Combined document corresponding to Deliverables 2.5, 4.4 and 5.3

Project acronym	EPIC 2020
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1 Introduction

This report summarises the key findings from Work packages 2, 4 and 5, with particular focus on differences and similarities in approaches adopted and the results they produced.

Given the highly different starting points of the different port sites at the beginning of the project, the readers who are not familiar with the initial context specific conditions are highly encouraged to read the "Backgroud to Port Sites" section of the EPIC202 deliverable 6.2 – "Final Report"

2 Key elements of project activities relevant for work packages 2,4 and 5.

Due to the highly intertwined nature of the activities performed within different work packages, first an overview of the key development approaches in different sites are provided. There are then analysed with respect to their relevance for different work packages.

2.1 Common to all sites

A critical observation was made by Linköping University and was related to the fact that some of the local project partners initially had highly limited knowledge about industrial symbiosis (IS) concept and inadequate experience with facilitating the development of networks that can effectively support IS developments. Unfortunately, the WP leader was within this category. This was a major bottleneck, as it is very hard to motivate stakeholders to join a network, if the objectives of the network cannot be clearly communicated. As a response to this demarcation, a two-day awareness raising and training workshop was organized by Linköping University in the beginning of December 2013. During this event, the partners were taken to a study tour where a bio-based IS network is operational, and had the chance to interact with the private and public representatives that are a part of this network. During these two days, they were also introduced to approaches that are proven to be effective or the development of networks providing the right support for IS. As part of this training, partners have developed their draft network development to plans, and had an opportunity to discuss and receive feedback on their draft plans. This event was certainly highly useful for capacitating the project partners. However, such a short exposure to relevant knowledge and methods is not sufficient to acquire strong skills. Moreover, some of the people who attended this training have left their organizations during the project's lifetime, or had limited involvement with direct network development activities.

2.2 Key activities in Akarport

The networking activity in Akarport started from a very unfavorable position. The region lacked any networks or examples to build on; there was highly limited commucation and collaboraton among actors; level of trust was low, and the project partner was rather peripheral to the region. Moreover, there were no leverage point to build on.

Initial set of actors to be engaged in the network were identified through the limited contacts of the coordinator and indirectly through the local chamber of commerce. Actors from relevant sectors– including animal farms, cheese production companies, slaughterhouses, aquacultures / fish farming units, olive mills, rice producers–were identified and provided with information about project's objectives and ambitions.

A network launch event was organized, to which Linköping university and other project partners also attend. In this meeting, stakeholders were provided with more detailed information about the

project, and its working methods. A small number of relevant actors attended this meeting. This initial group was able to qualitatively identify common problem areas as well as potential opportunities linked to regional bio-resource use and discharge. However, it was not possible to formulate any concrete solutions or quantitatively define the scale of problems and potential opportunities. It was also acknowledged that the number and diversity of involved stakeholders needed expansion.

As the region was characterized as having very poor data on biomass resource availability, a door-to-door data collection event was initiated. This was helpful in terms of engaging some actors, as more time was spend with them individually. However, there was also significant challenges. Actors didn't want to meet the project partners, or provide data. In such situations, local coordinators turned to proxy organizations like associations to gather relevant input. Eventually, sufficient data was collected through direct contacts and secondary sources and some concrete development opportunities were identified with the help of analyses performed within WP3.

Based on the outputs, the actors with highest relevance to the identified options were invited to join an incubator – expected to server for the discussion and refinement of ideas. Actors were approached and invited on a voluntary basis. As the municipalities were identified as key partners for the most important development idea, their involvement in subsequent discussions were prioritized by the local coordinator. However, to engage a public sector representative in the process took a very long time, due to the significant changes taking place with the public sector organizations. This has significantly delayed re-initiation of networking efforts. However, eventually, actors with key relevance to the identified development options were brought together and were engaged in a dialogue around specific development ideas. This was an important point, as more focused and open discussions started to take place and communication among actor intensified. Involvement of a competent external organization – Clean Energy, who also performed the data collection and analyses – contributed to most network meetings.

A number of meetings were organized where technology, economy, logistics, financing, legislative interventions, licensing and permitting, and communication related aspects of the identified opportunities were discussed; explored and refined different development ideas. As some ideas started to take shape, the project coordinators developed a better understanding of which other actors in the region could contribute to and/or benefit from these more concrete potentials. This allowed them to more successfully target and engage additional players. As the focus became stronger on the biogas related development–which also represented a big development opportunity for the port– other actors started to drift away. There was also a problem about different people representing different actors in different meetings. However, as the discussions continued, involved actors were able to further refine and develop the ideas. They also developed a much better appreciation of the importance of physical and administrative strengths the port has provided for the key development opportunities.

The differences between private and public organizations caused frustration in times, and eventually a decision was made to follow different paths for the development of biogas plants. However, both the private and the public actors greatly appreciated the increased and more open communication with each other. Only at the end of the project, the local partner admitted that he has ignored some other development ideas for the benefit of some others. He also acknowledged that they tried to steer network interactions too much, and did not leave enough room for free discussions.

