



NATIONAL TECHNICAL
UNIVERSITY OF ATHENS
SCHOOL OF CHEMICAL ENGINEERING

Best practices of Symbiotic Platforms

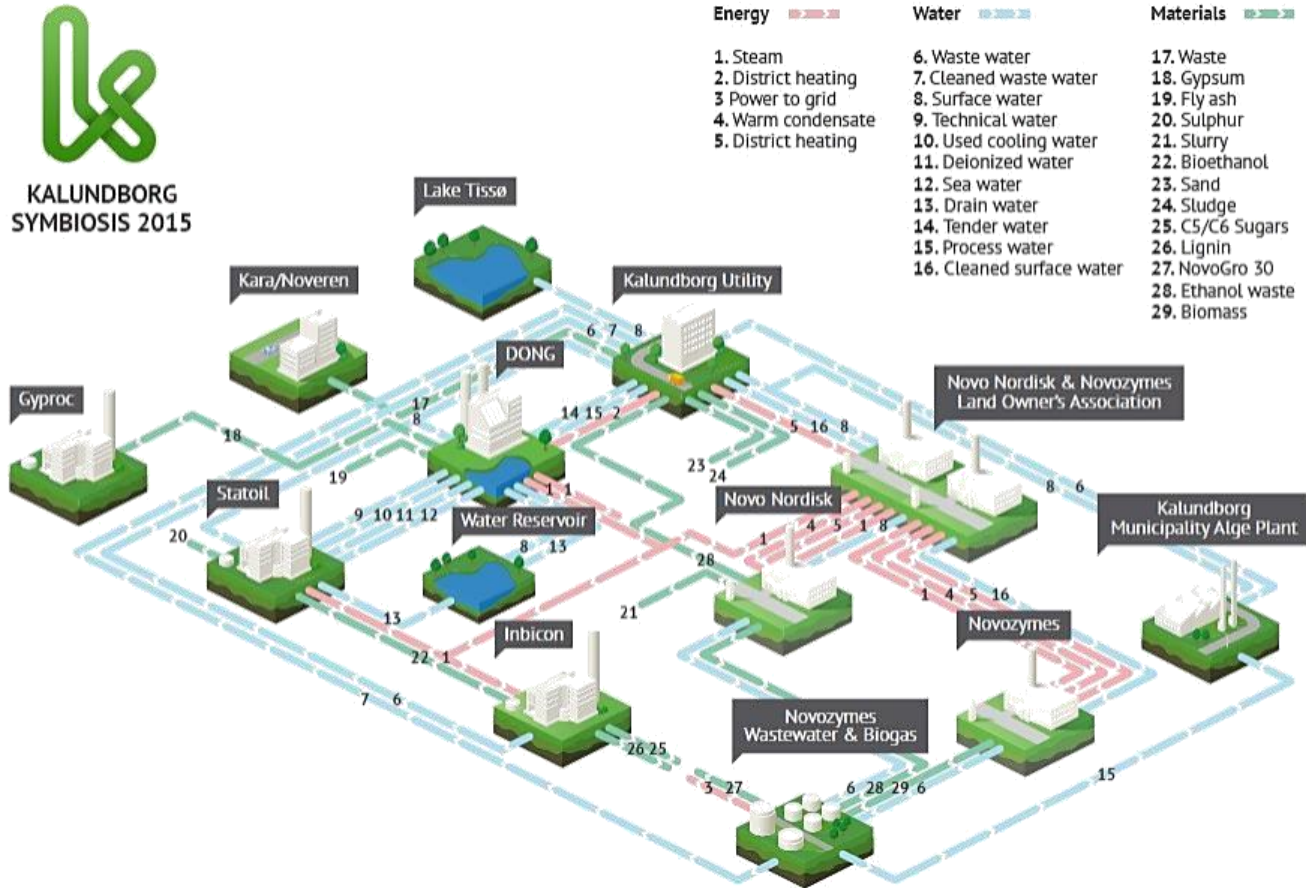
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Industrial Symbiosis - Definitions

- **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



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

Questionnaires

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

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



International Synergies
industrial ecology solutions

Trinomics 

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 initiatives has been carried out as part of the EU-funded project SHAREBOX³. 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” Platform 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


The screenshot shows the homepage of the SMILE Resource Exchange website. The header is green and contains navigation links: Home, Resources, Members, Technical Support, News, About Us, and Contact Us. On the right side of the header, there is a 'FREE' badge above 'Sign Up' and 'Sign In' links. The main content area is a large green banner with the 'smile :-)' logo and the text 'Resource Exchange'. Below the logo is a search bar containing the text 'dusc saw' and a magnifying glass icon. At the bottom of the banner, there is a section titled 'Latest Resources' with a 'VIEW ALL RESOURCES' link and three dots indicating a carousel.

