NATIONAL TECHNICAL
UNIVERSITY OF ATHENS
SCHOOL OF CHEMICAL ENGINEERING

Best practices of Symbiotic Platforms

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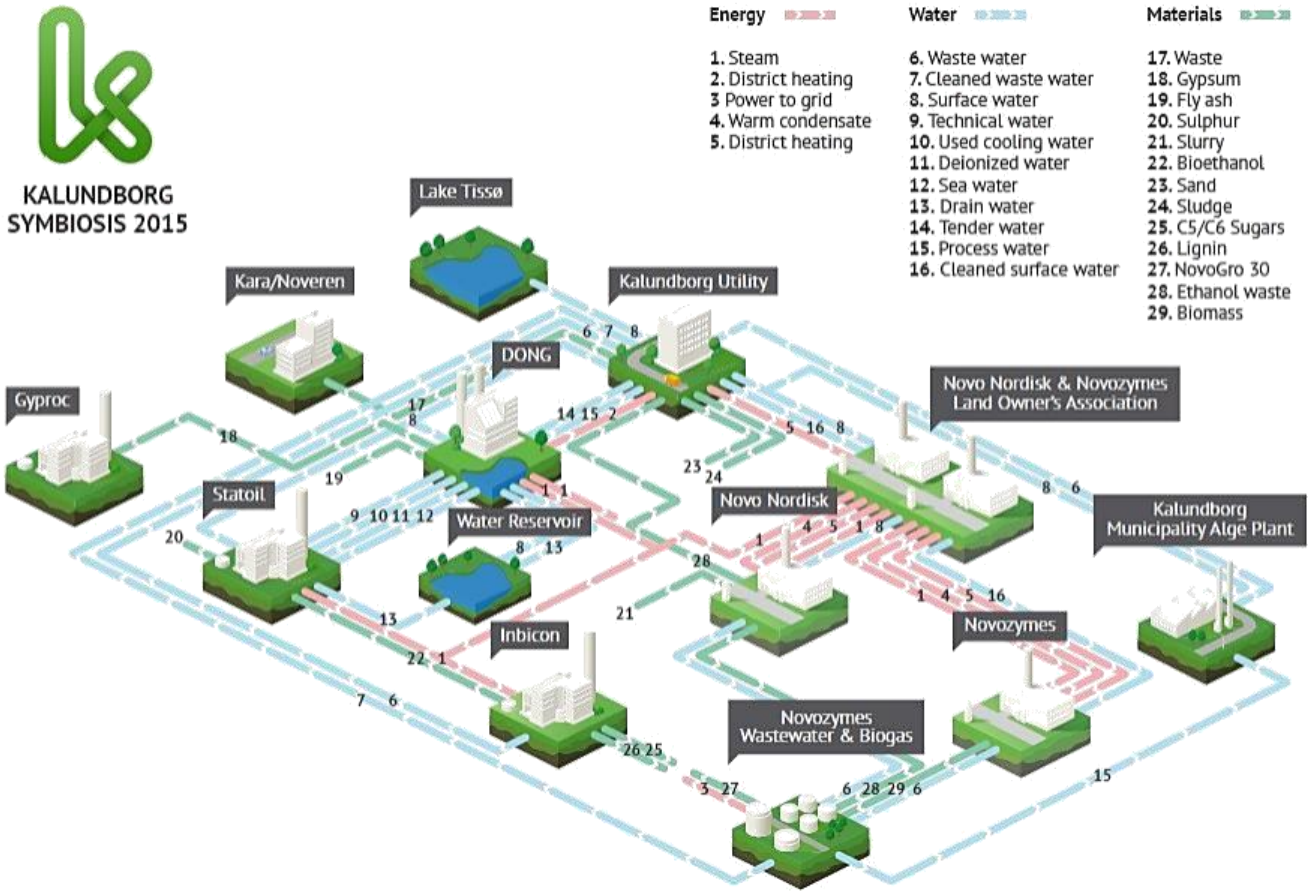
Industrial Symbiosis - Definitions

- **Industrial Symbiosis**: Creating industrial networks exchanging materials & energy for economic, environmental and social benefits.
- **Industrial Symbiosis** helps companies:
  - Reduce raw material and waste disposal costs
  - Earn new revenue from residues and byproducts
  - Divert waste from landfill and reduce carbon emissions
  - Open up new business opportunities

The Case Of Kalundborg



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The Case Of Kalundborg

- Located in Kalundborg, Denmark
- Self organized network
- 6 private partners
- 3 public partners
- Over 5000 employees combined
- 25 different resource streams exchanged

Kalundborg – Benefits Reported

- 2 million cubic meter/year ground water saved
- 1 million cubic meter/year surface water saved
- 200.000 tn natural gypsum saved
- 200.000 tn fly ash used as secondary material
- 2.800 tn of sulphur saved

Industrial Symbiosis - Challenges

- Focus mostly on “1-1” connections.
- Limited network size and complexity.
- Non systemic use of information and knowledge.
  - Accidental discovery of connections during workshops.
  - Dependence on the skills of each broker.
  - Absence of modelling of existing knowledge.
  - Brute force approach.

Data Is The New Oil

The Era Of Big Data

- Materials / Waste Quality & Quantity Data
- Location Data
- National Statistics
- Questionaires
- National Waste Registry
- Pretreatment / Upgrade Processes
- End of Waste Criteria
- Road Network and Geodata
- ISO & Other Standards
- Cost parameters
- Legal Framework

Industrial Symbiosis: State of Play

Industrial Symbiosis: A New Report

Cooperation fostering industrial symbiosis market potential, good practice and policy actions (2018)
Final report

University College London, Technopolis Group, Trinomics, TNO, International Synergies

technopolis | group |

TNO innovation for life

UCL

International Synergies
industrial ecology solutions

Trinomics

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IS: "Two Extreme Models"

For the present study we have identified a typology of intermediaries that differentiate two extreme models in a continuum, varying from hands-off support to hands-on support:

- At one extreme of the spectrum there are **waste exchange web-based tools** or portals, where companies can input waste and by-products which may be of interests to other firms. These types of initiatives have had a very limited success and have generally only led to one-off, low value transactions. A review of online waste exchanged iniatives has been carried out as part of the EU-funded project SHAREBOX[3]. In many cases, developed websites are extremely simple and do not allow for more complex IT platforms that also enable learning or more in-depth interactions.
- On the other side of the spectrum we have **hands-on support structures**, which in many cases resemble or build on the NISP model (see section 2). In these cases, IS is supported by a team of experts or practitioners that engage with firms and other stakeholders for the purpose of the development of IS projects.

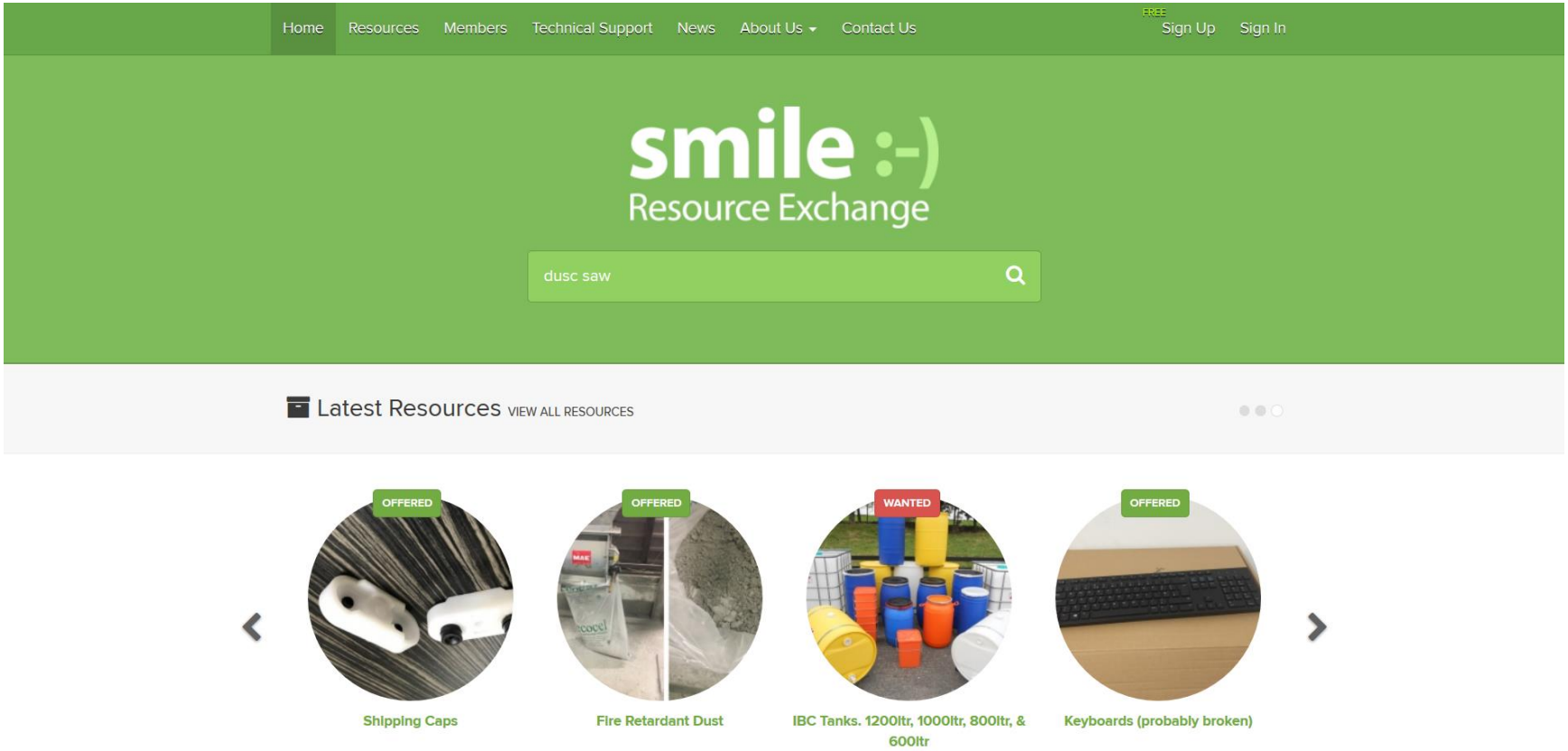
ICT platforms for quality assurance/reporting

- ICT plays a role in tracking and reporting auditable measurements.
- "Synergie" Platofrm managed by practitioners, proposes a 5 stage gateway process to manage the synergy initiated.
- INEX (France) has also developed a platform that incorporates a GIS system to track synergies and identify potential.
- Web-based platforms have been developed as a result of EU funded initiatives.

