First results of the implementation of the Industrial Symbiosis Platform in Italy

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Abstract
Purpose. Present work intends to present the ENEA methodology used for organizing and dealing the first Industrial symbiosis workshop held in Siracusa (south-east part of Sicilia) on 28.03.2014 in the framework of the project for the development of the first Italian platform for industrial symbiosis.
Methods. The workshop has been organised staring from an internal database of companies located in Sicilia Region and have been invited about 400 companies of the province of Siracusa and surrounding (Catania and Ragusa) both by emails and telephone calls. Registered companies (53) have been asked to fill in the ENEA input-output tables in order to collect their data before the meeting. We received 18 out of 53 input-output tables filled in.
Results. 44 delegates attended the workshop, from 36 different companies. Among them, 6 companies came to the venue without registration, while 23 registered companies were not present. During the meeting more than 160 output and more than 50 input of different categories have been shared and 160 potential matches have been found. Many other input-output data have been shared by companies in the precompiled input-output tables. Those information needs to be elaborated already.
Conclusions. The work is still ongoing with the testing phase of ENEA Industrial Symbiosis Platform and the Italian version of the NISP software. Companies have been informed about matches coming from the workshop but more matches are possible since info provided before are larger and more detailed. More work is needed in order to support companies to realise the effective matching.

Keywords: Sicilia, industrial symbiosis, input-output, companies, synergie, SME

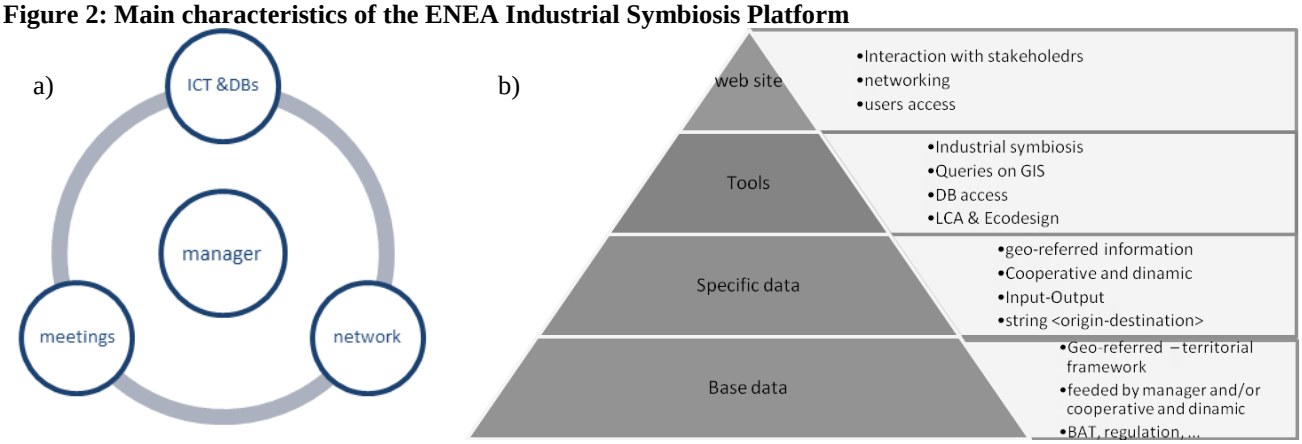
Introduction

The Environmental Technologies Technical Unit (UTTAmb) of ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) at half 2011 started a project for the development of the first Italian platform for industrial symbiosis (in Fig.1 the registered logo) to be implemented in Sicilia Region (in the framework of a larger asset to support productive development in southern Italy). The project is still on-going and will end in May 2015. After the end of the project, ENEA goal is to let the Industrial Symbiosis Platform work in the Sicilia Region, supported by local authorities, maintaining for itself the central management. Further, ENEA is working, also, on extend the Platform at other Italian regions in order to make the industrial symbiosis happen with the same supporting tool all over Italy.