A carousel of four resource listings is shown. Each listing is a circular image with a status label above it. From left to right: 1. 'Shipping Caps' with a green 'OFFERED' label, showing two white plastic caps. 2. 'Fire Retardant Dust' with a green 'OFFERED' label, showing a bag of grey powder. 3. 'IBC Tanks. 1200ltr, 1000ltr, 800ltr, & 600ltr' with a red 'WANTED' label, showing several colorful plastic drums. 4. 'Keyboards (probably broken)' with a green 'OFFERED' label, showing a black keyboard on a wooden surface. Navigation arrows are visible on the left and right sides of the carousel.

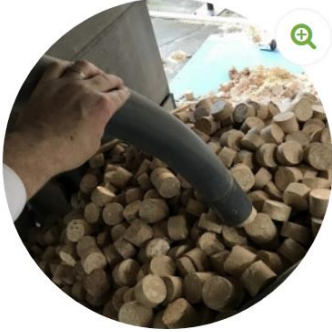
Case study:

SMILE Resource Exchange /Ireland

[Home](#) [Resources](#) [Members](#) [Technical Support](#) [News](#) [About Us](#) [Contact Us](#) [Sign Up](#) [Sign In](#)



[Resources](#) [VIEW ALL RESOURCES](#)



Sawdust waste (compressed as 'pogs')

Hardwood & softwood sawdust waste from timber workshops in Linenhall, DIT Bolton Street, compressed as (semi-compacted) by extraction system. There can occasionally be impurities in pogs such as a metal filing or screws. Not suitable for open fires.

Type	Offered
Location	Dublin
Categories	Wood & Timber
Frequency	Monthly
Quantity	1,300 kilogrammes

You need to be signed in to enquire about a Resource

Email Address:

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

The screenshot shows the 'Create Organisation' page on the eSymbiosis Platform. The page has a green header with the logo and tagline 'A Platform to enable and promote Industrial Symbiosis'. A navigation menu includes Home, Member Actions, Search Resources, Research, News, Success Stories, and About. The main content area features a progress bar with four steps: Step 1 (Register Organisation, highlighted), Step 2 (Add Site), Step 3 (Add Site Contact), and Step 4 (Add Site Resources). Below the progress bar is the 'Organisation Information' section with four input fields: Name (with a red asterisk), Web Address, Date Added (pre-filled with 30/11/2011), and Notes. A green 'Continue' button is at the bottom of the form. The footer contains links for Latest News, Success Stories, and Links, along with a search bar.

Search Links Logout

eSymbiosis

A Platform to enable and promote Industrial Symbiosis

Home Member Actions Search Resources Research News Success Stories About

Create Organisation

Step 1 Register Organisation	Step 2 Add Site	Step 3 Add Site Contact	Step 4 Add Site Resources
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Organisation Information

Name: Web Address:

Date Added: Notes:

Continue

Latest News Success Stories Links Search

eSymbiosis Platform

Step 1 Create Organisation	Step 2 Add Site	Step 3 Add Site Contact	Step 4 Add Site Resources
--------------------------------------	---------------------------	-----------------------------------	-------------------------------------

Site Information

Site Name:	<input type="text" value="MySite"/>	SIC Code:	<input type="text" value="123"/>
SiteAddress:	<input type="text"/>	PostalCode:	<input type="text"/>
SiteTown:	<input type="text"/>	County:	<input type="text"/>
Country:	<input type="text" value="United Kingdom"/>	Telephone:	<input type="text"/>
Fax:	<input type="text"/>	Web Address:	<input type="text"/>
Notes:	<input type="text"/>	Date Added:	<input type="text" value="30/11/2011"/>
Sector:	<input type="text" value="Sector A"/>		

Region Information

RegionId:	<input type="text" value="11"/>	Name:	<input type="text" value="Suffolk"/>
Latitude:	<input type="text" value="0.00"/>	Longitude:	<input type="text" value="0.00"/>

IS Practitioner Information

ISPractitionerId:	<input type="text" value="119"/>	Title:	<input type="text" value="Mrs"/>
FirstName:	<input type="text" value="Practitioner3"/>	LastName:	<input type="text" value="Practitioner3"/>
Telephone:	<input type="text" value=""/>	Mobile:	<input type="text" value=""/>

eSymbiosis Platform

eSymbiosis It's important to share and promote Industrial Symbiosis

[Home](#) [Member Actions](#) [Search Resources](#) [Research](#) [News](#) [Success Stories](#) [About](#)

Add Site Contact

Step 1 Create Organisation | **Step 2** Add Site | **Step 3** Add Site Contact | **Step 4** Add Site Resources

Site Contact Information

Title:	<input type="text"/>		
First Name:	<input type="text" value="Contact 1"/>	Last Name:	<input type="text" value="Contact 1 Last Name"/>
Telephone:	<input type="text" value="123123123"/>	Mobile:	<input type="text"/>
Fax:	<input type="text"/>	Email:	<input type="text"/>
Job Title:	<input type="text"/>	Notes:	<input type="text"/>
Date Added:	<input type="text" value="30/11/2011"/>	Is Main Responsible:	<input checked="" type="checkbox"/>
Type:	<input type="text" value="ContactType1"/>	Status:	<input type="text" value="ContactStatus1"/>