Very few of the local stakeholders took part in trans-national networking activities, motivated primarily by the lack of funds. Networking activities within the country was also performed mostly by the project partner, and to a lesser extent by the subcontracted organization.

At the end, a relatively small but fairly dedicated core network was formed and presents a health diversity of public and private sector actors representing key sectors of the region. A limited number

of actors also manifested their commitment to continue working with the identified ideas after the end of EPIC2020.

Although this was not a specified intention for this region, the project activities have also influenced local/regional policies in favor of IS developments, by: of the project activities in this region, re

- Bringing biogas production as a more productive waste managemene alternative for the organic fraction of MSW;
- Supporting the land-use plans towards concentration of pig farms – which will allow collection and processing of their biowastes possible. Due to lack of knowledge, options like composting without energy revalorization are promoted in local waste management plans.

2.3 Key activities in Malmö

Network development efforts in Malmö started from a very favorable situation. An IS network development effort was initiated in 2011 and two large events were organized. More than 20 local actors were involved in these events, and they already contributed to a resource mapping work. So, rather than having a dedicated network launch event, EPIC2020 was introduced to the existing network in an event where more than 50 individuals representing 20 organizations took part. In addition to the industrial players, members of the so called “expansion group” which is tasked with driving the development of the new harbor area–was also identified as an important target group. The group has decision power over new establishments in the harbor area and consists of the highest management at CMP (port operator) and directors of the technical departments in the City of Malmö.

A core coordination group was formed, with representation from the environmental department of the municipality, the energy utility company E.ON, and Linköping university.

Using the data collected earlier, a number of symbiotic development scenarios were created by this core group, by giving broader societal sustainabilty ambitions and trends and maintaining a holistic view (the outside-in approach). These scenarios were presented to the network members. Alongside, Based on these scenarios, a key target group was identified and the ideas were presented. As expected, different actors showed different levels of interest for different ideas. It is concluded that outside-in approaches needed to be complemented by an inside-out approach, that is more attentive to core business interests and particular agendas of individual organizations. The need to perform coherent and systemic assessments from the perspective of individual organizations was identified. A framework as shown below was created to guide efforts in individual company assessments, and companies were invited to work with this framework. The expansion group was informed about the developments.

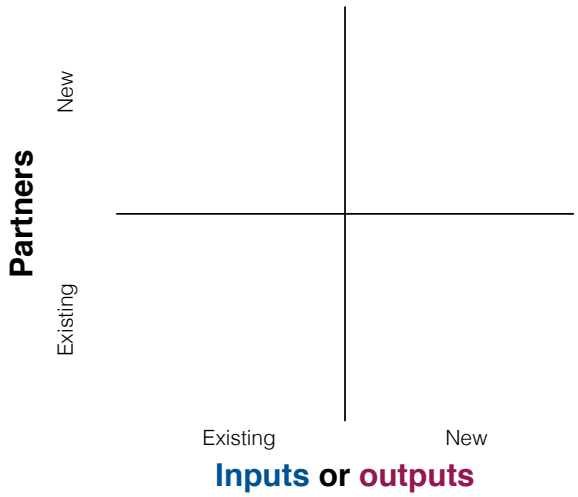

Figure 1: Synergy assessment framework used for inside-out assessments.

To assist the efforts of interested actors, project coordinators paid them visits and conducted detailed interviews. These gave them an idea of different options considered within different actors, and allowed them to cross-fertilize ideas. Actors also arranged bi-lateral meetings to further develop and/or refine their ideas. As this work continued, some actors, particularly those with a clear opportunity in energy related synergies, grow more and more interested, while the interest started to fade from others.

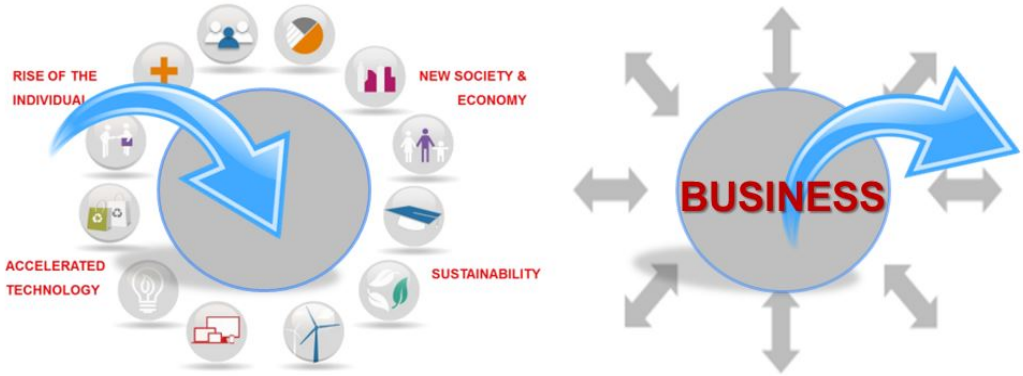

Figure 2: The outside-in and inside-out approaches

As ideas started to emerge, workshops with thematic foci were organized. Members first created their gross list of options, and then focused on those that were of high importance in the short run. A short-list was created from the perspective of every company. A sample shortlist of opportunities created by the local energy utility company is shown below:

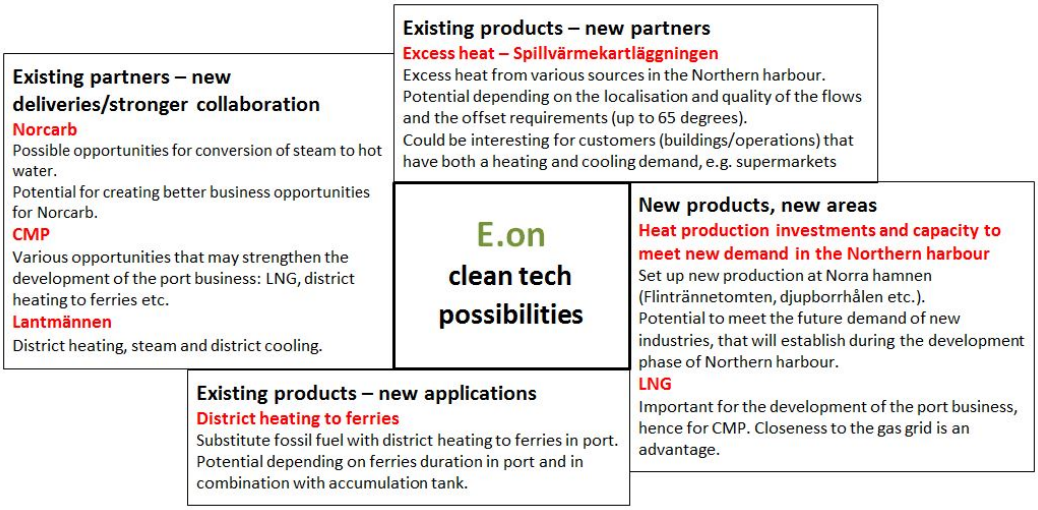

Figure 3: Shortlist of cleantech opportunities for E.ON.

These were again discussed in workshops, and a decision is taken to apply for national money to further explore the identified options. A much larger number of actors committed their own resources and the application was co-funded by the Swedish innovation agency. Within this project, actors continue to explore identified options, as well as searching for new ones. Some of the ideas that were identified are already implemented; some got approved for investments, and some others are still being investigated.

With the more concrete development ideas being pursued by local actors, the expansion group was approached again. This group took a decision for all technical departments to appoint representatives on management level to address within the Industrial Symbiosis focus area. This was an important step to get all departments inline and well informed about projects and actions that wins on a gathered planning approach. The work with the vision for industrial symbiosis was approved by the group and carried out as a cooperation between the different departments at the City and CMP. The vision is to be presented at the next meeting in August 2016. It also needs to be noted that based on the insights gained by the project, the municipality's environmental program was upgraded to include industrial strategy as an integral part.

Efforts towards the development of a marketing framework for Malmö were also initiated. As part of this work key target groups and their expected communication preferences were assessed. Based on this key communication channels and contents were determined and a draft framework was formulated. This framework will be discussed with the higher level decision makers by the end of August, adjusted if necessary and be put into use following approval. This framework also proposes the establishment of a symbiosis center in Malmö.

Work was also initiated towards the development of symbiotic development agreements. A team in Malmö first studied other similar agreements the municipality has used in other sustainable development initiatives("Climate contract for Hyllie" and Environmental build programme for Western Harbour" – both sustainable neighbourhood development programs). Interviews were also conducted with companies and key stakeholders exploring level of commitment and ambition, the focus of content, and interest in joining the agreement. Formulation of a document which is more in line with "principles of operation" were considered to be more appropriate, and is considered to be developed for two different stakeholder groups: industry and utility companies. As this agreement will be closely linked to the vision for the region, the project team also considers its finalization after

the approval of the vision more appropriate. For the time being, interested parties will be invited to include their logo on the draft vision to manifest their support.

In between these developments, a number of national and trans-national events were organized in Malmö. The developments created a lot of interest from municipalities in southern Sweden, but also in other parts. Due to its extensive work with IS in Sweden, Linköping university has also been highly instrumental in maintaining a two way flow of information and experiences. Inspired by the interest the topic receives in Sweden, LiU has initiated the efforts to develop a national network on IS. Already more than 20 companies and a number of municipalities from different parts of Sweden are involved in this currently informal network.