Figure 1: The ENEA Industrial Symbiosis Platform logo

The Industrial Symbiosis Platform is based on a Manager (at the moment ENEA itself) and an integrated system of an ICT and DBs tools supporting and managing DBs, stakeholders' networks and meetings with companies. Figures 2.a) and Figure 2.b) summarize the Industrial Symbiosis Platform, better described in Cutaia et Al. (2014), which at present is in the test phase.

Figure 2: Main characteristics of the ENEA Industrial Symbiosis Platform



Source: ENEA

In March 2014 the first operative meeting with companies was held in Siracusa (Sicilia Region), finalized to involve companies in the project, have from them input-output related information, looking for potential synergies between companies taking part in the work-table and not only.

The meeting has been organized starting from a broad database of companies in Sicilia (more than 1,500) and, making from this DB a query of those companies nearby the province of Siracusa, about 400 companies have been invited. Among them, about 50 companies have been registered at the event and about 40 were actually present the day of the meeting (28.03.2014).

The meeting has been organized using both the ENEA methodology and the NISP one (the UK National Industrial Symbiosis Programme) and, according to ENEA methodology before the meeting registered companies have been asked to fill in input-output tables about the resources they want to share within the project. Many of them returned the input-output tables compiled before the meeting. During the meeting more information has been shared and more than 160 potential synergies have been identified. After the meeting a further check has been done with companies in order to confirm, modify or integrate information and data provided before and during the meeting.

The combined information (provided pre-after and during the meeting) are now in the checking and uploading phases in the ENEA platform in order to test it and to looking for more potential synergies, since information provided pre or after the meeting (namely, not shared publicly during the meeting), using the ENEA input-ouptut table, are much more detailed and numerous than those provided during the meeting.

ENEA input-output table foresees a taxonomy for the inventory of input-output data of companies, taking into account as resources "materials, energy, services, skills" and using code systems officially used in Italy (according EU regulation) for different kind of inventories (e.g. Nace codes, ProdCom, EWC) with which companies normally deal with.

Present work intends to present the ENEA methodology used for organizing and dealing the meeting and the first results obtained in terms of input-output data, of companies involved, data shared pre-during and after the meeting and first outcomes.

Matching between outputs and inputs in the ENEA's industrial symbiosis platform

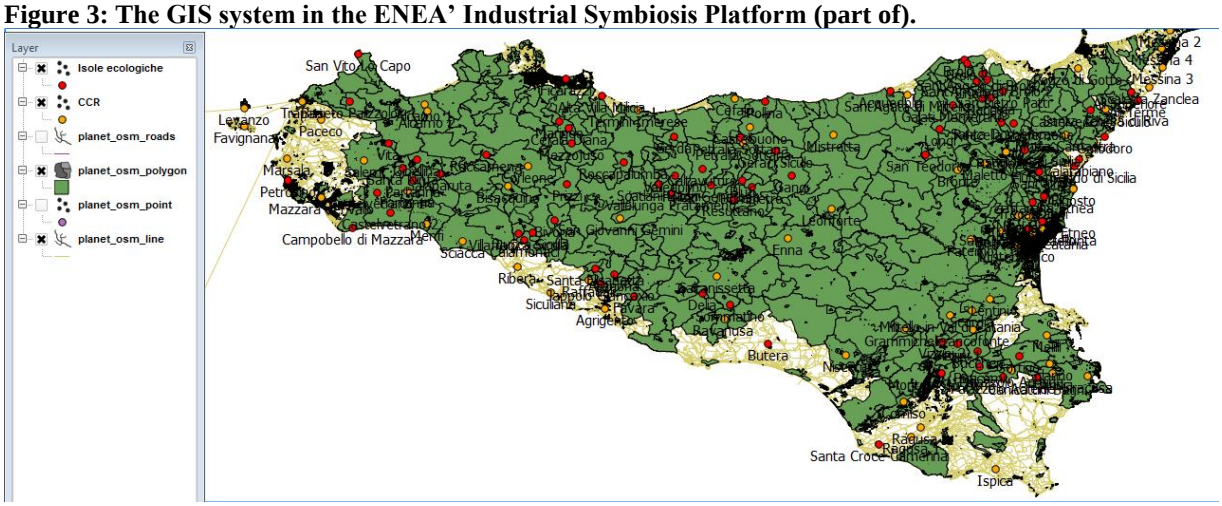
Referring to our previous work recently published (Cutaia et al., 2014), we can here better explain the main aspects related with the process of the ENEA's industrial symbiosis platform.

