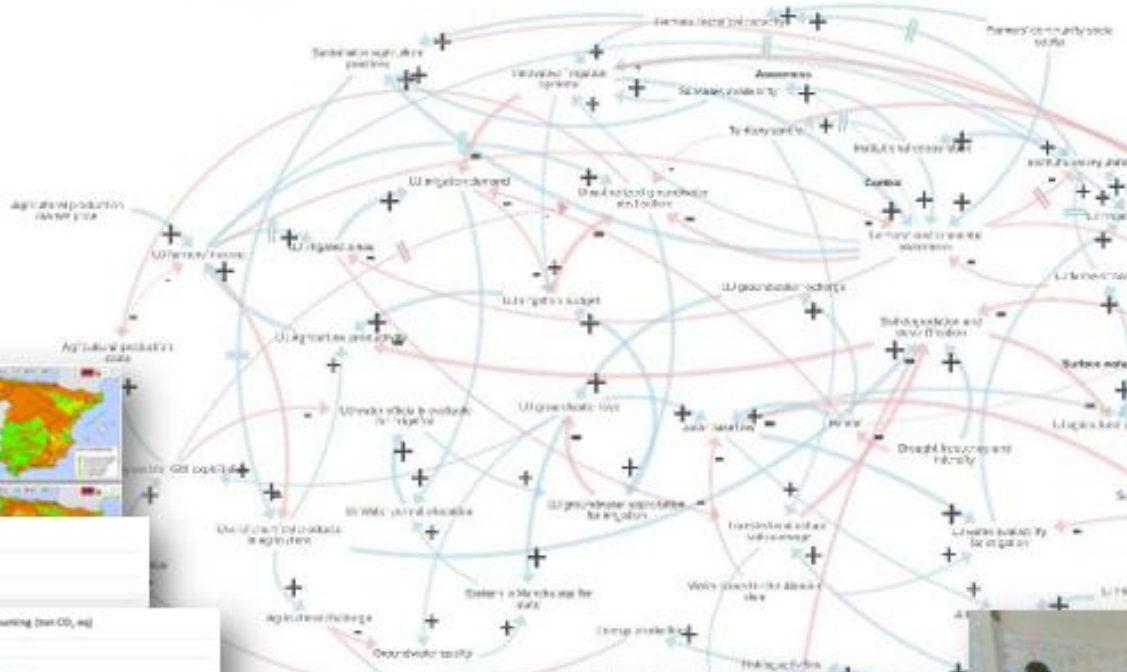
The REXUS Approach

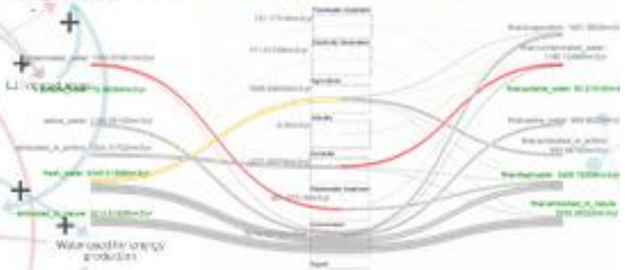












AirNbS - Nature Based Solutions

Development of a Participative vision

Giordano et al., 2024, Journal of Hydrology, Under review

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Pilots – Pinios (Greece)

- Located in central Greece with a spatial extent of ca 11,000 km^2.

Improve the irrational water resources management. Therefore, the REXUS project must contribute to: Maintain sufficient water quantity and quality; Satisfy the needs of all the competitive water users; Maintain the environmental flow for ecosystems; Adapt to the decreased water availability indicated by the CC scenarios; and deal with climate extremes (floods but mainly with droughts).

Maintaining or increasing energy production through renewable resources to decrease emissions (transgression to the post-lignite era is a critical symbolic target of the State). At the same time, it is challenging to satisfy the energy needs of several uses (agricultural, industrial, domestic, etc.).