2.4 Key Activities in Mantova

In this region there were very diligent networking activities and approaches. Agire and the province met. They divided the key actors in the three categories: businesses, citizens, and public authorities. They identified those that were more available for the networking activitis. They build a list of actors (with 40 companies; a list of public bodies, and a list of citizen associations). Project partners also reached out to the industrial partners in the area using their existing networks, as well as through hub-organizations like “industrial association of Mantova”. When identified actors were invited to be a part of the network, among others, they were informed that this was an opportunity to influence future strategies of the region. These efforts triggered some curiosity with a range of stakeholder. Initial hearings were organized with different stakeholder groups and the project, its objectives, and working methods were presented. As the local parties felt that they didn’t have enough insight on IS concept, LiU was invited to join these events. Network was starting with few members- participation at the beginning was very low- but the network was going to be a forum and a continued forum. Initial set of ideas started to be collected. In light of the likely closure of the local oil refinery, the idea for its conversion to a bio-refinery was put forward.

Through the use of personnel contacts some additional actors were interested in the project. In order to provide necessary input to WP3, an information collection campaign was initiated. However, the key industries in the region remained passive. They continued to take part in project’s network meetings, but they were not providing any active support. According to the local project partners, this was primarily due to the fact that actors–whose engagement in, and support to, the network were desirable–did not recognize a meaningful value the project could deliver for them. Necessary data was collected primarily using secondary sources, such as permit applications and environmental reports.

The bio-refinery idea was enriched with another idea created as part of another project. Alongside, in light of the WP3 findings, development of two biogas plants appeared as a promising idea. This made local livestock farmers and slaughterhouses an important stakeholder group. An agricultural association was approached and joined the network. These are combined with other ideas generated in earlier discussions, and a study for their detailed feasibilities have started.

While the feasibility studies were being conducted, a number of workshops were organized, investigating different options. It was extremely difficult to engage top managers with executive powers in the network meetings, and the people representing these organizations didn’t have any real power to make decisions. The problem was exacerbated in cases where the local plants were subsidiaries belonging to headquarters outside the region. Therefore, the consideration of key actors was an evolving process.

As the bio-refinery conversion idea gained importance, a new project was initiated, concentrating on the creation of the value chain for this development, by covering actors within a 70 km radius. This allowed the project to reach out to a wider set of actors. Some of them started to manifest their interest to become suppliers to, or clients for, the future bio-refinery. The regional authorities have also started to give more attention to the bio-refinery idea.

The feasibility studies were completed and showed attractive results. Some of the actors that were keeping a distance, were starting to get interested. It was also time for the project to focus its efforts on providing policy guidance for desired developments.

First actors representing key target groups–industry, public bodies and communities–were identified and their input regarding future development interests and concerns captured systemically through public hearings and local meetings. Such input was fed to a working group formed by relevant departments of key public organizations (at municipal and provincial levels) with good operational competence. This group, through various internal consultations, has formulated an initial vision, which was then discussed with the local stakeholders in a public hearing. Based on the feedback collected in this event a refined vision document was created, to be discussed by the politicians. As this draft was customized by their voters, the politicians were more perceptive and respectful to this vision and provided their own comments. A new vision was formulated based on their input and was presented back to the politicians. As they are better informed about local tools and processes, that can best orient local choices and paths–to propose a roadmap that can lead to this vision.

Alongside, with the help of competent personnel from the provincial planning department those steering documents with high relevance for the desired developments and for affecting the development of the port were screened out and possibilities for making them more supportive for IS were identified. As part of this exercise, an action directive was prepared to implement IS in the region. When approved, by the if the policy council of the province, then the relevant local and regional bodies will have the right to modify governance tools in the region–such as influence the energy plans or resource use plans.

The process followed in Mantova also had an important capacity building impact for new policy/strategy development with a more holistic approach and longer time horizon – which is considered unique for Italy. The experiences with this exercise were captured and compiled into a guideline document for the use of others.

2.5 Key Activities in Wismar

In Wismar, network development efforts also concentrated on integrating and nurturing the IS idea and project objectives and working methods within existing networks. Project partners with belongings to multiple networks were well positioned to do this. The unexpected withdrawal of Wismar port authority made access to some of the desired stakeholders very difficult.

The actors identified the areas where EPIC2020 objectives intersected with interest areas within existing networks. Through this exercise, they identified development ideas – such as heating facilities fuelled by renewable fuels. Following this, the partners wrote down what they wanted to achieve with the project and prepared a plan. Due to such structure, interesting new research areas were identified, such as how the advanced logistics competencies could be deployed for the increased use of biofuels.

Networking activities quickly spread to Rostock, which replicated developed approaches and achieved good results. There has also been extensive national and international networking, that were highly useful for profiling the project within a wider base.

The main activity for the stimulation of bio-energy resource synergies was the development and testing of a "communication and logistics tool", the purpose of which is to catalyse increased bio-energy use and bio-energy business development by providing improved information on the regional supply and demand dynamics for bio-energy resources. First, an existing tool designed to handle only woody biomass resources were modified to handle a much broader spectrum of bio- as well as other residual resources. The tool was then tested extensively in Wismar area focusing on woodchips and in Rostock area for straw. Additional tests, with limited breadth and depth, were conducted in Malmö and Mantova, focusing on farming residues and animal wastes, respectively. The observations and feedback from these field tests were compiled and analysed in order to identify success factors and barriers, as well as opportunities for further improvements.