In this platform there is a GIS system, as shown in the figure below, where many different databases can be uploaded. One of this database is that of the registered companies, that, through the www.industrialsymbiosis.it portal can provide their general information (name, address, activity sector and so on). Doing this the GIS system can localize registered companies in the map.

Than companies can go further and look for "cooperation" in terms of industrial symbiosis potential. In order to look for industrial symbiosis potential registered companies can become "associated companies", providing their own information about inputs and outputs they want to share within the industrial symbiosis network.

As explained in our previous work, users are in this way encouraged to go from the "registered company" level to the "associated" one, also because in this way they can use all the functions provided by the platform (queries, DBs, industrial symbiosis matching).

Figure 3: The GIS system in the ENEA' Industrial Symbiosis Platform (part of).



Source: ENEA

Figure 4 shows the relation between associated companies (the boxes A, B, C, …), their own input-output (going into and going out from the boxes respectively) and the possible synergies among one output coming from one company to one or more than one input being used by other companies. This connection go through a string "origin-destination" which allows to find relation between one waste/by product with its potential of productive use as one input for someone else within the project we are feeding this "origin-destination" database which, in the aim of the project, can become more and more effective as real case will be implemented.

Input-output tables, with information asked in the platform at associated companies are shown in figure 5. Information asked in the input-output tables for collecting data are the more simplified we could find in order to allow companies to fill the tables with the less possible effort, since information asked are those already used by the companies for their normal management (e.g. Nace code, or CER code – EWC code).

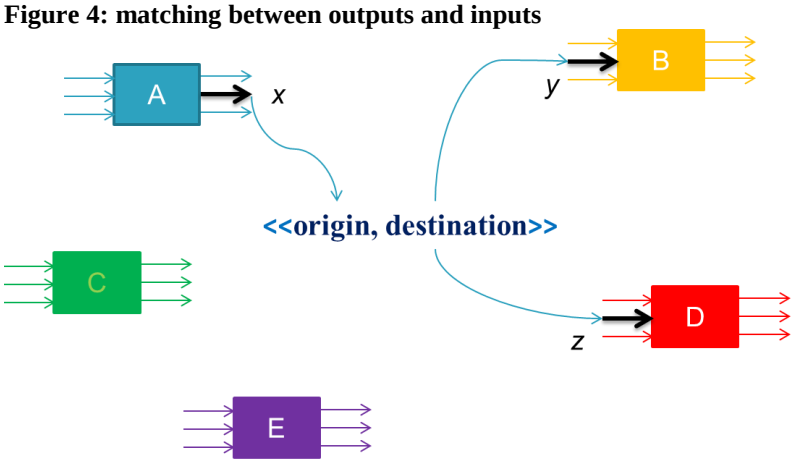
One empty <origin, destination> string is shown in table 1, showing information in this case for connection, with the logic one-to-many one, of one output to its possible productive destinations. There is a similar, but inverted table, for the opposite direction (one input and its possible alternative supply).

The industrial symbiosis platform software connects inputs and outputs through the "bridge" represented by the <origin, destination> string. In other terms, searching for possible matches for output *x* of company A, the software finds two possible destinations as inputs for companies B or D as inputs *y* or *z*. Needless to say that these connections need to be verified in technical, regulatory, logistic and economical terms.

At present we are in the last year of the project ending in May 2015 and we are in the test phase of the platform. For this reason data are uploaded in the platform nor directly by companies, but by ENEA staff.