Site Contact Addresses

AddressId	Address	Postal Code	Town	County	Country
1					United Kingdom

eSymbiosis Platform

Home Member Actions Search Resources Research News Success Stories About

Add Site Resources

Step 1 Create Organisation
Step 2 Add Site
Step 3 Add Site Contact
Step 4 Add Site Resources

Site Information

Site Name:	MySite	SIC Code:	123
SiteAddress:		PostalCode:	
SiteTown:		County:	United Kingdom
Country:		Telephone:	
Fax:		Web Address:	
Notes:	<input type="text"/>	Date Added:	30/11/2011
Sector:	Sector A		


[Back](#) [Add Process Material](#)

eSymbiosis Platform

Step 1 Register Organisation	Step 2 Add Sites	Step 3 Contact Info	Step 4 Site Resources
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Site Info

Site Name: Activity Sector:



Map Satellite

Site Address: Postal Code:

City: County:

Country:

Address Longitude: Address Latitude:

Fax:

Web Address:

Sector: Region:

Creation Date: Notes:

eSymbiosis Platform

The screenshot displays the eSymbiosis Platform interface. At the top, there is a green header with the logo and tagline: "eSymbiosis A Platform to enable and promote Industrial Symbiosis". Navigation links include "Home", "Search Resources", "Research", "News", "Success Stories", and "About".

The "Search Resources" section contains a search criteria form with the following fields:

- Resource:
- Region:
- Resource Quantity (>=):

A green "Search" button is located to the right of the form.

Below the search form, the "Results" section displays a table of search results:

Name	Quantity	Have	Want	Type	Sub Type	Transport Method	Storage Method	Site SIC Code	Region
21312.00		<input checked="" type="checkbox"/>	<input type="checkbox"/>						
100.00 Tonnes		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Solid	Flake	Bulk Bags	Bunker		
150.00 Tonnes		<input checked="" type="checkbox"/>	<input type="checkbox"/>	Solid	Powder	Bulk Bags	Bay		
240.00 m3		<input checked="" type="checkbox"/>	<input type="checkbox"/>	Liquid	Slurry	Tanker	Closed Tank		
350.00 Kg		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Solid	Flake	Bulk Bags	Bunker		
1250.00 Tonnes		<input checked="" type="checkbox"/>	<input type="checkbox"/>	Solid	Flake	Tipper	Bunker		
10.00		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Solid	Flake				
20.00		<input type="checkbox"/>	<input type="checkbox"/>	Solid	Powder				
asdasd	123.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Solid	Powder			12 SIC Code 2	
asdasd	1000.00 m3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Liquid	Slurry	Pallet	Bunker	123 SIC Code 1	

eSymbiosis Platform

Synergy Information

Synergield:	768	CreationDate	09/11/2012
IsCompleted	<input type="checkbox"/>	isBlocked:	<input type="checkbox"/>
First Party ready to proceed to next Status:	<input checked="" type="checkbox"/>	Second Party ready to proceed to next Status:	<input type="checkbox"/>

Step 1: Idea	Step 2: Discussion	Step 3: Negotiation	Step 4: Implementation	Step 5: Complete
--------------	---------------------------	---------------------	------------------------	------------------

Description of Current Status: *The parties discuss in more detail (costs, quantities, critical path, etc).*

[Proceed To Next Step](#)

Block Synergy

Reason for blocking Synergy Progress:

[Block Synergy Progress](#)

eSymbiosis Platform

Resource Match

Relevance: 75.67 %

First Resource

Resource Id: 142

Matches Count: 6

Locked:

Name: boxes

Start of availability: 2001/01/01

End of availability: 2012/01/01

Quantity Type: Solid

Quantity: 1

Unit of Measurement: Tonnes (kg*1000)

Second Resource

Resource Id: 275

Matches Count: 0

Locked:

Name: Lignocellulosic Feedstock

Start of availability: 2012/08/09

End of availability: 2015/12/08

Quantity Type: Emulsion

Quantity: 150

Unit of Measurement: Tonnes (kg*1000)

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

User profile

Username dok

Full name Δοκιμή

E-Mail info@ai4b.gr

Submit

My Biomass Offers

Biomass Type	Biomass Quantity	Created			
Olive Leaves And Branches	222tn	2017-10-06	Details	Edit	Remove

My Biomass Demands

No results found.

Installations

No results found.

Create New Offer

Create New Demand

Create New Installation

AI4B Platform

Create new Offer

* Biomass

* Area

Price (euros/tn)

Moisture Min


Moisture Max

LHV Min

LHV Max

Is available on

* Location



Submit Offer

Create new Demand

* Biomass

* Area

Price (euros/tn)

Moisture Min


Moisture Max

LHV Min

LHV Max

Is available on

* Location



Submit Demand

AI4B Platform



I am offering Biomass

Are you a Biomass Producer? This is the way to find people and companies in your area that have specific Biomass demands.

I am looking for Biomass

Are you a Biomass Consumer? This is the way to find quantities of the Biomass you need, from producers in your area.