Case study: SMILE Resource Exchange /Ireland

- The SMILE programme started off as a platform for connecting companies for exchanging excess resources. This didn't require much expertise, as the material exchanges were not very difficult, and therefore the methods employed by the platform for facilitation were simple.

Case study:
SMILE Resource Exchange /Ireland



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Case study:
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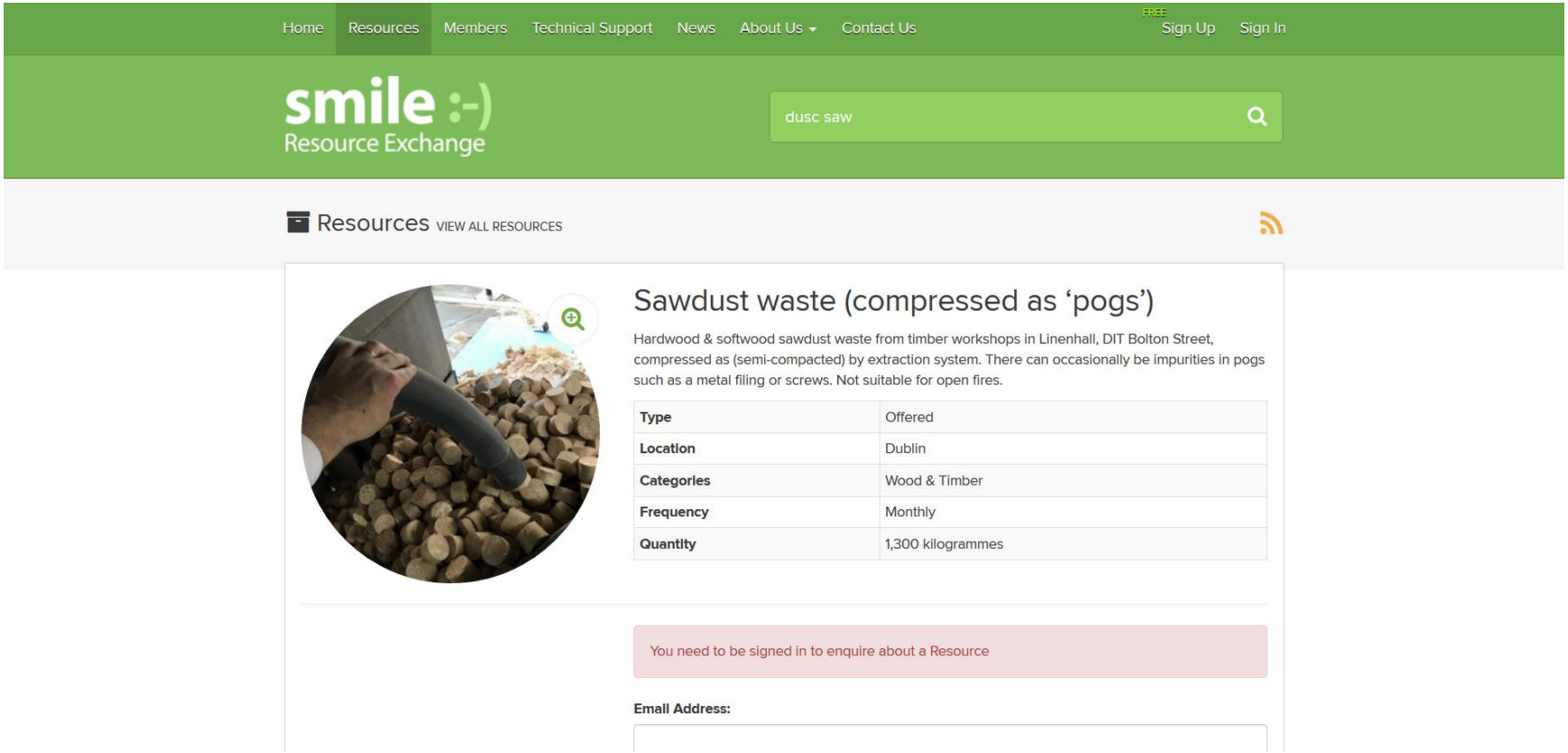

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Case study: SMILE Resource Exchange /Ireland

- The website services of a sharing platform have been maintained in their simplified version. There, for example, a large company trying to donate furniture can connect to organisations who can reuse that. This type of exchange does not require expertise of consultants and is resolved through facilitating the contacts between supply and demand on the platform.
- However, in order to undertake larger scale IS projects, the role of the technical consultants in mobilising the companies was believed crucial.

Case Study: Symbiose Platform /Belgium

- The Flemish Agency for Innovation and Entrepreneurship funded the Symbiose Platform between September 2012-December 2015.
- As an output of these activities, the database mapped 2000 opportunities for flows of raw materials and technologies that could happen between 300 companies. Of these opportunities, some 500 were followed more closely.

Case Study: Symbiose Platform /Belgium

- However, these links then needed to go through the negotiation and testing phase, which was out of the scope of the support offered by the Symbiose Platform.
- The programme was therefore renewed in September 2017, opening the platform for exchanges across more industries, in order to achieve cross-sectoral synergies.

Local & Regional IS Platforms

- **In general, local and regional levels are seen as better suited to promote IS synergies.** Most of the stakeholders consider that synergies can be better coordinated at the regional level.
- The main concerns
  - Ownership and management of the platform (who would own it and who would manage it)
  - Viability…

Economically Sustainable IS: How-To be Viable

- Network: organizations for cooperation, information and knowledge exchange.
- Capabilities – the skills, expertise, knowledge needed to adapt to changes.
- Institutions.
- Technical infrastructures, technologies, logistical arrangements, ICT necessary for the handling of big data, providing potential technical solutions and tacit information in support of IS activities.

Challenges - Barriers

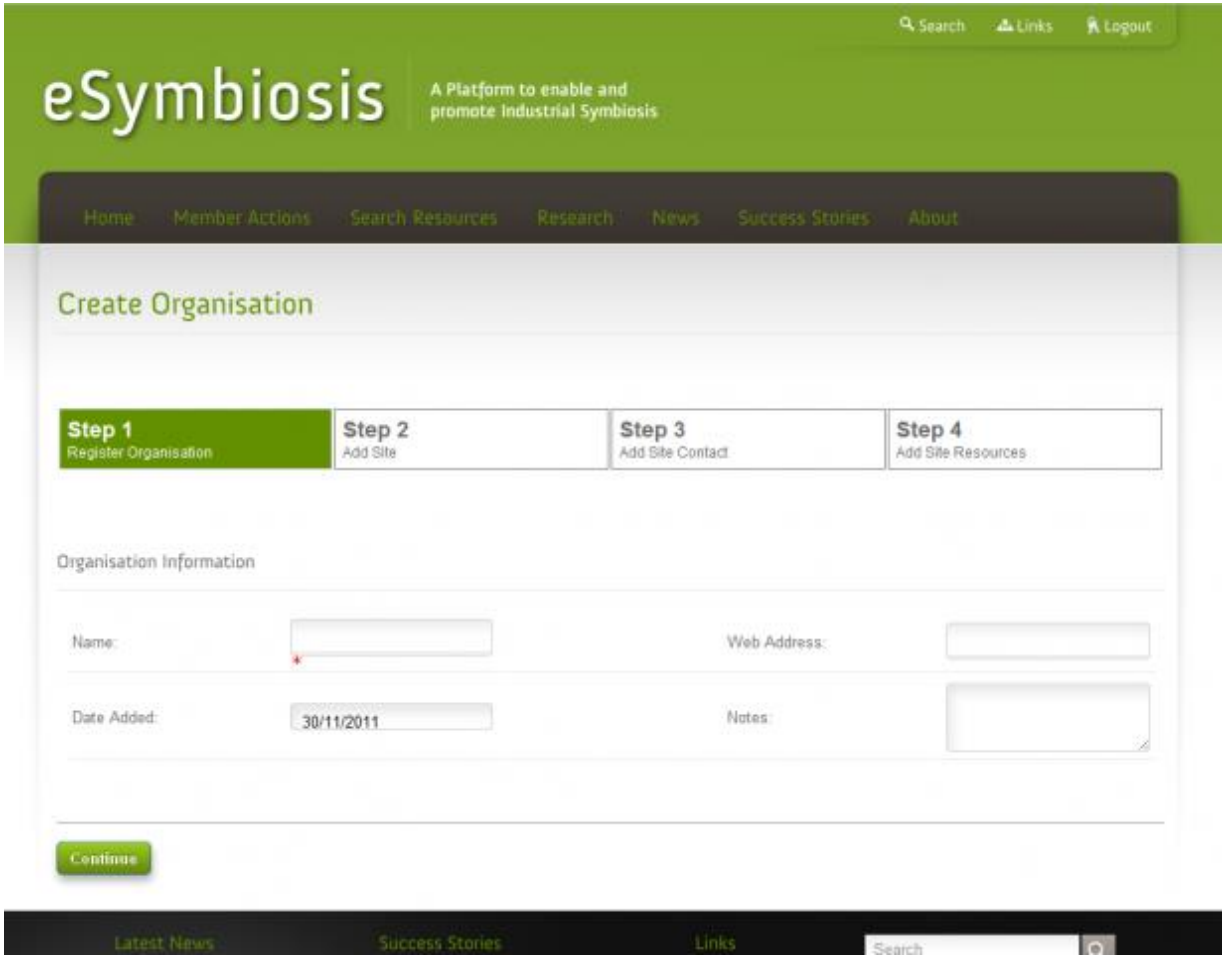
- Limitations imposed by regulations (political boundaries)
  - Transport of waste
  - Lack of harmonisation of end-of-waste status across country
- Issues related to the confidentiality of data and its commercial character.
- Lack of integration of existing IS web tools.