3 Key findings from the work package 2 activities and results

3.1 Akarport

Networking activities in this region started from a highly unfavorable position and has been slow and demanding. However, significant progress was made and a functional and well-capacitated network has been created.

With regards to the EPIC2020 expectations placed on networks, the position of the emergent network can be summarized as following.

Table 1: Network competencies in Astakos with regards to EPIC2020 expectations.

Desired abilities of the networks	Observed situation
Identify possibilities for creating industrial symbiosis within the port-located industrial area as well as between the port and nearby urban areas	☺
Assess obstacles and challenges for symbiosis– rooted in physical, fiscal, legal, technical, organizational domains	😐
Assess competences and training needs of relevant stakeholders	☹
Define division of specific and shared responsibilities amongst stakeholders	☺
Find the business in bioenergy resource based symbiosis and bring this to the center of public policy debate–in interaction with the business community and other institutions	☺
Identify and communicate overarching benefits linked to symbiotic bioenergy resource relations within the port-located industrial area as well as between the port and nearby urban areas	☺
Ensure media attention and citizen awareness around symbiotic bioenergy resource relations	☺
Attract interest on the regional and national levels	☺

☺: Strong progress; 😐: Progress with limitations; ☹ :Weak progress

The strengths of the network can be summarized as following:

- a balanced mix of public and private actors;
- a good representation of key sectors of the region;
- significantly improved understanding of the concept of IS and its benefits;
- significantly improved understanding of bio-energy resource potentials;
- significantly improved understanding of symbiotic partnership opportunities;
- significantly increased levels of communication and trust among actors;
- significantly improved capabilities for exploring partnerships;
- significantly improved understanding of the importance of the port's physical and administrative strengths with regards to bio-energy synergies.
- The network managed to further develop a limited number ideas bringing them closer to implementation;

The weaknesses of this network can be summarized as following:

- Lack of strong commitment from actors;
- Limited openness;
- Lack of knowledge organizations (in its future);
- Network relying too heavily on a single actor, who also defines the main agenda;
- Some key actors drifting away from the network
- Network continuity is unsecure;

Strong elements of the network development activities can be listed as:

- Ability to create options around shared interests;
- Bringing external resources with useful competencies;
- Insisting on bringing public and private actors together;

Weak elements of network development efforts were:

- Weak understanding of the network coordinator about IS and networking (at the beginning)
- Development process has been unnecessarily slow;
- Potential ideas were identified too late in the process;
- Focus areas were heavily influenced by the interests of a single actor;

3.2 Malmö

Networkig activities in Malmö were more focused on improving the capacity within an existing newtork, making it more focused and effective, and expanding its member base – in terms of active participants, diversity of participants and their geographic reach.

With regards to the EPIC2020 expectations placed on networks, the position of the emergent network can be summarized as following.

Table 2: Network competencies in Malmo with regards to EPIC2020 expectations

Desired abilities of the networks	Observed situation
Identify possibilities for creating industrial symbiosis within the port-located industrial area as well as between the port and nearby urban	☺

areas	
Assess obstacles and challenges for symbiosis– rooted in physical, fiscal, legal, technical, organizational domains	☺
Assess competences and training needs of relevant stakeholders	☺
Define division of specific and shared responsibilities amongst stakeholders	☺
Find the business in bioenergy resource based symbiosis and bring this to the center of public policy debate–in interaction with the business community and other institutions	☺
Identify and communicate overarching benefits linked to symbiotic bioenergy resource relations within the port-located industrial area as well as between the port and nearby urban areas	☺
Ensure media attention and citizen awareness around symbiotic bioenergy resource relations	😐
Attract interest on the regional and national levels	☺

☺: Strong progress; 😐: Progress with limitations; ☹ :Weak progress

The strengths of this network can be summarized as following

- Excellent representation of public, private and knowledge sector actors;
- Significantly increased number of active and committed members;
- Significantly increased communication and trust among members;
- Significantly increased diversity of members;
- Good prospects to maintain and expand its activities;
- Very strong links to relevant regional and national actors;
- Includes strong champions

The weaknesses of this network can be summarized as:

- Limited involvement of entrepreneurs;
- Overly focused on existing actor interests (so far)
- Limited, but growing, involvement of key public sector actors;

The strong elements of network developing activities were:

- Quick generation of ideas capturing actor interests;
- Strong member participation in idea generation;
- Good awareness of actor roles relevant for network development;
- Active involvement of two champion actors;
- Strong presence of actors with relevant competencies;
- Excellent outreach to local and national actors;

Weak elements of network development efforts were:

- Some actors could not be kept interested;
- Too much focus was placed on ideas involving existing actors;

3.3 Mantova:

Networking efforts in Mantova have been very diligent. The emergent network has a very strong involvement of the public sector actors and citizens. Althoug industries from within the region are also active in this network, local industry presence and support is remains weak (primarily because bio-based developments are a major competitor)

With regards to the EPIC2020 expectations placed on networks, the position of the emergent network can be summarized as following.