Enter your Biomass offer parameters

Do you know the Biomass Product you need?	What is your Production Activity?
Biomass Category	<input type="text"/>
Biomass Product	<input type="text"/>
Municipality	<input type="text"/>
<input type="button" value="Get Results"/>	

AI4B Platform

I am offering Biomass

Are you a Biomass Producer? This is the way to find people and companies in your area that have specific Biomass demands.



I am looking for Biomass

Are you a Biomass Consumer? This is the way to find quantities of the Biomass you need, from producers in your area.

Enter your Biomass demand parameters

Do you know the Biomass Product you need?	Do you know the Enabling Technology you use?
Biomass Category	<input type="text"/>
Biomass	<input type="text"/>
Municipality	<input type="text"/>
<input type="button" value="Get Results"/>	

AI4B Platform

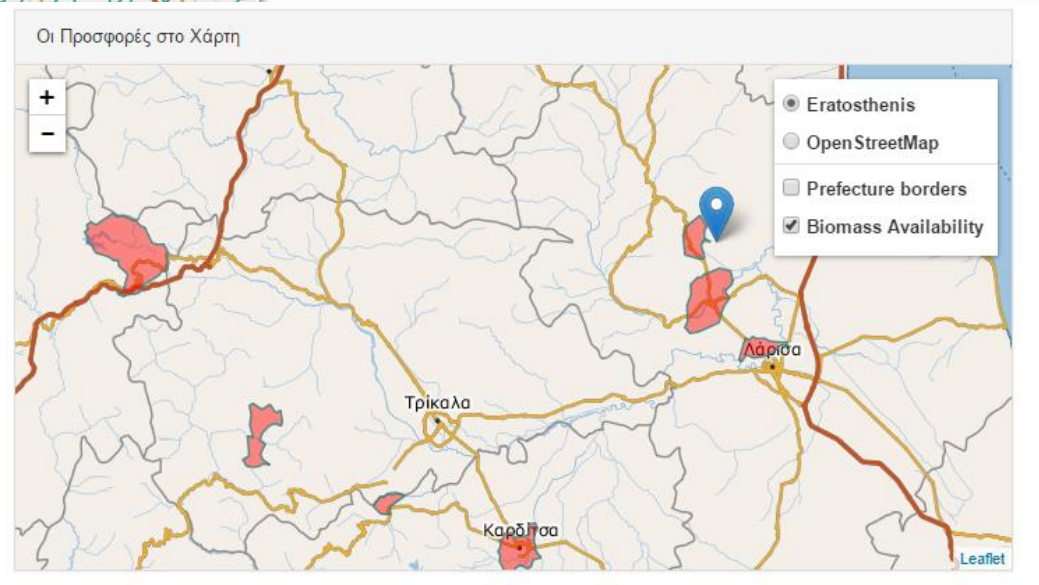
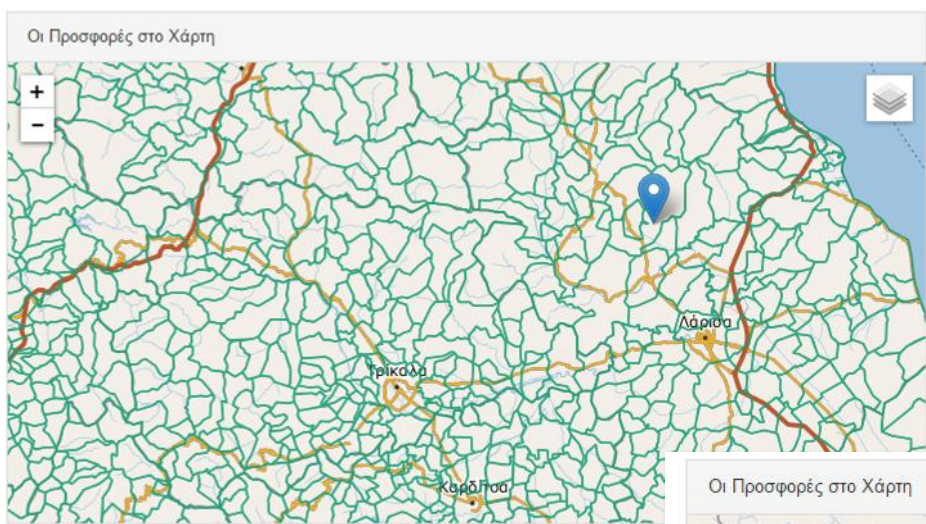
Offers for the Biomass you need:

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

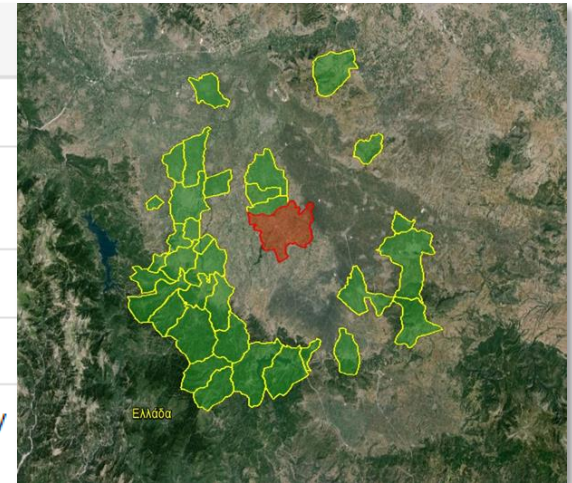
AI4B Platform



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



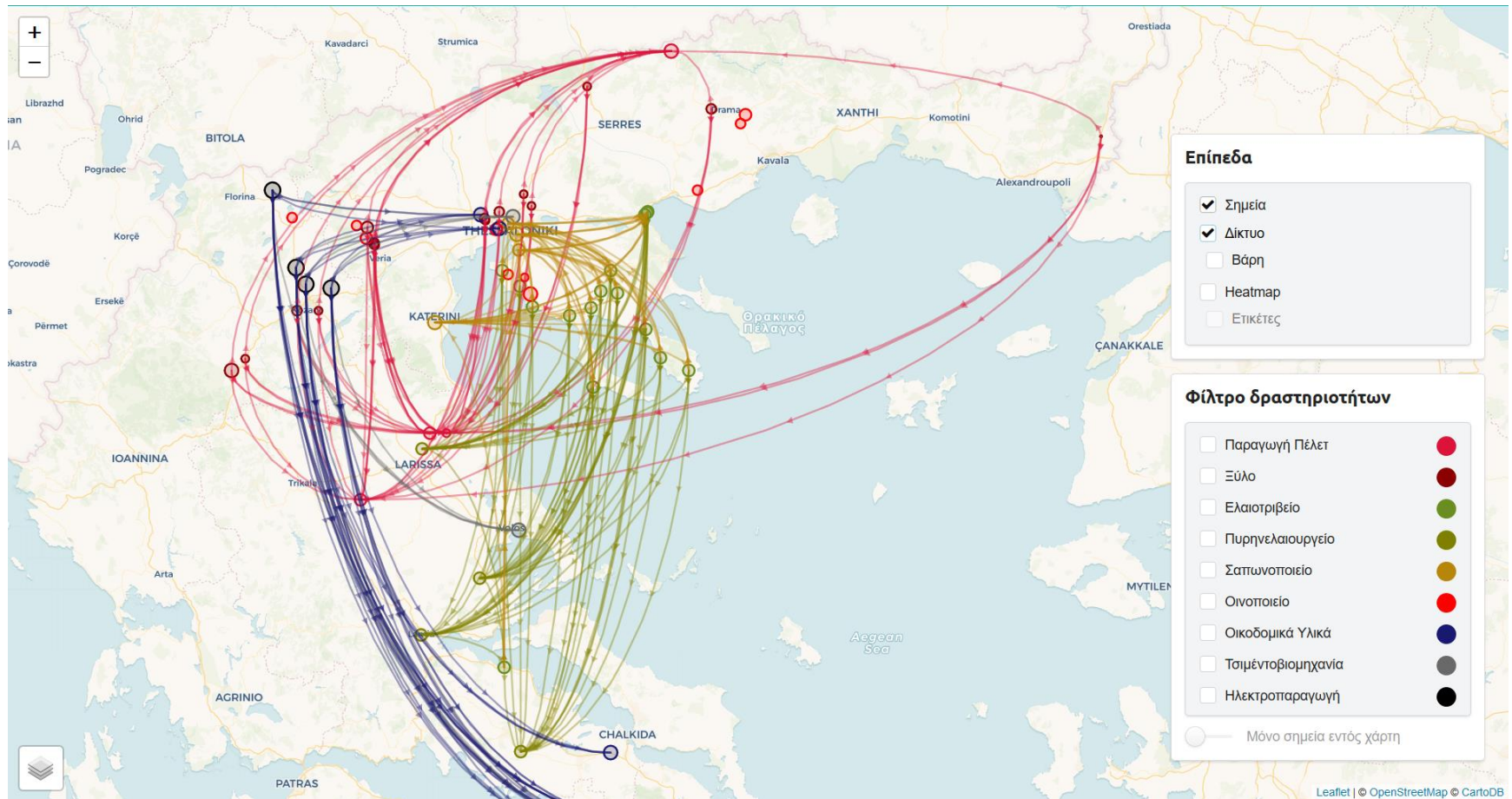
Industrial Symbiosis: A Modern Approach

Designing the SYMBIOSIS Platform

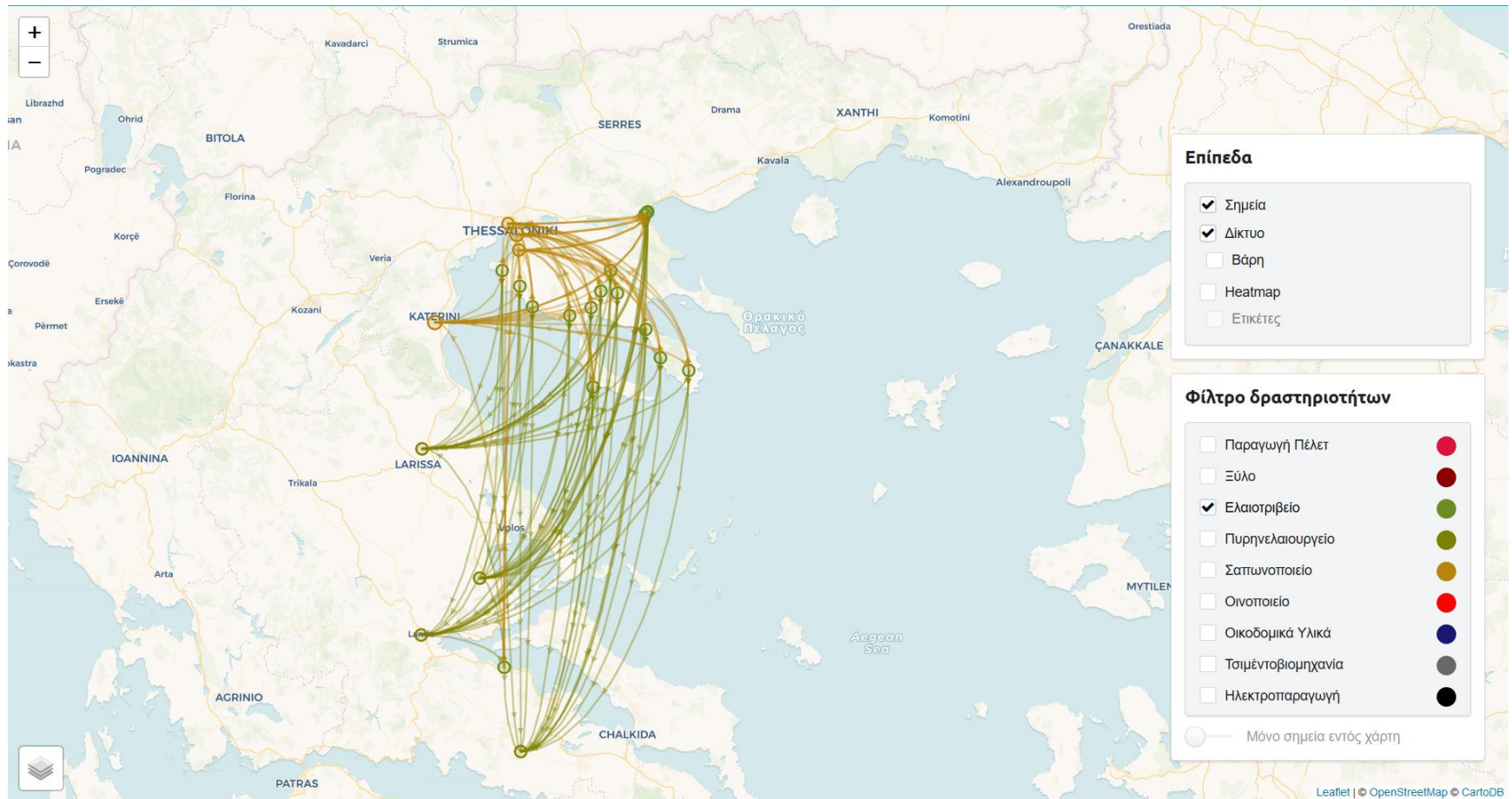
Platform Design Principles