Industrial Symbiosis: The Greek Experience

eSymbiosis Project

- Start: 01/10/2010 - End: 30/06/2014
- To produce a Web Based platform for Industrial Symbiosis communities, offering automation, supporting SMEs considering regional priorities and enabling the public administrators (municipalities, regional offices) to implement their environmental policy and to monitor environmental and economic consequences.

eSymbiosis Platform



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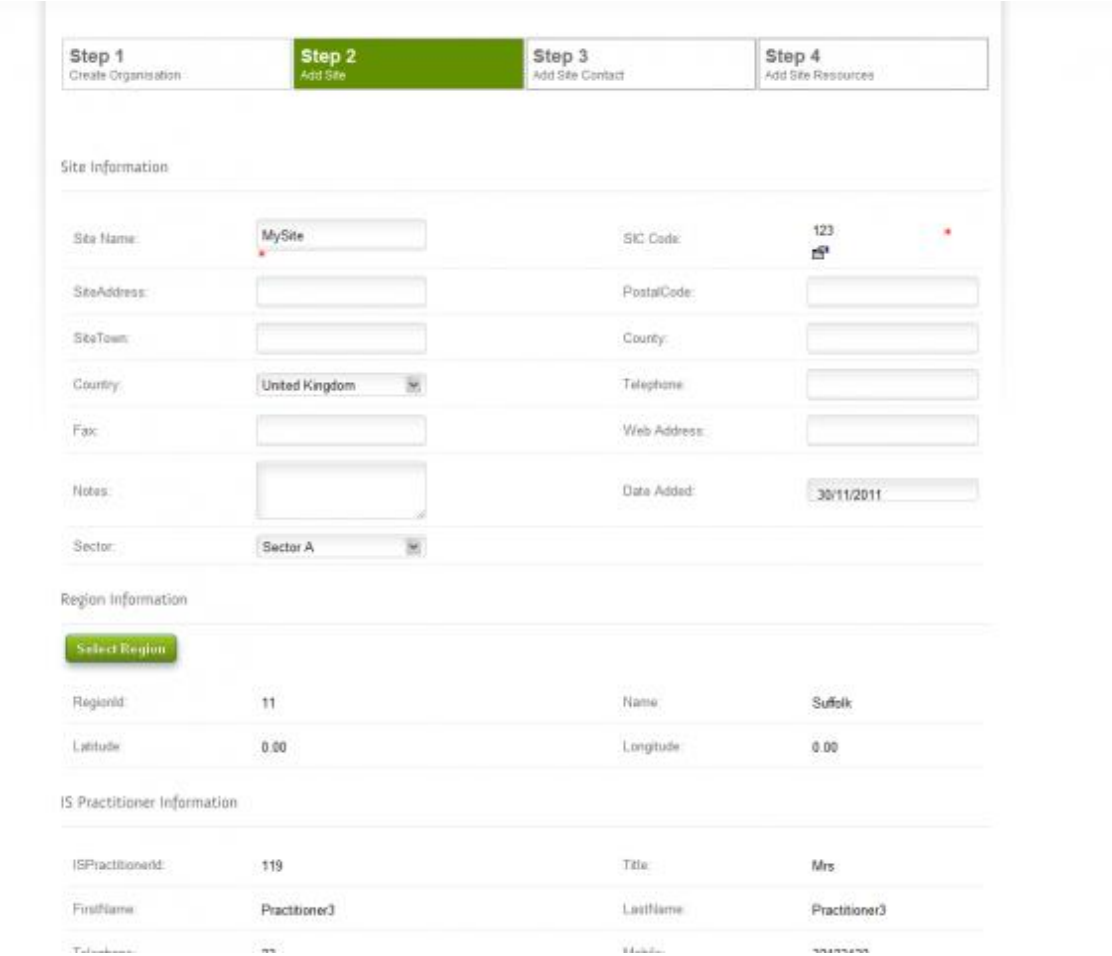
eSymbiosis Platform



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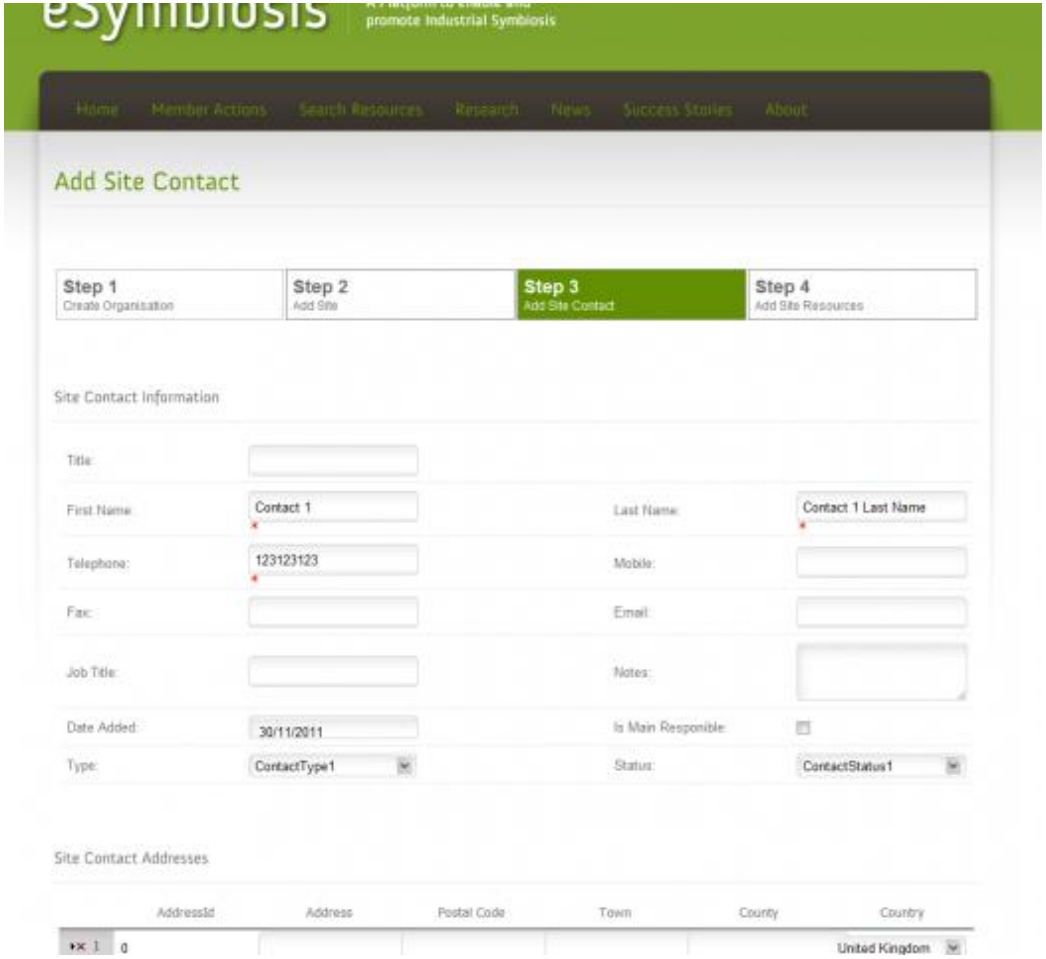

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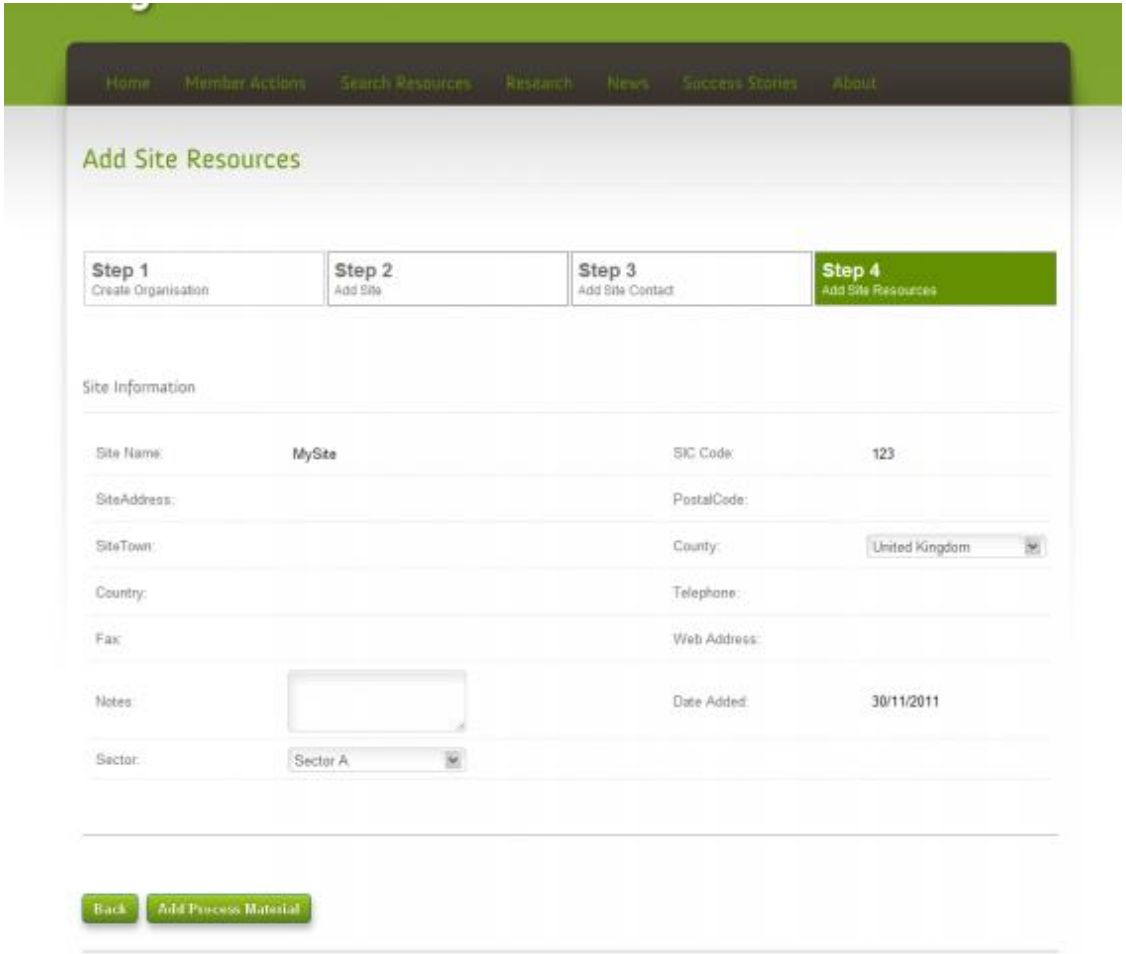