Table 3: Network competencies in Mantova with regards to EPIC2020 expectations

Desired abilities of the networks	Observed situation
Identify possibilities for creating industrial symbiosis within the port-located industrial area as well as between the port and nearby urban areas	☺
Assess obstacles and challenges for symbiosis– rooted in physical, fiscal, legal, technical, organizational domains	😐
Assess competences and training needs of relevant stakeholders	😐
Define division of specific and shared responsibilities amongst stakeholders	☺
Find the business in bioenergy resource based symbiosis and bring this to the center of public policy debate–in interaction with the business community and other institutions	☺
Identify and communicate overarching benefits linked to symbiotic bioenergy resource relations within the port-located industrial area as well as between the port and nearby urban areas	☺
Ensure media attention and citizen awareness around symbiotic bioenergy resource relations	☺
Attract interest on the regional and national levels	☺

☺: Strong progress; 😐: Progress with limitations; ☹ :Weak progress

The strengths of this network can be summarized as following

- Very strong public sector and citizen representation;
- Very strong links with regional actors relevant for value chains of development ideas
- Significantly improved understanding of the concept of IS and its benefits;
- Significantly improved understanding of bio-energy resource potentials;
- Significantly improved understanding of symbiotic partnership opportunities
- Good cooperation among public sector actors
- Working in pursuit of an idea with a big potential

The weaknesses of this network can be summarized as:

- Limited contributions from industrial members;
- Limited involvement active industry representatives;
- Strong resitence from actors linked to petro-chemical industry;
- Limited participation from people with decision power;

The strong elements of network developing activities were:

- Highly systemic networking and outreach efforts;
- Very organized, responsible and competent network organizer;
- Strong member participation in idea generation;
- Ability to bring in needed competencies
- Excellent outreach to local and national actors;

Weak elements of network development efforts were:

- Project coordinators had limited understanding of IS and networking at the start;
- Purpose of data collection was not properly explained;
- Some actors could not be kept interested;
- Too much focus was placed on ideas involving existing actors;

3.4 Wismar

Networking activities in Wismar also focused on integrating the IS concept and the project objectives into existing networks.

With regards to the EPIC2020 expectations placed on networks, the position of the emergent network can be summarized as following.

Table 4: Network competencies in Mantova with regards to EPIC2020 expectations

Desired abilities of the networks	Observed situation
Identify possibilities for creating industrial symbiosis within the port-located industrial area as well as between the port and nearby urban areas	😐
Assess obstacles and challenges for symbiosis– rooted in physical, fiscal, legal, technical, organizational domains	☺
Assess competences and training needs of relevant stakeholders	☹
Define division of specific and shared responsibilities amongst stakeholders	☺
Find the business in bioenergy resource based symbiosis and bring this to the center of public policy debate–in interaction with the business community and other institutions	☺
Identify and communicate overarching benefits linked to symbiotic bioenergy resource relations within the port-located industrial area as well as between the port and nearby urban areas	☺
Ensure media attention and citizen awareness around symbiotic bioenergy resource relations	☺
Attract interest on the regional and national levels	☺

☺: Strong progress; 😐: Progress with limitations; ☹ :Weak progress

The strengths of this network can be summarized as following

- Built upon existing networks with good continuity prospects
- Ability to generate innovative ideas grounded in core orientations of actors;
- Efficient completion of required tasks;

The weaknesses of this network can be summarized as:

- Limited involvement active industry representatives (Wismar);
- Limited involvement of public sector actors;
- Lack of openness for new ideas from dominant industrial sectors (wood cluster)
- Incompatible cultures between public and private sector actors;

The strong elements of network developing activities were:

- Very organized, responsible and competent network organizer;
- Strong member participation in idea generation;
- Ability to bring in needed competencies
- Excellent outreach to local, national and international actors;

Weak elements of network development efforts were:

- Network development is overly influenced by coordinator organizations and their core interests;
- Inadequate attention given to non-fuel based synergies (ie. Steam integration)

3.5 Conclusions and recommendations

Key conclusions of this section can be summarized as following:

- In all regions, networking efforts have been successful, resulting in significantly improved understanding of IS concept and its potentials, symbiotic business development opportunities.
- Networking efforts have brought actors with common interests together, that had limited or to interaction prior to the project;
- Level of trust has significantly improved among actors;
- Developments were much more and quicker in regions with suitable networks in place and with embedded coordinators.
- Trans-national interactions are highly appreciated. Actors were happy to learn about, and be inspired by, others who are dealing with concerns by common and differing approaches.

Network development is a path dependent and slow process. Developments are particularly difficult if network members are expected to gather around a new idea and the benefits are not immediately clear. This is why in areas with reasonable understanding of the idea of industrial symbiosis, or with the presence of network who can easily make a bridge between their core foci and the IS idea, more effective networks have been developed.