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

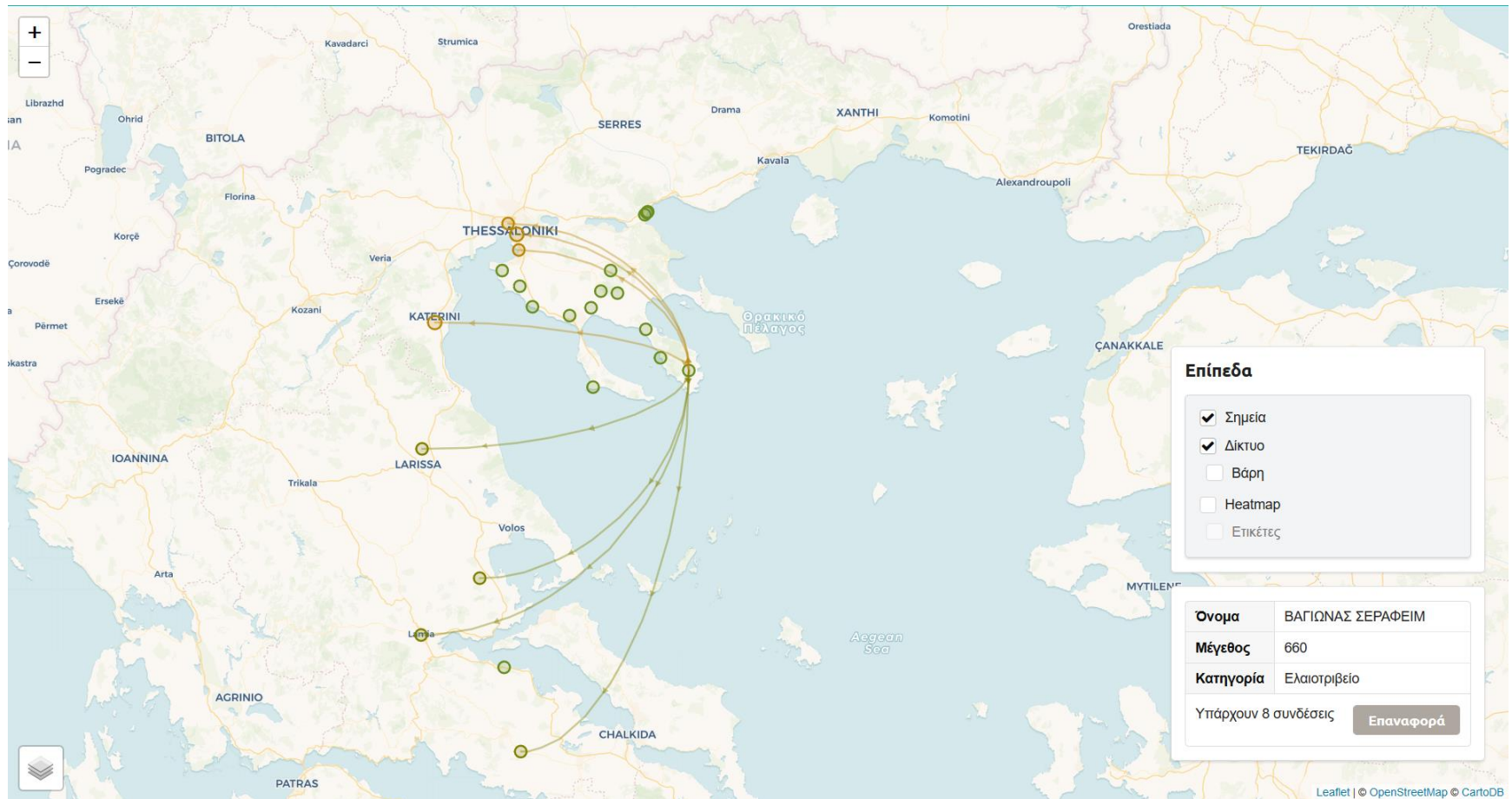
A Modern Platform - SYMBIOSIS



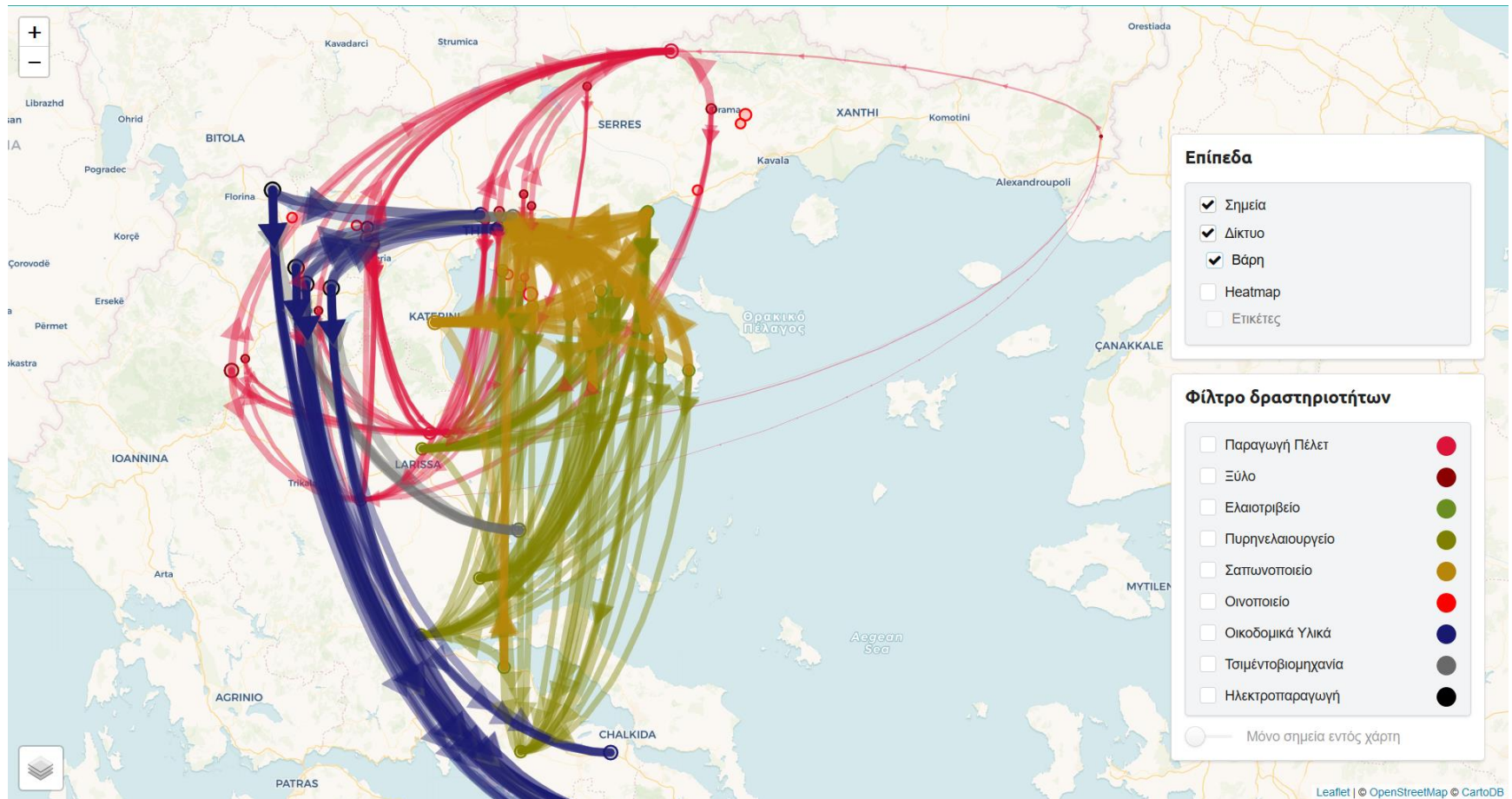
A Modern Platform - SYMBIOSIS