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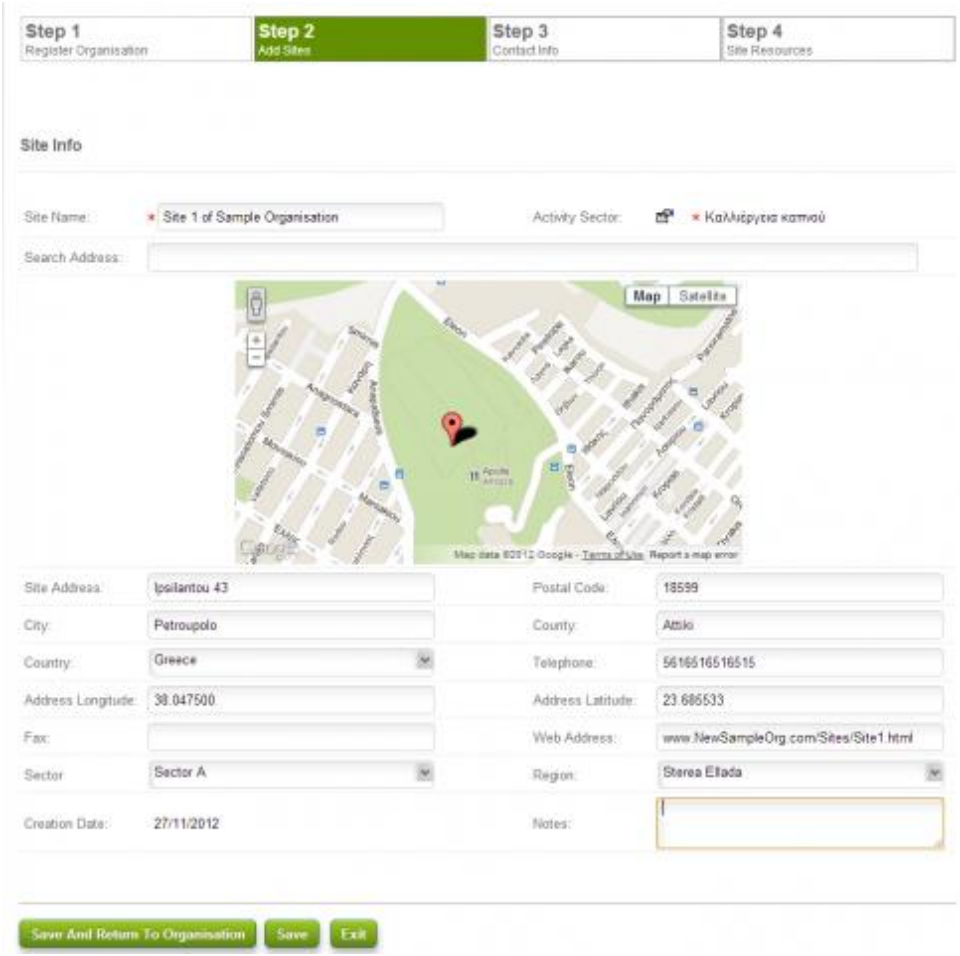

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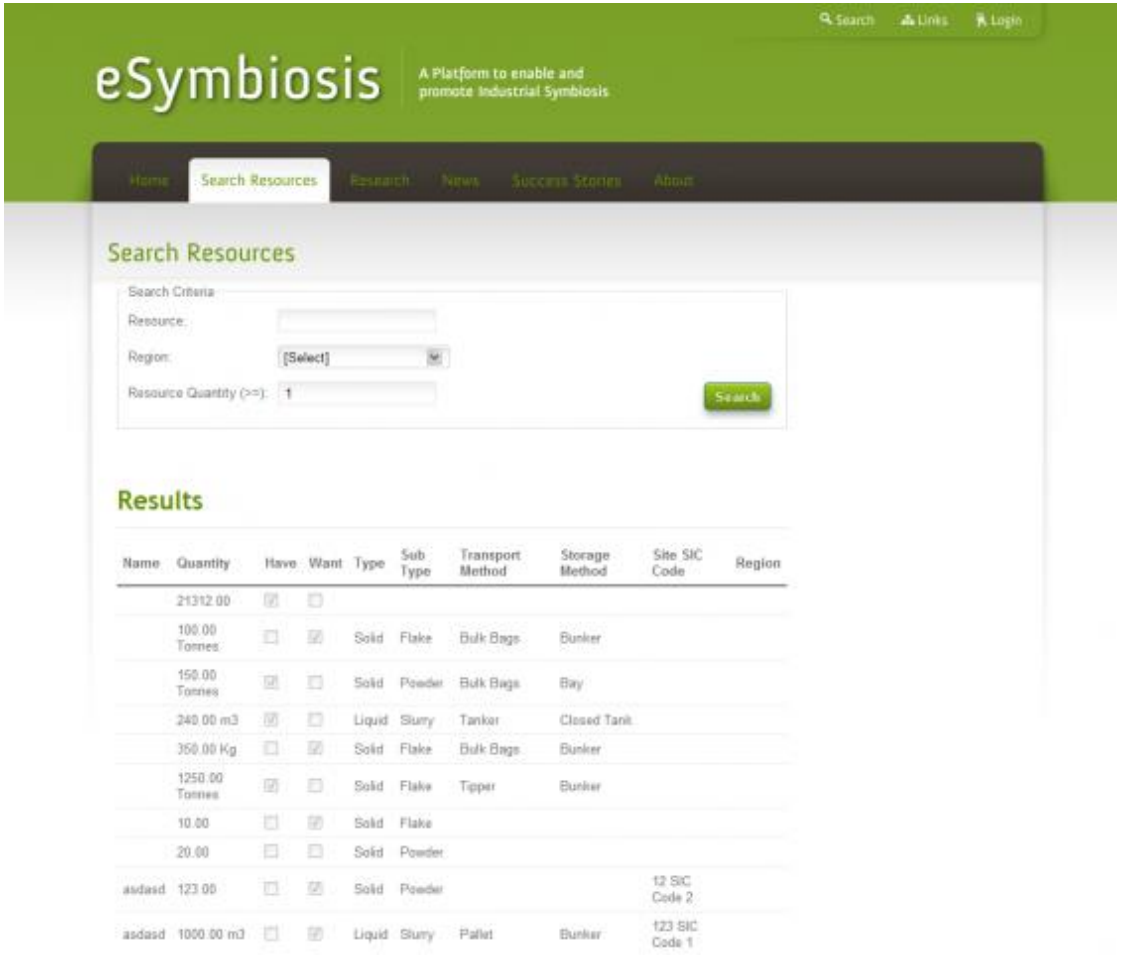

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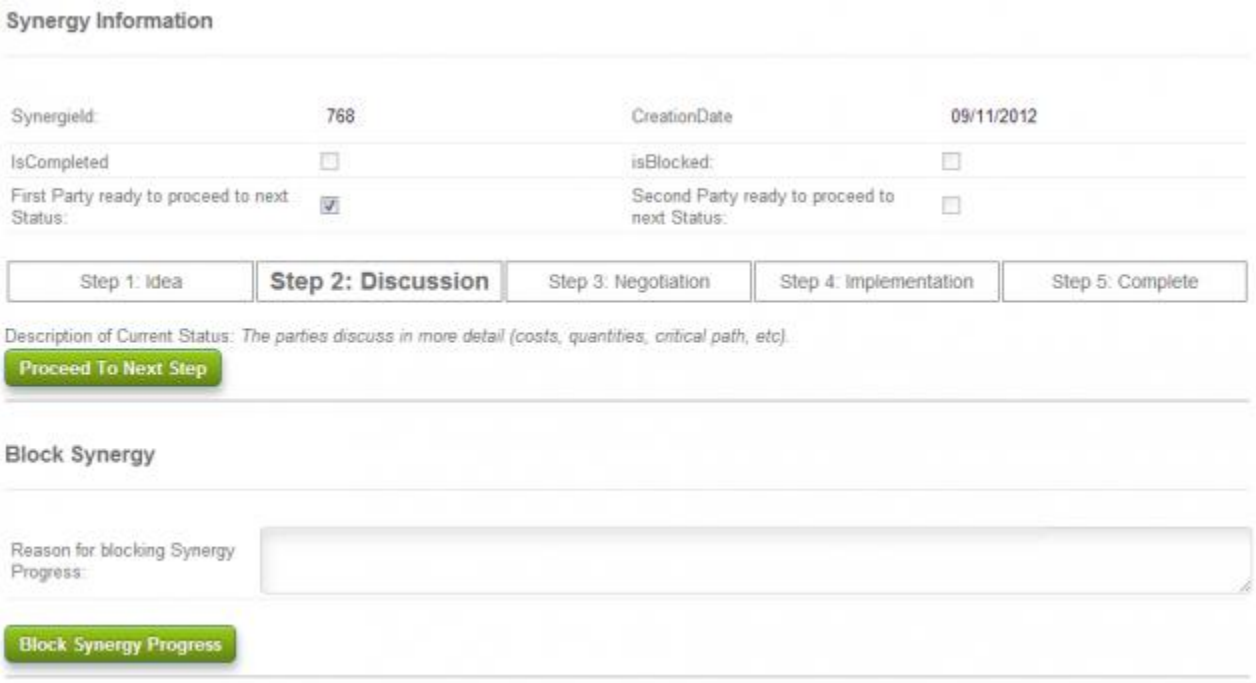

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eSymbiosis Platform

Resource Match

Relevance:	75.67 %

First Resource		Second Resource	
Resource Id:	142	Resource Id:	275
Matches Count:	6	Matches Count:	0
Locked:	☐	Locked:	☐
Name	boxes	Name	Lignocellulosic Feedstock
Start of availability	2001/01/01	Start of availability	2012/08/09
End of availability	2012/01/01	End of availability	2015/12/08
Quantity Type	Solid	Quantity Type	Emulsion
Quantity	1	Quantity	150
Unit of Measurement	Tonnes (kg*1000)	Unit of Measurement	Tonnes (kg*1000)