We are now testing the platform using information provided by companies participating directly or indirectly to the meeting held in Siracusa in March 2014, as described below.

Figure 4: matching between outputs and inputs



Source: ENEA

Figure 5: input-output table

Risorsa (descrizione)	Risorsa (nome commerciale)	Risorsa (tipologia)	Risorsa (codice ProdCom) [se tipologia a)]	Risorsa (codice NACE) [se tipologia c)]	Tipo di quantitativo risorsa	quantità	unità di misura
		a) materiale			annuale		
input		b) vettore energetico			batch		
		c) servizio					
		d) competenza					

Risorsa (descrizione)	Risorsa (nome commerciale)	Risorsa (tipologia 1)	Risorsa (tipologia 2 - a)	Risorsa (codice) [CER - se rifiuto]	Risorsa (codice) [ProdCom - se sottoprodotto]	Risorsa (codice) [NACE - se servizio]	Tipo di quantitativo risorsa	quantità	unità di misura
		a) materiale	rifiuto				annuale		
		b) sottoprodotto energetico	sottoprodotto				batch		
		c) servizio							
		d) competenza							
output									

Source: ENEA

Table 1: example of <origin, destination> string (output to inputs direction)

Product description (output)	
EWC Code (or other appropriate code if the resource is not a waste)	
Origin	
Fiscal properties	
Composition properties	
Possible productive destinations (ATECO codes – the Italian transposition of NACE codes)	
ATECO code	Input type (possible destination)
Applicable regulations and technical norms	
Others use full information (e.g. collecting managing systems)	
Abstract	
Key words	

Source: ENEA

The pre-workshop activity

As the project is based in Sicily Region, we compiled a company's database for that region, taking information from productive districts, association and public registries available online. Doing this we set up a quite large database with more than 1800 companies in Sicilia (Table 2).

From this database we selected about 400 companies around Siracusa, taking into account the provinces of Catania, Ragusa and Siracusa itself and selecting, where it was possible, companies with number of employees larger than 5 (in Sicily there are many small companies).

Starting in the month of January 2014, we sent out invitation emails and after, in the month of February, we did finalized telephone calls in order to explain better the goal of the meeting. We asked companies to register to the meeting and after we sent to registered companies our input-output table (Figure 5), asking them to fill it in before the meeting and send it back to us.

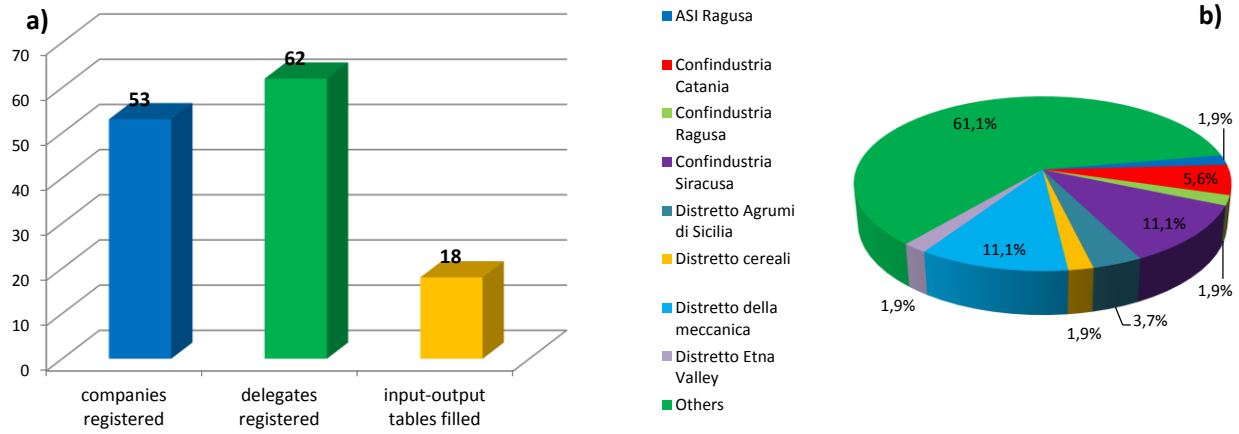
Table 2: Synoptic of the companies' database of Sicilia