It is critical that parties with responsibilities to drive network development have a thorough understanding of IS concept and nuances of network development. Although this focused capacitation can delay the process in the beginning, its long term implications would be highly beneficial. Organizations with relevant understanding and experiences should be brought in to provide necessary support.

The embeddeddness and identity of project partners also have a significant impact on the network development. Individuals or organizations with good local connections and a history of credible work

have a better chance to more effectively drive the network development process. Finding such organizations/individuals (the so called anchor tenants) and forming partnership with them in the development process is a sensible strategy. However, if the person/organization has a particular interest within a specific scope, ideas outside this scope may not develop as much.

Industrial symbiosis efforts are coordinated with limited resources. This does not allow for following all opportunities with the same detail and energy. Therefore, focusing attention is necessity, particularly if the network members are not able, or willing to carry necessary assessment/development activities themselves. Priorities need to be set, but it is important to be clear about the temporality of this action and keep peripheral vision. When progress is made in one area of focus, a new focus relating to other interests should be chosen.

Also related to the above, there is no “one-size-fits-all” approach when it comes to network size. Different approaches come with their respective strengths and shortcomings. For example, limiting the number of targeted members at earlier stages allows the development process to remain focused, secure stronger commitment from involved parties, and sustain interest from parties. Having too narrow of a focus, on the other hand, faces a real risk of leaving an important share of the development opportunities unidentified. Having a broader network gives more opportunities, but has the risk of shallow member engagement and coordination difficulties arise. Thus, an approach resembling a hairglass could be helpful. This implies starting with a large member base, but swiftly focusing on areas which can give quick returns. Once success can be demonstrated, focus can be turned to the wider group, and new orientations can be prioritized.

In general, it is very important to find development opportunities to which the network actors can relate to. In order assist this, some background work on the region and in the relevant literature and media can be performed. Identifying local people with IS experience and putting them on the center stage will also be helpful. However, attention should also be paid that the examples are not the whole project, and additional ideas relating to wider base will be developed within the process.

Developing public-private partnerships is often a very desirable objective. However, this cannot be turned into an end by itself. In cases where the differences between these sectors are too large, a very gradual approach should be considered to bring these actors together. Else, significant frustration can be caused at both sides.

There is also a critical distinction between quantitative and qualitative aspects of networks. For an idea like IS, that is new and where actor diversity and number is often a positive factor to identify new options having a large number of networks is desirable. However, with growing numbers it also becomes harder to keep network members interested and engaged. Recent research in the field highlights that different organizations, and individuals, in addition to their core business and identity, may have particular strengths to contribute to the IS network developments. A utility company with existing distribution assets can serve as a good “enabler”; a respected and trusted figure can be a powerful “champion” to create enthusiasm and engagement; or an actor with large resource needs and outputs can be an important “physical anchor” around which many new connections can be initiated. These functional considerations will benefit increased actor engagements and more effective development of networks.

Despite significant challenges, and “slower-than-usual” development processes observed in certain port sites, EPIC2020 has been immensely instrumental in creating and capacitating relevant port sites. It is critical that the momentum created within the networks will be maintained and enhanced, and the networks will move to the next levels of their complexity and effectiveness.

4 Key findings from the work package 4 activities and results

Some of the positive findings from this work package can be summarized as following:

- All regions have identified meaningful symbiotic development possibilities, most receiving adequate support from their stakeholder base;
- In Malmö and Wismar, some ideas got already implemented.
- Akarport prioritizes ”conversion-enabled” synergistic development, which was originally considered too advanced for them;
- Although not a planned outcome, in Astakos WP4 activities also stimulate supportive policy interventions.
- With expanded use of the communication and logistics tool, a relatively large virtual market can be created with direct implications on regional bio-energy resource exchanges.
- As would be expected, opportunities that have a clear benefit; a straightforward technological solution; a reliable supply condition, and simple decision path (ie one actor deciding); things move very swiftly (such as the hard coal plant deciding to switch to straw).

Findings on challenges

- There is often a big gap between generic opportunities to and ideas that can be implemented in the short run.
- Two of the conversion enabled synergistic developments projects in Malmö are put on ice due to unsupportive market conditions and policy environment.
- Limited “new business development” focus in Malmö during EPIC2020, but this will have a bigger focus within the follow-up project.
- Some of the most promising alternatives for Mantova currently have no clearly committed partners to drive developments.
- The realization of ideas that require decisions from multiple actors take place slower; specially if there are competitive tensions or cultural differences (such as public and private bodies).

In this work package four different approaches have been implemented with different outcomes. These have differences as well similarities, as well as their own respective strengths and shortcomings. Their applicability will depend on the prevailing conditions in the port sites.

Looking at the experiences in Malmö, Mantova and Akarport collectively, the importance of combining high level analyses with organizational level input becomes very clear. This can be done at different levels of ambition and complexity. For regions where the organizational and network capabilities are relatively under-developed, starting with WP3 findings, and using them as a starting point for collectie discussions over a series of meetings produces results that have a common ownership. In the process actors not only fine-tune ideas and bring them closer to their level of interest, but also improve inter-organizational connections. This, however, requires the prsence of interest from a critical number of actors to engage in, and contribute to relevant discussion.