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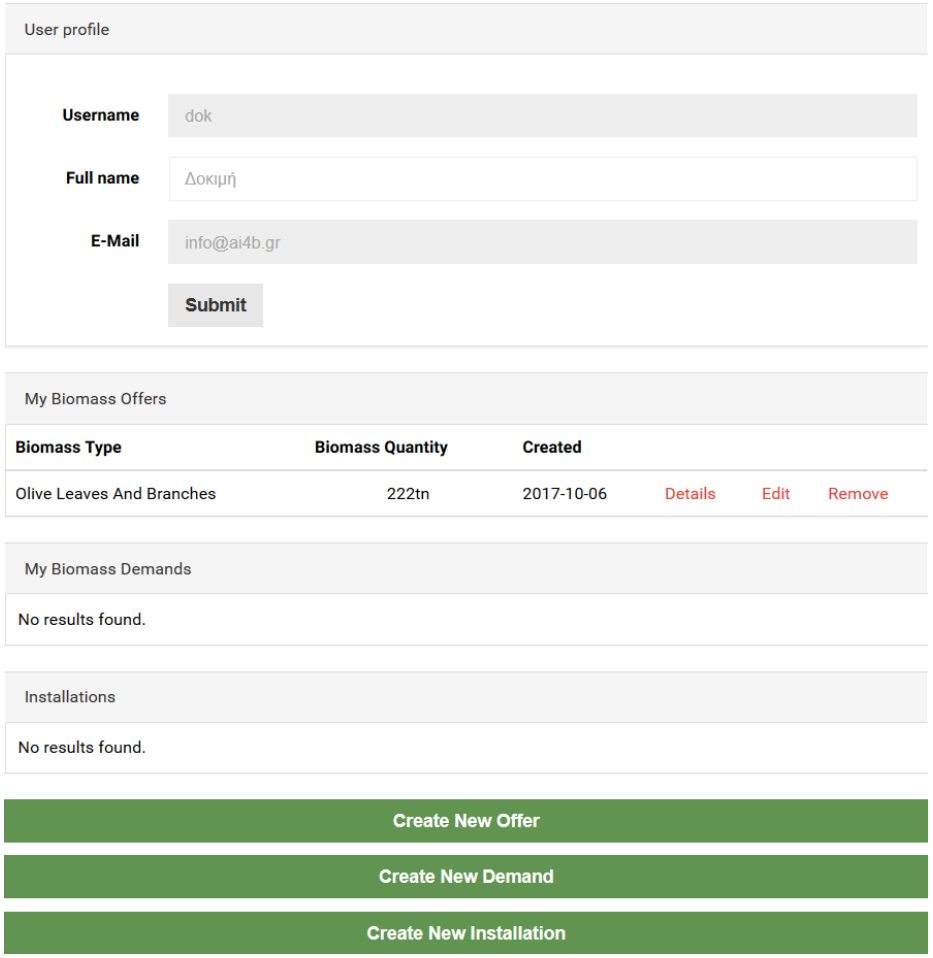
AI4B Project

- Advanced IT Infrastructures for Biomass Supply Chains
- Co-financed by EU's Regional Development Fund and Greek national resources.
- Mobilizes academic partners, IT SMEs and regional development agencies.
- Brings IT closer to biomass symbiotic networks to leverage sustainable bioenergy practices.

AI4B Platform



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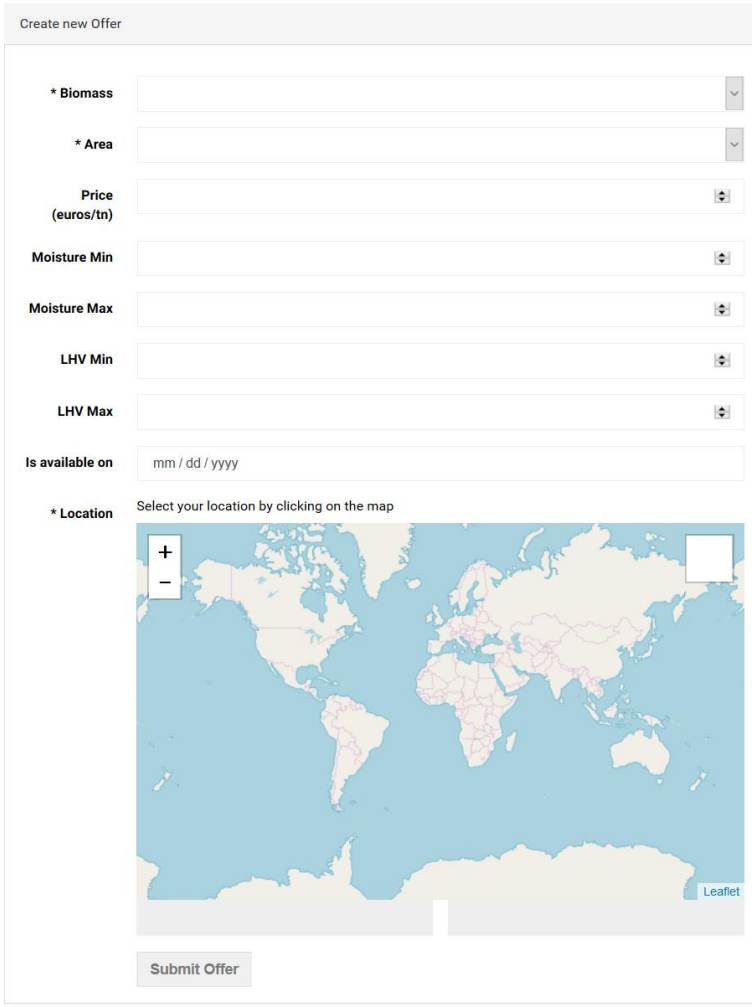

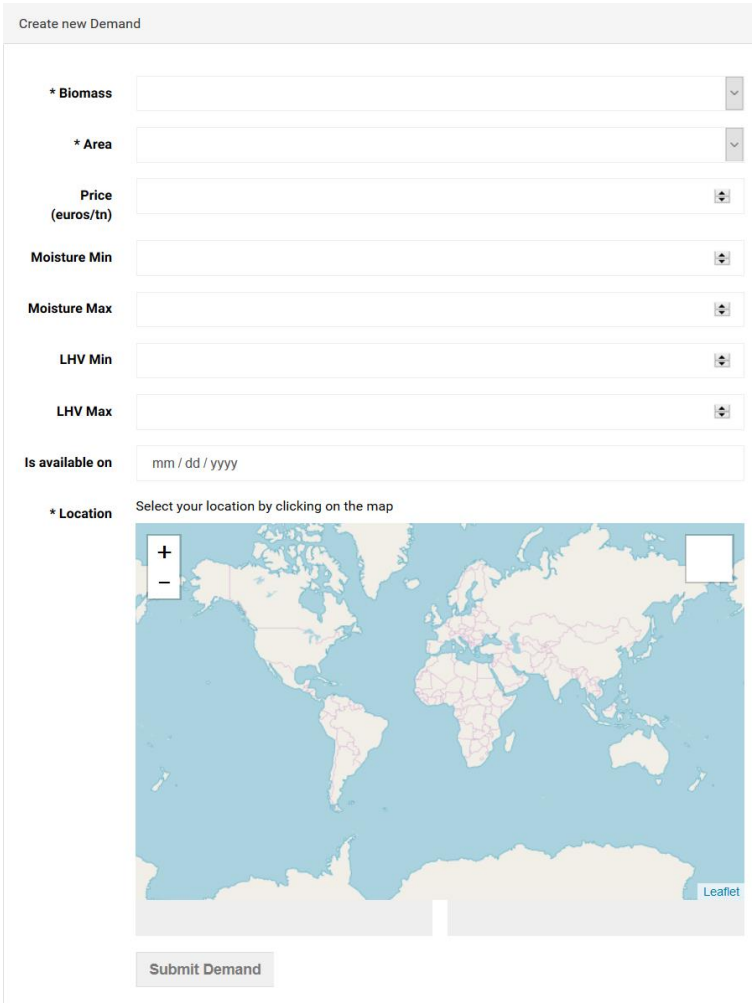

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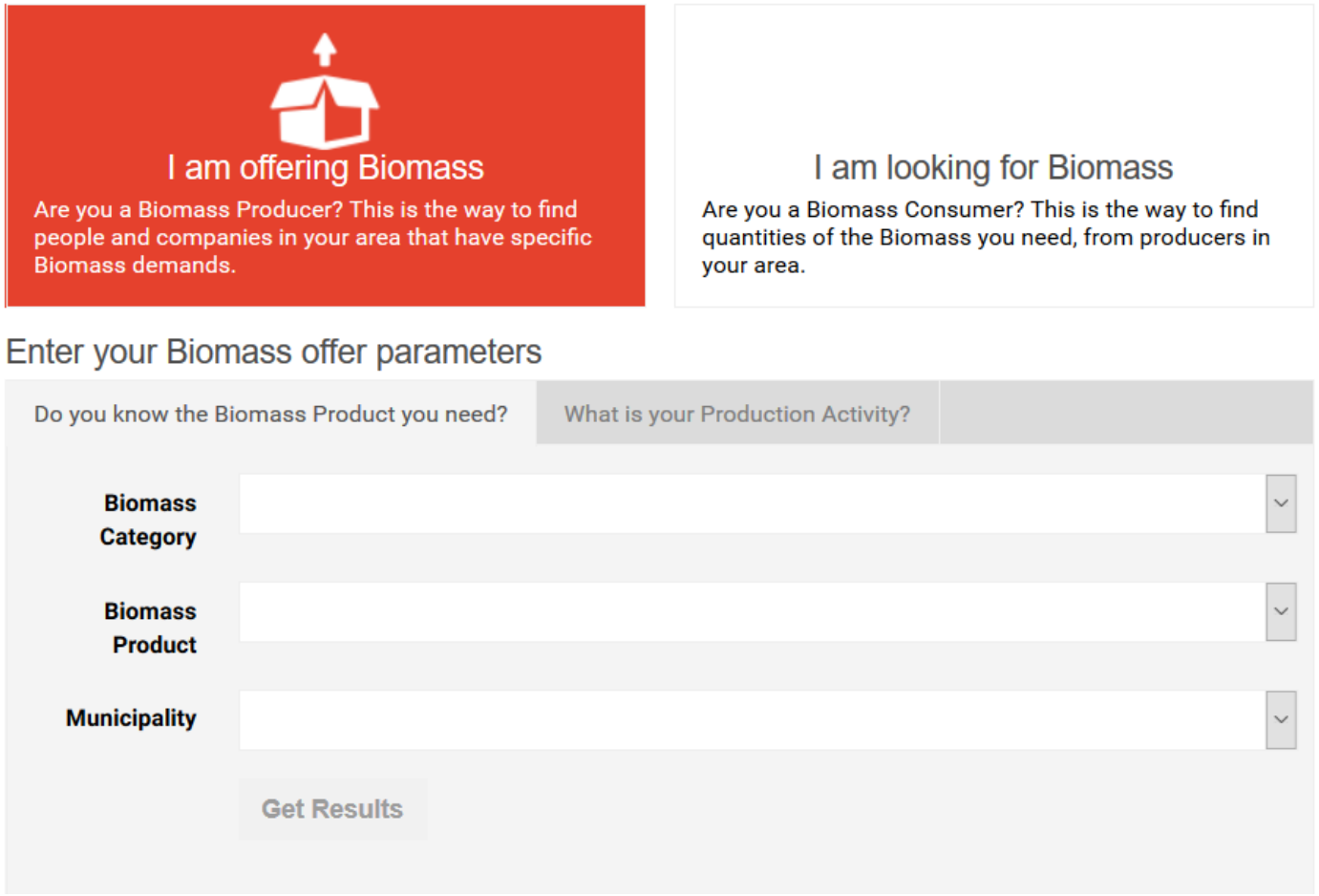