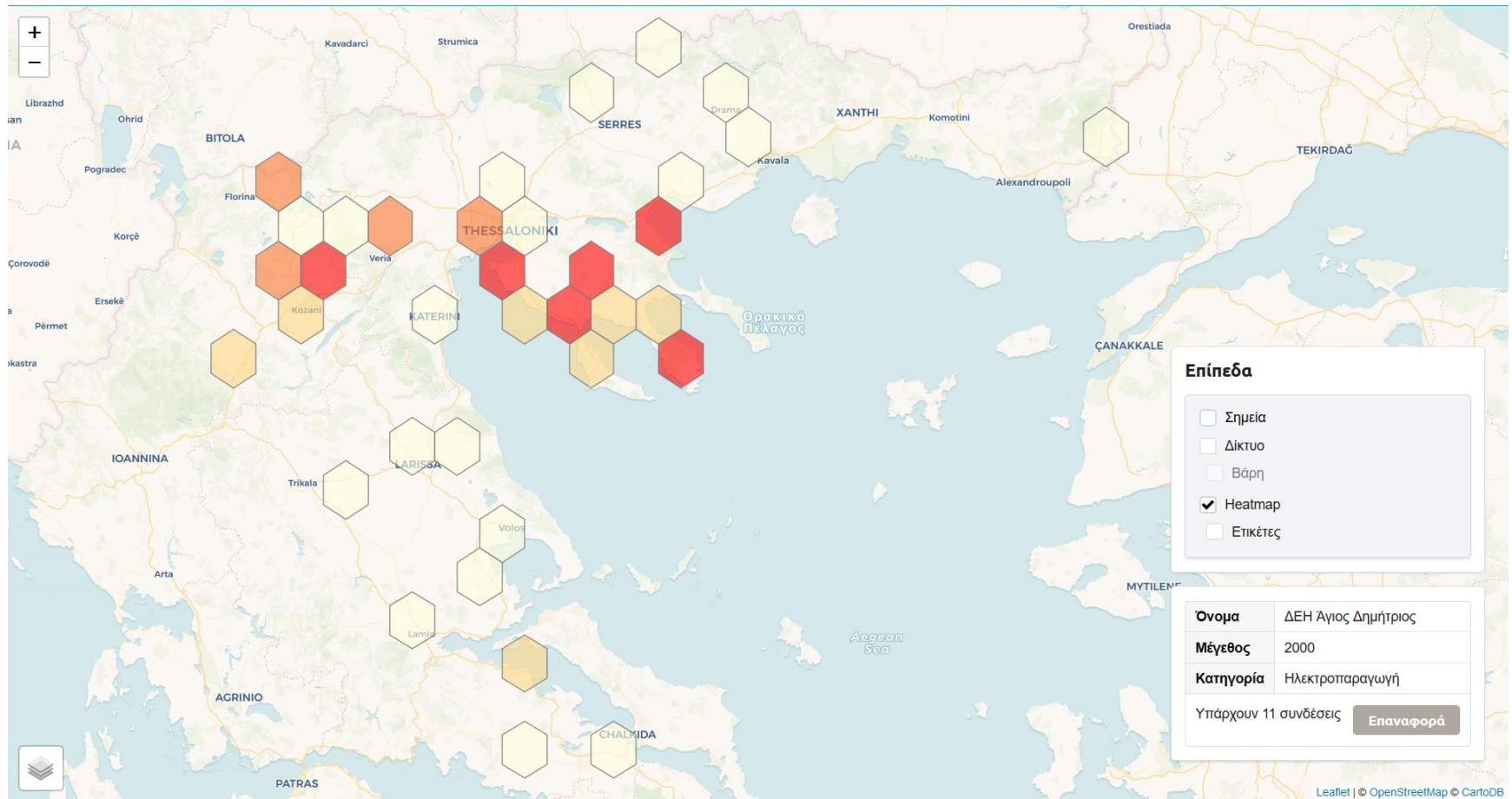
A Modern Platform - SYMBIOSIS



A Modern Platform - SYMBIOSIS



A Modern Platform - SYMBIOSIS



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Thank You!