Companies of:	n.	Companies of:	n.
ASI Ragusa	25	Distretto Eda Ecodomus	150
Confindustria Catania	38	Distretto Etna Valley	84
Confindustria Ragusa	35	Distretto filiera carne bovina	118
Confindustria Siracusa	44	Distretto florovivaismo	91
Distretto Agrumi di Sicilia	102	Distretto lapidei di pregio	62
Distretto Avicolo	61	Distretto lattiero caseario	255
Distretto cereali	53	Distretto legno e complementi	51
Distretto del ficodindia	55	Distretto Meccatronica	104
Distretto della meccanica	62	Distretto pietra lavica	51
Distretto della pesca	104	Others	52
Distretto dolce Sicilia	294		
Total			**1891**

Source: ENEA

Before the meeting we had the situation described in figure 6. 62 delegates were registered to the event from 53 different companies. 18 companies sent us the input-output table filled with their data before the meeting.

Figure 6: Situation before the Siracusa Workshop: a) registration details; b) companies' productive district



Source: ENEA

The workshop held in Siracusa

The operative meeting was held in Siracusa (Sicilia Region) on March 28th 2014 in the headquarter and with the support of the Chamber of Commerce (Figure 7). Sicilia Region gave their patronage to the workshop as Confindustria Sicilia did. The province of Siracusa was represented and did an oral presentation in the opening session as ENEA and the Chamber of Commerce did.

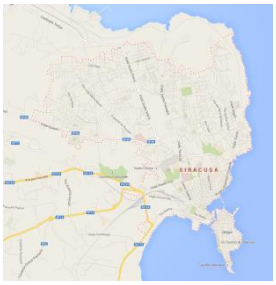
The workshop had quite good results in terms of participation and interest from the companies. There was, further, a very high interest from stakeholders (Chamber of Commerce of Siracusa, province of Siracusa, Sicilia Region and UnionCamere), as a really high is the potential for industrial symbiosis in Italy

The main goal of the workshop was involving companies in the project, get from them data, and at looking for potential synergies between companies.

But in addition to this practical purpose the other goal of the workshop was trying to let the industrial symbiosis concept go not only at company level, but also, and in particular, at stakeholders level since the possibility of making the industrial symbiosis happen or not, is in Italy deeply depending on the regulatory system and on our monitoring and control system (this is a very sensitive subject, mainly for waste streams).

Figure 7: Sicilia Region (a), Siracusa (b) and the location of the meeting, Chamber of Commerce – Siracusa (c)

(a)

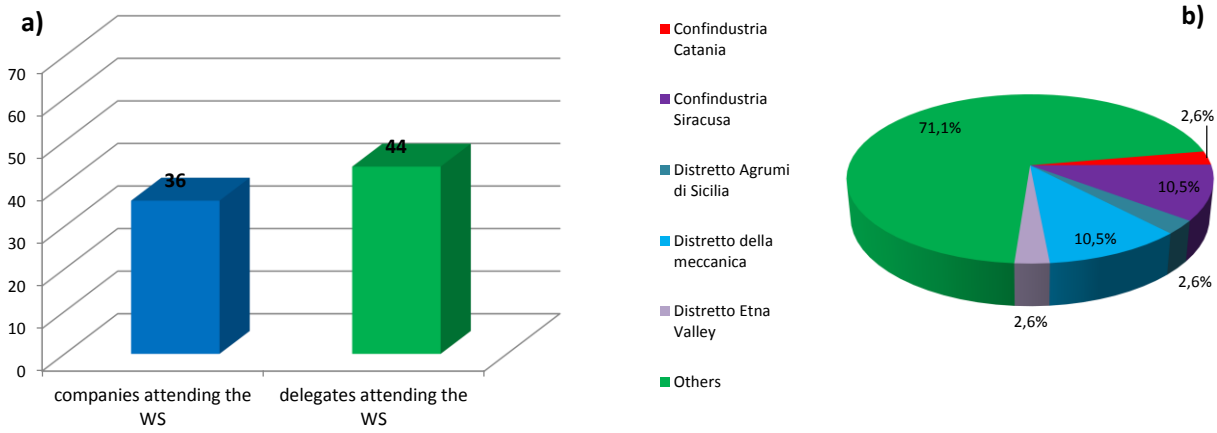


(b)