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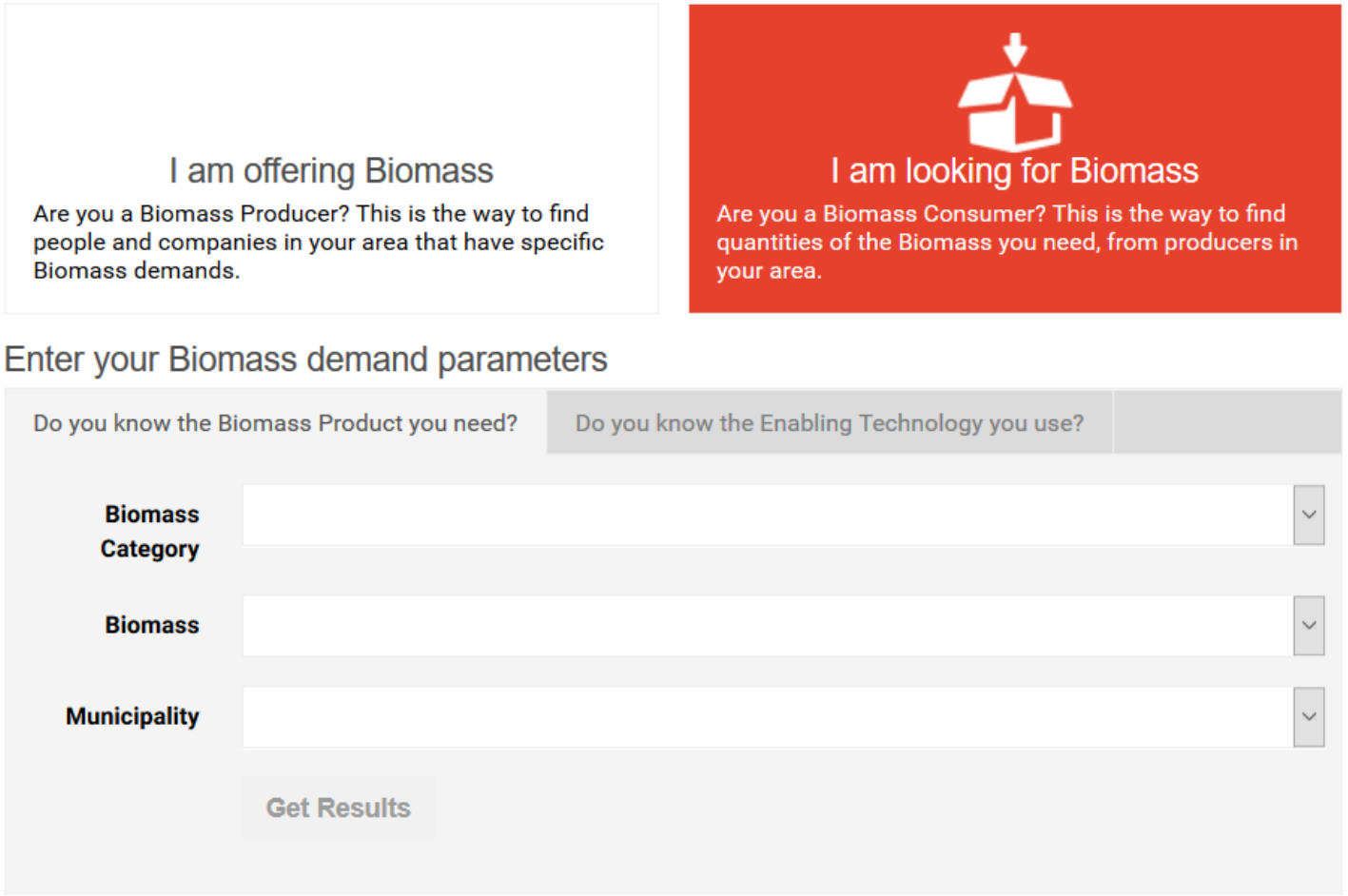

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AI4B Platform

Offers for the Biomass you need:

Name	Biomass Type	Biomass Quantity	
ΠΑΠΑΛΕΞΗΣ	Peach Tree Prunings	18	Details

Biomass Potential in the Area:

Municipality	Municipal District	Estimated Available Quantity (tn)
	KOIN. DENDRON	1536
	KOIN. FALANNIS	1037
	DIMOS AMPELONOS	691
	DIMOS TYRNAVOU	600

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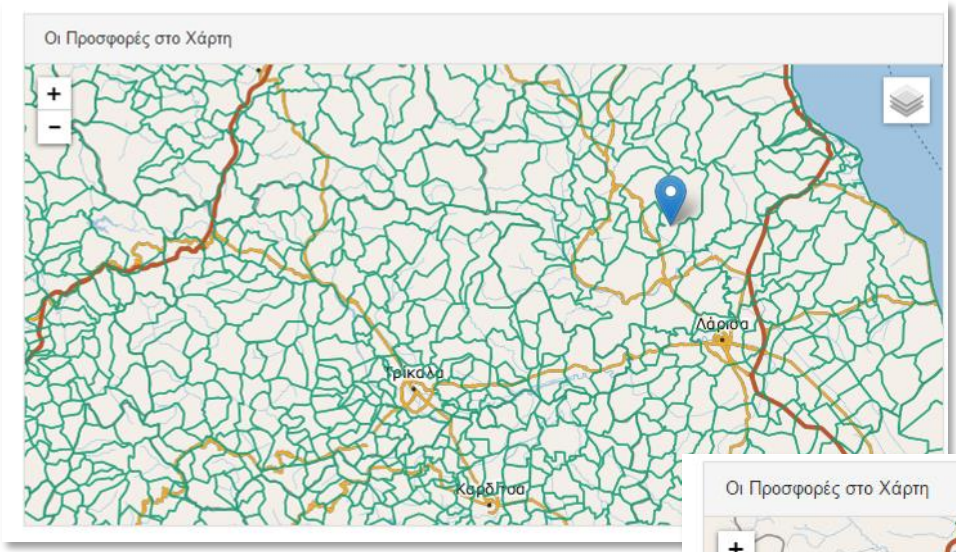
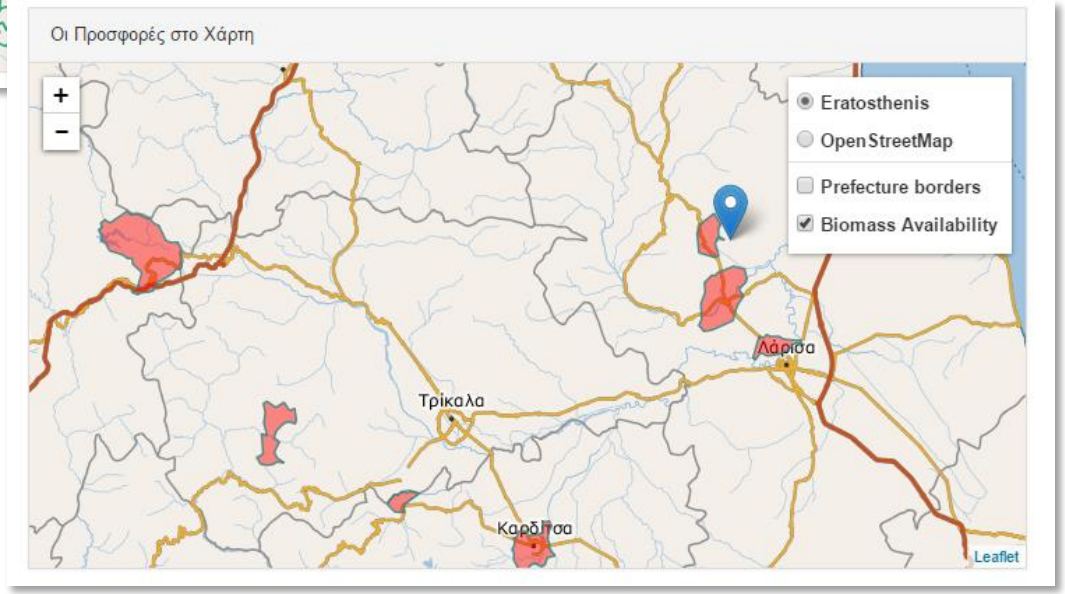
AI4B Platform





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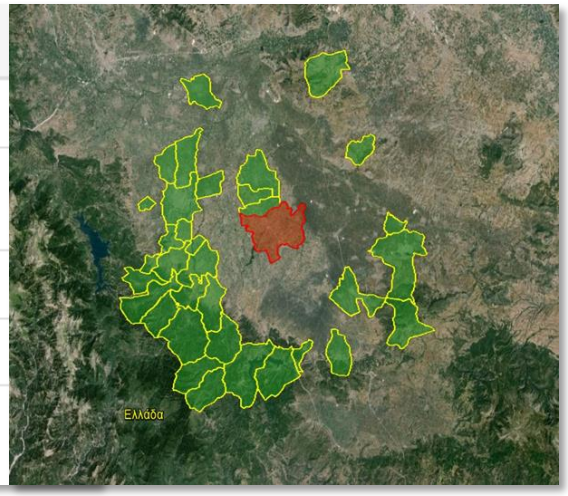
AI4B Platform