To maintain the agricultural production of the most productive basin in Greece. Production costs must be optimized to keep agriculture viable and competitive

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IMPLEMENTED TOOLS IN PINIOS RIVER BASIN

Learning & Action Alliances

Stakeholders' engagement, Workshops, Young farmers' seminars, Field trips, Proposal, Evaluation and Prioritization of Measures

Stock and flow modelling

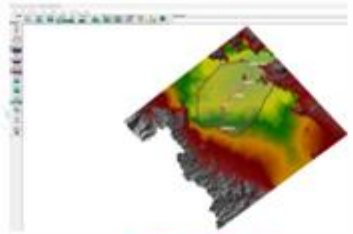
IMPLEMENTED TOOLS IN PINIOS RIVER BASIN

01

Ecosystem Services Assessment

ES assessment: in biophysical and economic terms
Establishment of NBS enabling framework: policy and governance aspect

09



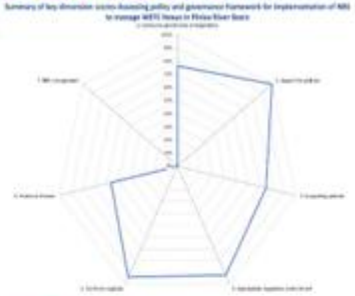
10

Flood modelling

HEC-RAS 2D model
Ground surface: DEM 5x5m
Land use: Corine Land Cover 2018
Cell size= 20x20m
Simulation step= 4 sec

Metamodel

Integration with the mGROWA model results has been performed.



11

12

Framework for Assessment of Governance & Policy associated to Nexus-relevant NbS

Linking challenges with the ES and non-ES strategies to face them, allowed to understand the interlinkage among the different challenges of the Nexus that can impact the same ES.

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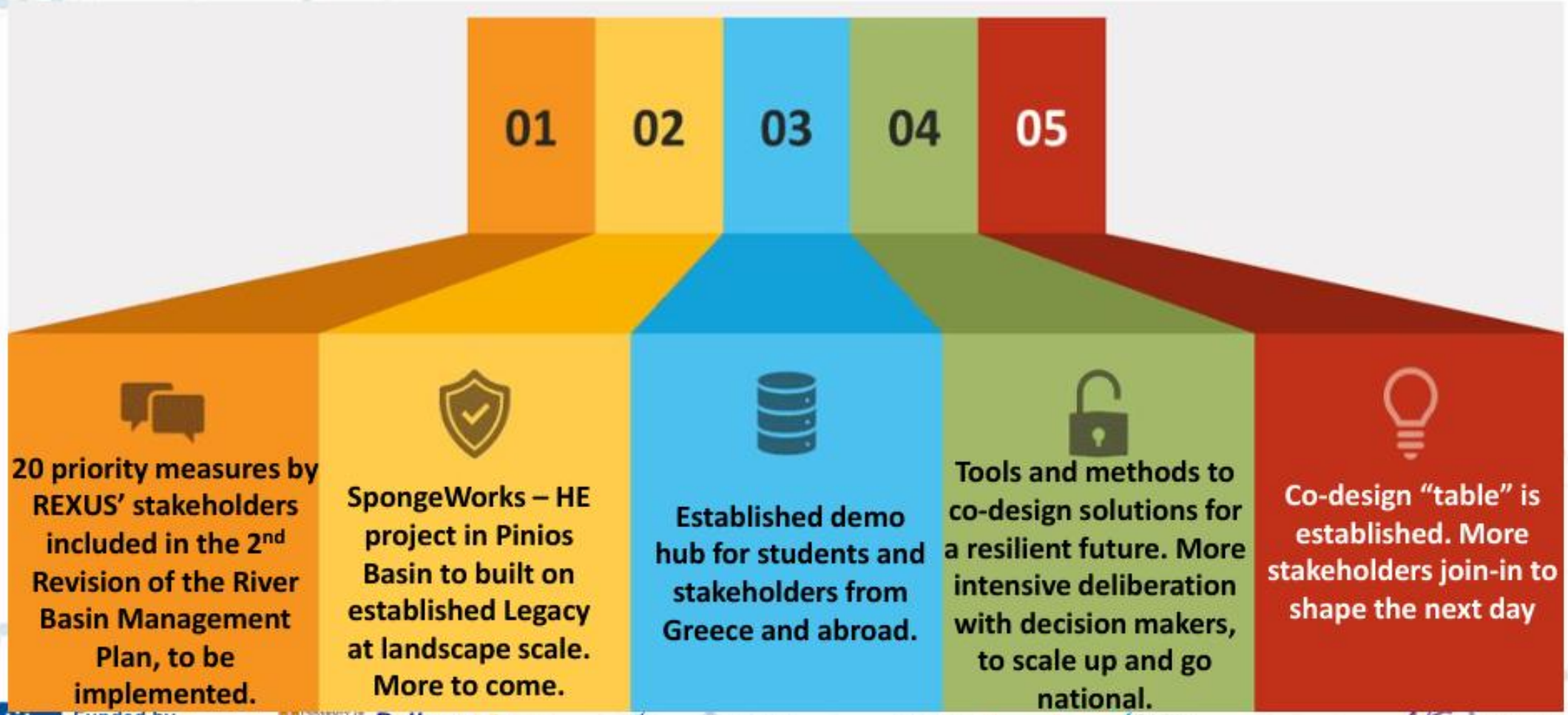
Impact Particular