The approach taken in Mantova is useful if the actors are not very interested in investing the resources to further improve the understanding about identifed options, of if they don’t have necessary capabilities to do so. A central organization taking on the responsibility and clarifying the techno-economic outlook of tabled options can then be trigger of increased interest. The downside

with this apporach is that fine-tuning an idea and creating ownership for its implementation gets disconnected. Moreover, the feasibility studies face the risk of giving inadaeque consideration to important organizational issues – such as complexity of managing necessary inter-organizatioal relationships. The results in Mantova had their strengths in the sense that it performed the feasibilities of big and complex projects diligently. The results were very attractive and created a rather big interest from potential developers. However, the actor involvement in the process was limited, making the final interest in the ideas insecure.

The approach tested in Malmö has clear strengths. Starting from holistic view of the activities and creating a list of potentials by looking at the companies from the outside enables the creation of a range of development scenarios that are aligned with the sustainability objectives of the region. These, however, are not necessarily ready to be taken up by the local actors, at least in the short run. Adopting views grounded in the realities of individual companies, and reassessing synergistic development possibilities that are most relevant and interesting for them increases the applicability of the ideas. When commonalities are found between priority areas, developments move to the next step much faster. However, in order to be able apply such a method regional actors need a rather good understanding of the activities performed by the others; should have both the will and the resources to perform rather comprehensive assessments; and should have the inter-organizational communication and trust to mobilize on identified option.

A completely different approach of creating a virtual marketplace with democratic and credible information on bio-energy resource supply and demand conditions appear to work effectively in developing new transactions. However, for such a system to deploy its full potential, it needs to be used for a larger number of actors. Moreover, unlike the use cases tested in Wismar and Rostock (woodchips and straw) other bio-energy resources, particularly those embedded in waste streams that are much more variable and complex–will require the integration of other functionalities to the tool to deliver utility. Such attempts have started within EPIC2020 but are in need of further developments.

A very important consideration for these activities relates to staying connected to wider pool of opportunities identified. Once the options for which there is higher interest for action are set in motion, the project coordinators should turn their attentions to the remainder of the alternatives idetntified, and continuously monitor their applicability in terms of the dynamically changing characteristics of the context.

5 Key findings from the work package 5 activities and results

This work package formed one of the backbones of the project. However, limited progress was possible due to a combination of reasons, including: being the last task in the flow; being overly dependent on the outputs of other work packages, and; requiring rather new and demanding competencies. However, the progress made and the outputs created in both Mantova and Malmö are highly valuble and are likely to have a significant impact in the future.

The followed process of bringing ideas from the grassroots of the key sectors, merging them with newly identified development opportunities and exploring policy interventions that could lead to the realization of developed visions were unique and highly valuable. In doing this, the actors in the regions have been successful in targeting relevant key stakeholders. Due to the more integrated nature of the city and the industrial port site, compounded with the increased tension between the two due to environmental concerns made the involvement of citizens in the process critical. Despite repeated efforts, however, the involvement of the industry in this process has remained low. As the process included many consultations and integrated the views of a broad stakeholder base they gained better acceptance (or faced less resistance)

In Malmö, on the other hand, the port is relatively isolated from the residencies, and the municipality is a trusted organization for properly controlling industrial activities so as to assure minimal disturbance for the local communities. Therefore, the direct involvement of the citizens in the port development discussions have less relevance.

The ability to engage competent people with awareness of both the content and the development process of locally applicable steering mechanisms in the process was highly valuable in Mantova. This allowed identification of targeted and feasible interventions. This targeted input was also highly appreciated by the public authorities, particularly those responsible for port management and planning; development of energy and renewable energy strategies; environmental and energy planning and urban planning, who developed a much better understanding a course of action they can take and how it can lead to a much needed revitalization of regional economy. As more concrete outcomes of this WP activities, in Mantova there are considerations to update the renewable energy program document, and include IS as an integral part. An interest to introduce the concept of “advanced infrastructure” – an infrastructure development approach that would strengthen technical potentials for resource exchange and actor integration – is also triggered.

Overall, WP activities in Mantova were highly instrumental in building capacity with the politicians. Politicians are highly informed about the project, about the fundamentals of IS, and how it can contribute to the region’s development needs and ambitions. They are also staring to think more holistically and within a longer time frame. This was a major achievement with significant long term implications.

The work performed also have implications in the wider context. An approach of this kind was not performed before for the systemic development of policies supporting symbiotic bio-energy networks. The guidelines prepared based on the experiences of Mantova will start valuable support for other regions interested in taking this challenge.

It must be noted that without all the previous work that set the ground for the this WP, progress would have been impossible. In similar future projects, the duration of the preparatory stage for the policy and strategy formulation work needs to be better adjusted to the context specific conditions; keeping in mind that building the right level of understanding and institutionalizing the concept can take a long time. .