Choose Enabler	Gasification A
Choose Biomass	Corn Straw / Corn Strains / Corn Stalk / Corn Stover
Annual Biomass Quantity	2006

Unit Costing	
Capital Expenditure	1,716,000.00 €
Capital Expenditure based on annual operational costs	257,000.00 €/y
Fixed operational cost	57,000.00 €/yr
Variable operational cost	17,000.00 €/yr
Involved Treatments	drying, mechanical size reduction, burning, electricity production



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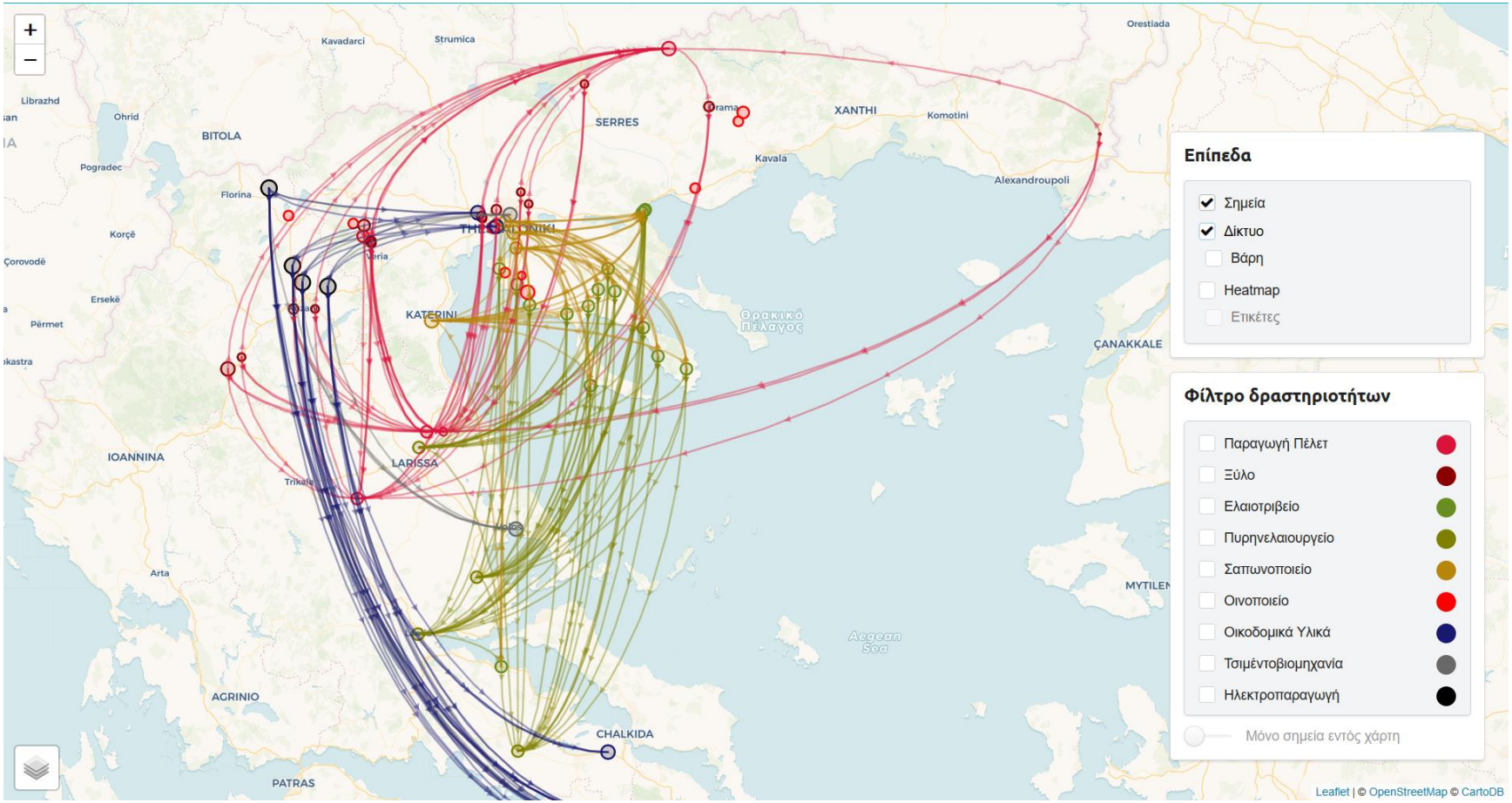
Industrial Symbiosis: A Modern Approach

Designing the SYMBIOSIS Platform

Platform Design Principles

- Open Architecture / Extendable
- User friendly / Intuitive
- Automated
- Cost Effective
- Partial Matches discovered
- Dynamic Process
- Accountability / Metrics
- Data Protection

A Modern Platform - SYMBIOSIS



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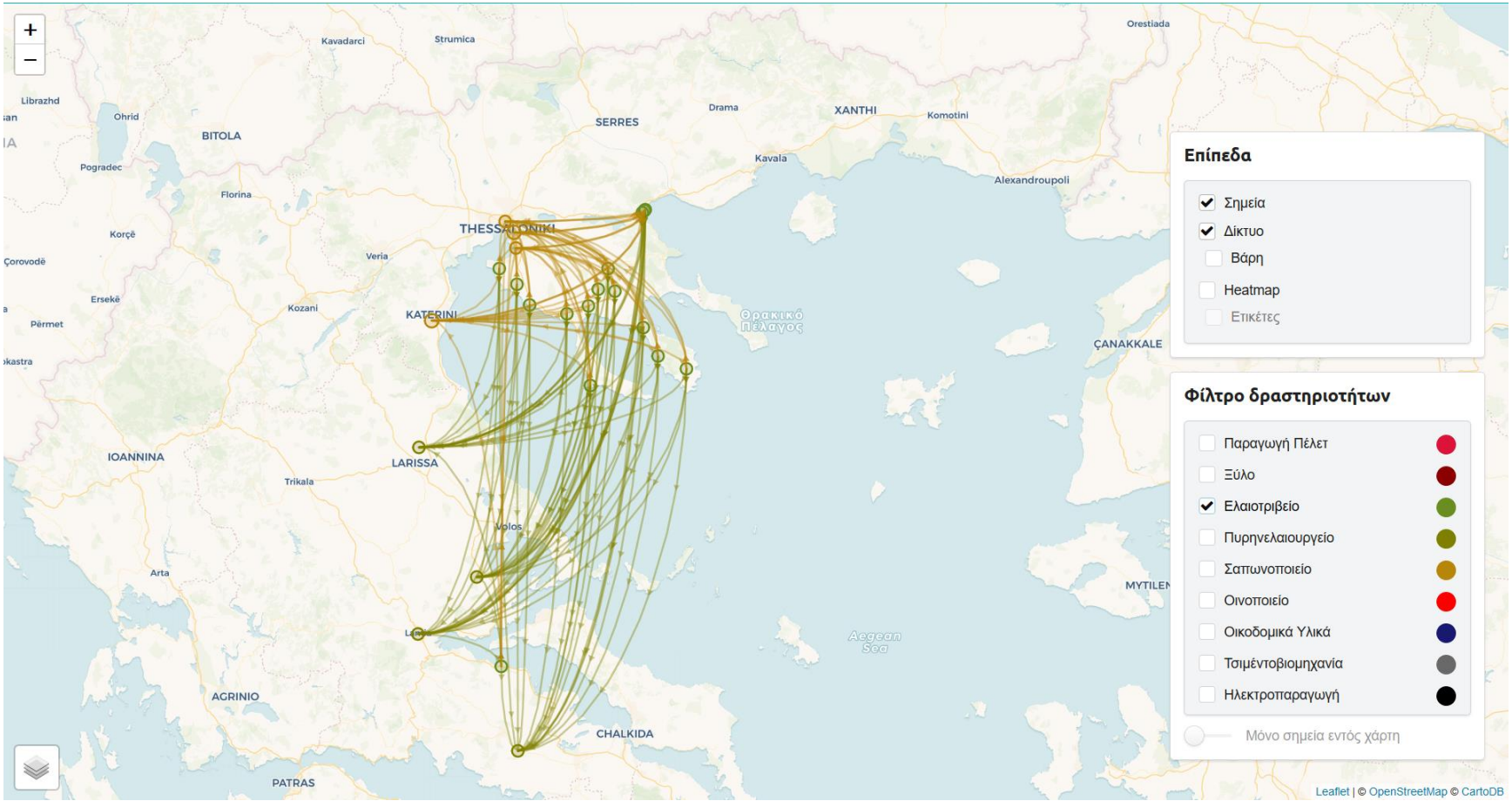