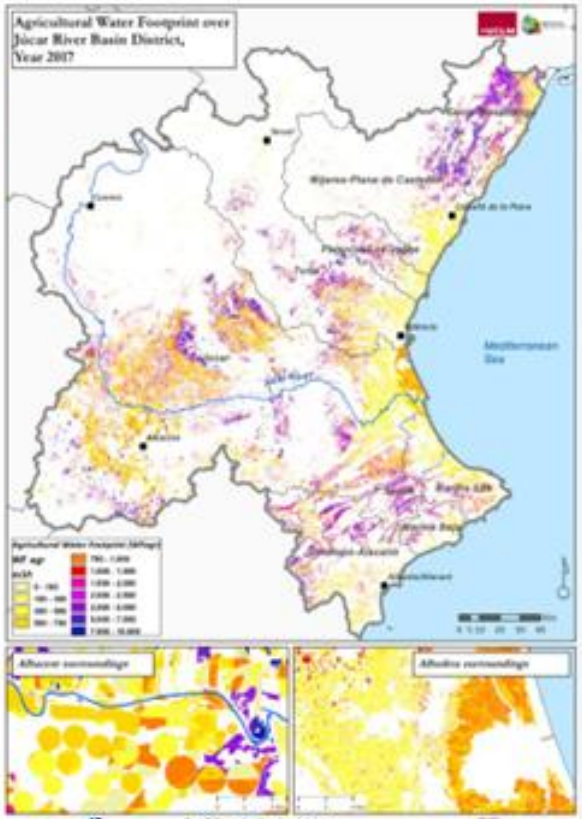
Funded by the European Union

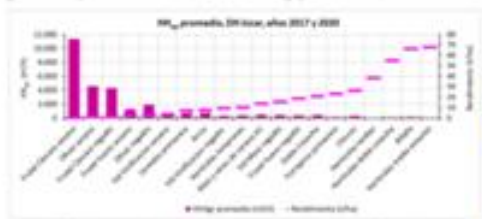
Impacts on Water Policy

European Parliament
Water Management
Consultancy
25th march 2023

Ecological Indicators
Volume 167, October 2024, 112587

Garrido-Rubio, J., González-Piqueras, J., Calera, A., Osann, A., 2024, **Remote Sensing-based Green and Blue Agricultural Water Footprint Estimation at the River Basin Scale**, *Ecological Indicators*, Accepted.





PLAN HIDROLÓGICO DE LA DEMARCACIÓN HIDROGRÁFICA DEL JÚCAR

MEMORIA

Ciclo de planificación hidrológica 2022 - 2027

Confederación Hidrográfica del Júcar

MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

CONFEDERACIÓN HIDROGRÁFICA DEL JÚCAR, O. A.

Enero de 2023

Funded by the European Union

Impact General

- Enhance **sharing knowledge and best practices** in climate-water-energy-food nexus assessment (Qualitative and Quantitative with PSDM and stock and flow diagrams).
- Improve **integrated water resources management** and increase resilience to climate change (Future projections of water necessities).
- **Reduce the water risks for the energy sector** and optimize market and trade solutions across the nexus.
- Assess the impacts of **EU regulatory framework** on a sustainable water-energy-food nexus (consultancy on April 2023)
- **Reduce institutional fragmentation whilst increasing cross water, energy, food collaboration** and inclusive multi-stakeholder engagement (LAAs created in all pilots).
- **Strengthen EU role in international water issues and** become a leading actor on water diplomacy. (Nima Pilot Area and academic research ongoing in Argentina and Uruguay)

Funded by the European Union

FutureMed
TRANSDISCIPLINARY NETWORK

Thank You

Contact: Caucci@unu.edu

NexusNet
COST Action Network on Water-Energy-Food Nexus