(c)

As shown in figure 8, 44 delegates attended the workshop, coming from 36 different companies. Among them, 6 companies came to the venue of the workshop without registration, while 23 registered companies were not present.

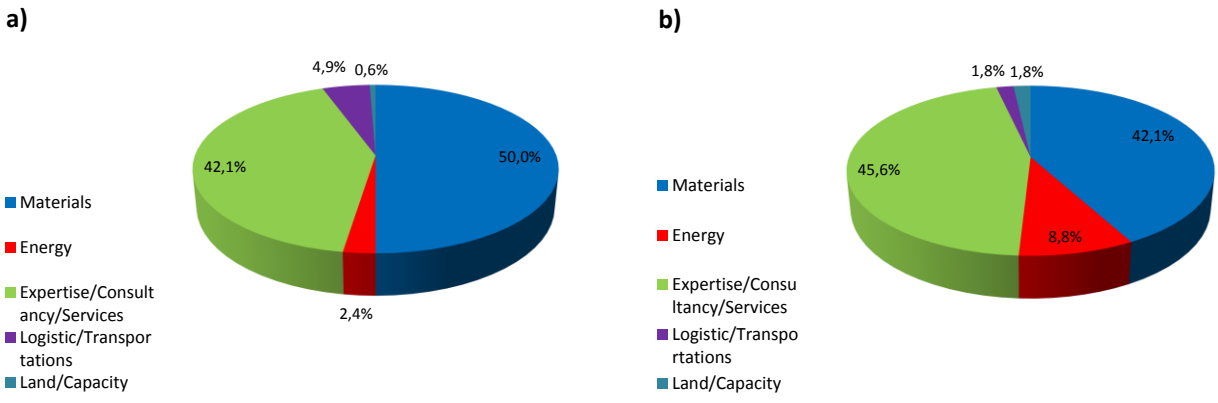
Figure 8: Situation during the Siracusa Workshop: a) registration details; b) companies' productive district



Source: ENEA

The meeting has been carried out by ENEA staff using both the ENEA methodology and the NISP one. During the meeting a lot of information has been shared by the companies: more than 160 output resources and more than 50 input resources of different categories (Figure 9) and 160 potential matches were found during the workshop. The resources shared by the companies during the workshop were mainly "Materials" (e.g. water, plastic, metals, chemicals, etc. – 50% of the output resources and 42.1% of the input resources) and expertise, consultancy and services (42.1% of the output resources and 45.6% of the input resources).

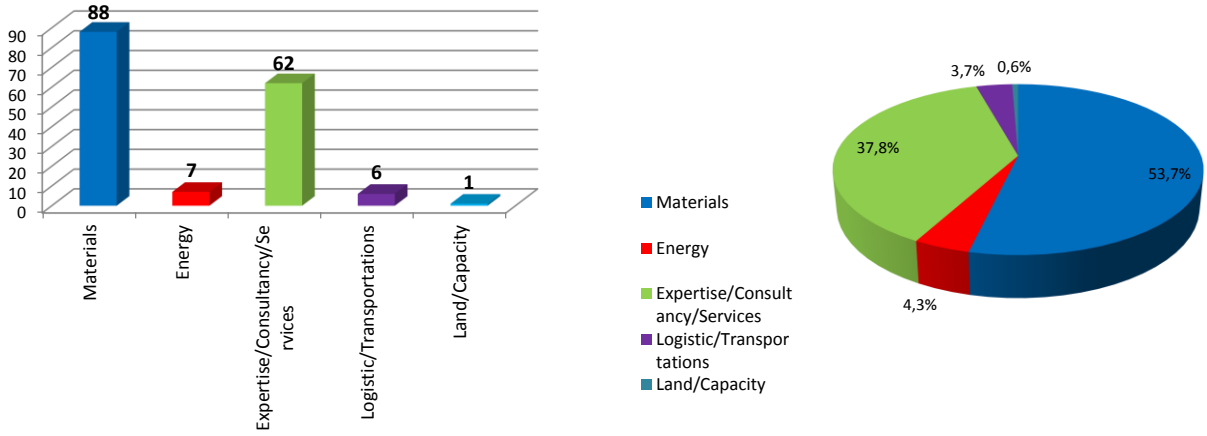
Figure 9: Resources' categories: a) Output resources ; b) Input resources