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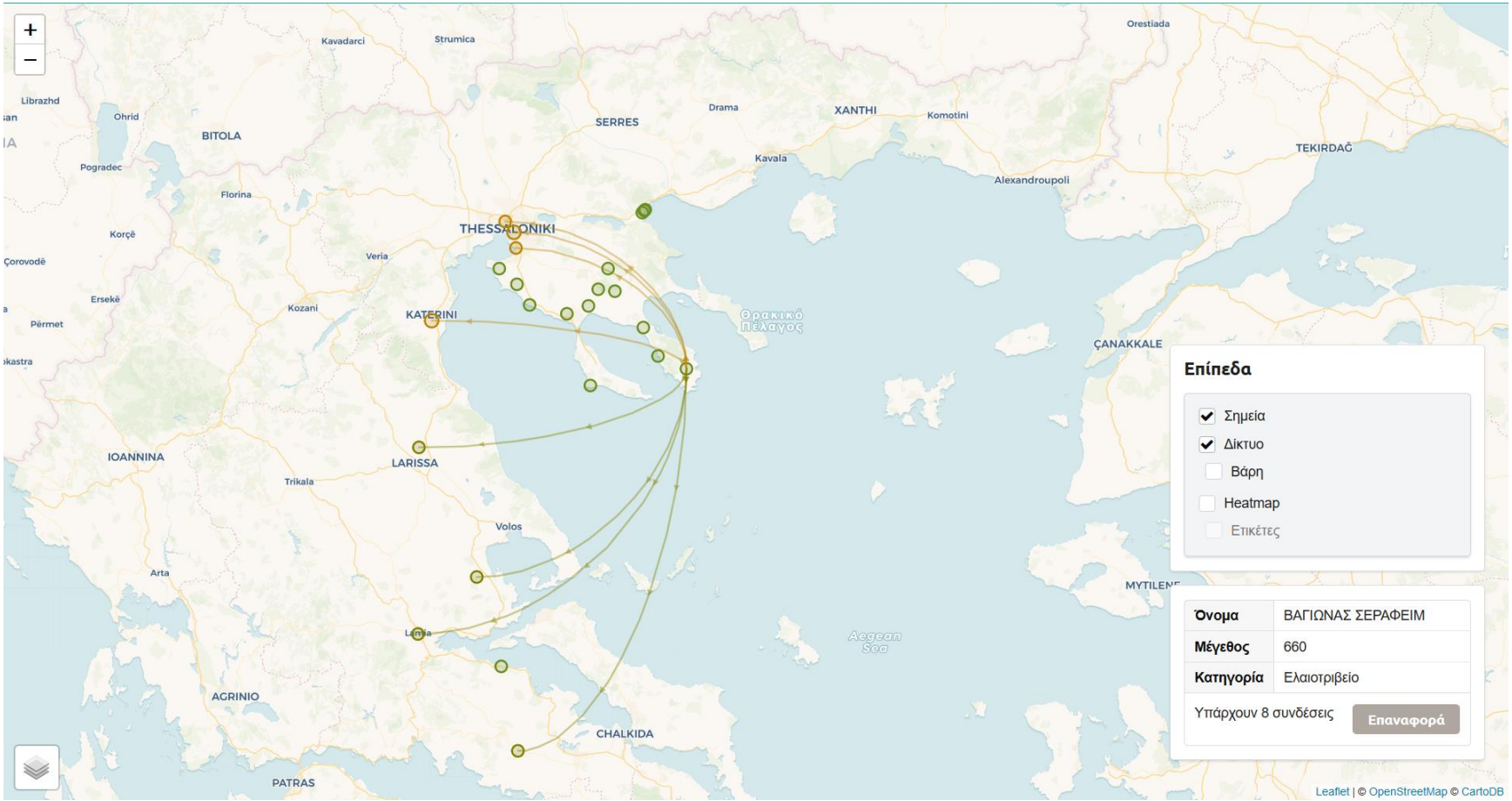

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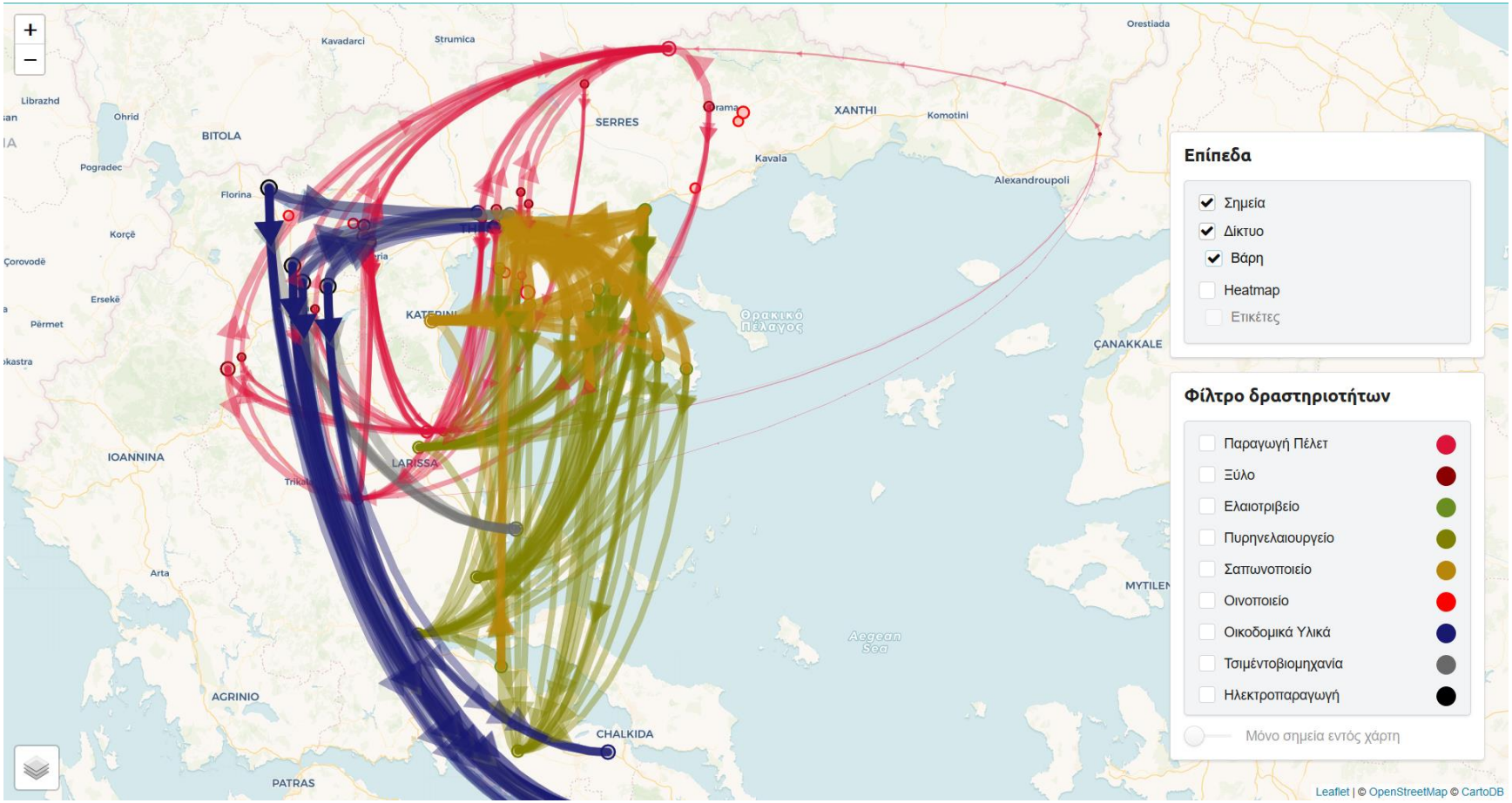

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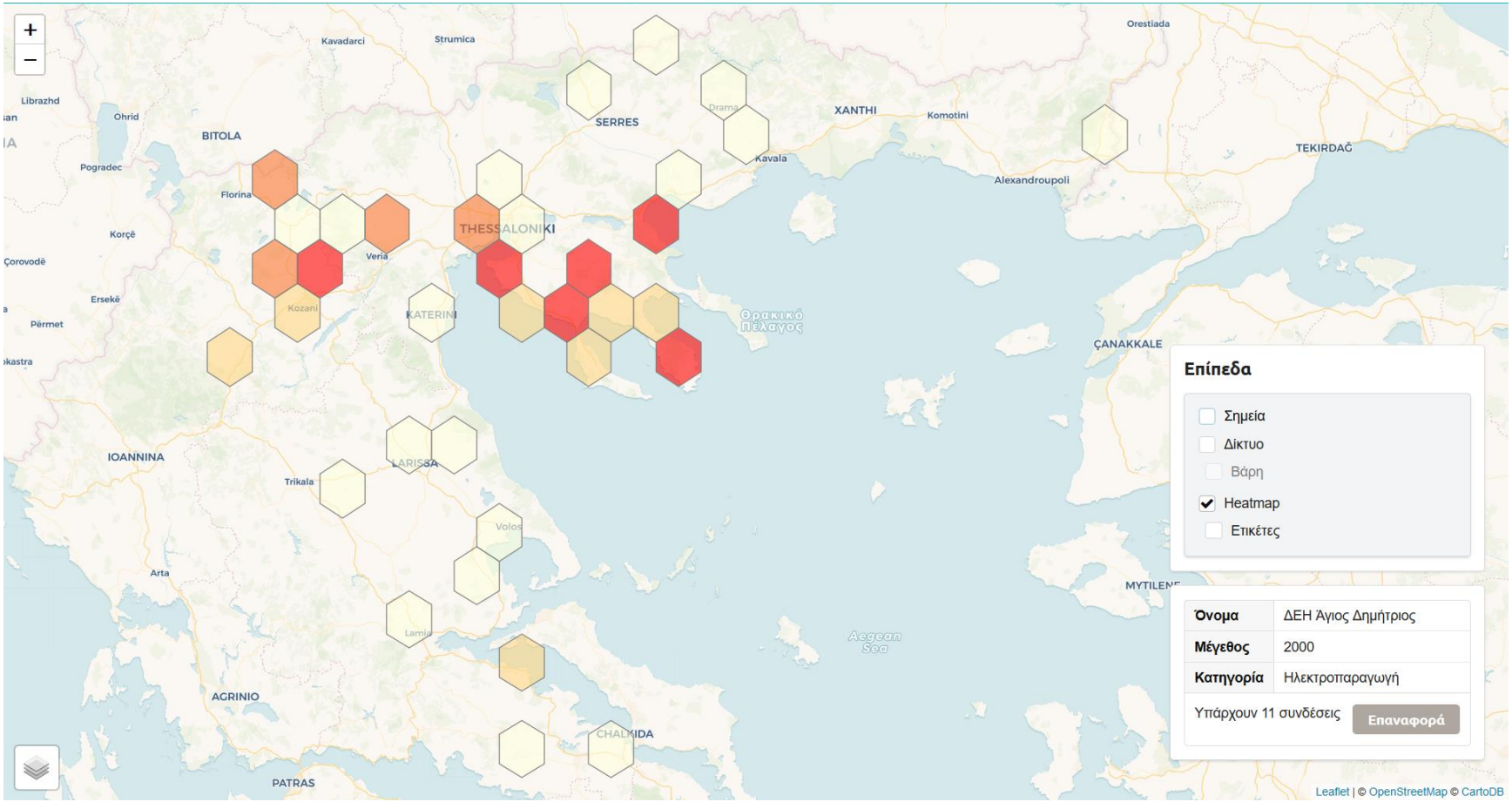

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Thank You!

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