Source: ENEA

As shown in figure 10, also the potential matches identified during the workshop interested mainly materials (53.7%) and expertise, consultancy and services (37.8).

Figure 10: Potential synergies



Source: ENEA

The post-workshop activity

After the Workshop we updated (if already sent by the companies) or created the input-output tables for each registered companies (even if they did not attend the workshop) or companies participating even if not previously registered. Where applicable, resources shared during the meeting were added to the resources provided by the companies before the meeting. Then, we sent to the registered companies our new input-output tables, asking companies to check them, to confirm, modify or integrate information and data provided before and during the meeting, and to send them back to us. Four companies returned back to us the input-output tables with negligible adjustments. One company filled entirely the tables because the delegate was not able to be in Siracusa for the meeting. Less than 20 new output resources were added.

Data provided during the workshop were elaborated and individual company reports were generated and sent out to the companies with information about their potential matches. Potential matches found during the workshop are part of the whole potential matches that are potentially possible, since information provide by companies before the meeting, filling in input-output table are much more detailed and large than those provide during the workshop. For this reason ongoing activity foresee the completion of elaboration of input-output data provided, as a whole, by the companies.

Ongoing activity

The combined information (provided pre-after and during the meeting) are now in the checking and uploading phases in the ENEA platform in order to test it and to looking for more potential synergies.

In addition, ENEA is implementing and testing the Italian version of the NISP software on which we already uploaded the companies and contacts details; once this test phase is concluded, ENEA will upload also the data (resources) in order to look, even using the NISP tool, for more potential synergies.

Ongoing activity foresee thus the testing phase of both ENEA Industrial Symbiosis Platform and Italian version of the NISP software financed within the project. We are the designer and the owner of the ENEA Industrial Symbiosis Platform therefore future implementation and improvements of this tool are possible both for its implementation in Sicilia and for any other implementation in other regions. Instead we have been working with NISP method only since autumn 2013 in order to be in connection with probably the most relevant project on industrial symbiosis in Europe within the approach of a future pan-European industrial symbiosis network.

Further steps foresee to support companies in the implementation of synergies till the effective implementation of the match. At list one-other workshop is foreseen before the end of the project (May 2015) as well other activities for involving companies. ENEA is working for let the Industrial symbiosis platform work in Sicilia even after the end of the project with the support and cooperation of local public or private stakeholders.

Conclusion

The first industrial symbiosis workshop organised by ENEA and held in Siracusa on the 28.03.2014 had a good participation from companies (53 companies registered, 36 companies participating with 44 delegates) and a very good support and sponsorship from the main stakeholders in Sicilia (Regione Sicilia, Confindustria Sicilia, Camera di Commercio di Siracusa).

Companies shared data on their available resources (input-output) before and during the meeting and, according only to the work done during the meeting, about 160 potential matches have been found. It is possible that

many other potential matches could be found not only implementing data provided during the workshop, but also because some companies provided a large number and detailed information before the workshop.

ENEA is still working in supporting companies in order to let potential matches to become effective ones.

Acknowledgments

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References

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