

# Cross-fertilisation results

Project title: **European Lightweight Cluster Alliance**

Acronym: **ELCA**

D3.2. Cross-fertilisation results

Work Package 3. Monitoring and cross-fertilisation

Grant Agreement No 951158



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## 1. Objectives of the Work Package 3

The aim of the Work Package 3 was to ensure that the activities carried out during the intelligence analysis (WP1) and international missions (WP2) are continuously aligned with other lightweight-related initiatives, such as Alliance 4 Materials. The promotion of exchanges with other partnerships and clusters is also an activity to enable cross-fertilisation and mutual learning at different levels (OBJ. 4). Other initiatives funded and/or boosted by the EC (Smart specialization platforms -S3-, Interreg o H2020) were also linked to establish cross-sectoral collaboration. In the case of S3 platform some of them have been identified already: advanced manufacturing, safe and sustainable mobility, chemicals and advanced manufacturing and energy. The WP also aimed to establish a close collaboration with international development and innovation agencies at EU level, also in the targeted countries (OBJ.3). To do so, the WP was integrated by three complementary tasks in which dedicated activities were scheduled during the interregional workshops and international missions foreseen in the action.

WP leader: MAV      Duration: M6-M18

### 2. Task 3.1. Cross-fertilisation with other partnerships and initiatives

Leader: MAV    Participants: AMZ, POL, BIC, MECH; M6-M18

Considering the information retrieved from the relative positioning in T1.1, this task aimed to search for linkages with other partnerships in the COSME programme and EU-related initiatives across lightweight-related sectors (e.g., health, energy, building). Linkages with other international oriented EU clusters were sought too, with the aim of achieving a cross-sectoral participation (complementing WP1). MAV is the task leader, which identified in the first place those partnerships/initiatives that might be of interest to the partnership. MAV also assigned to each participant (e.g., according to region/interests) the work that was necessary to develop to achieve the objective of the task. This work included at least 1 regional and 1 international meetings and events for developing cooperation & business agreements with other EU clusters (and SMEs) related to mobility, lightweight and industrial-oriented focus (contacts already established with European Lightweight Cluster Alliance and Alliance 4 Materials). Other EU relevant stakeholders e.g., technological centres were targeted as well. In some cases, the international meetings were scheduled at the same time of partnerships meetings.

During the development of T3.1, MAV have established a strong link with European cluster initiatives in specific aspects e.g., European Cluster Excellence initiative (on best practices and lessons learned), European Cluster Observatory (on mapping of competences and ongoing experiences), and European Cluster Alliance (ECA) (on cluster policy and cluster development supporting instruments). MAV also organised meetings with other COSME Go International

(all ongoing ones) consortiums to share best practices and activities (at national/international levels).

### 3. WP3 Performance Indicators

The list of performance indicators for WP3 is indicated in **Table 0**.

#	Title	Description	Total
1	Number of <b>Cluster organisations</b> and business networks from different COSME participating countries having benefited from the supported actions	This performance indicator allows to measure the number of partnerships and related initiatives that are linked to the action, either coming from the lightweight domain or cross-sectoral.	12
2	Number of <b>Cluster Cooperation Agreements</b>	Number of cooperation agreements that partners sign during the execution of WP2/WP3 with other clusters and related organizations and SMES	12
3	Number of <b>Clusters/Consortiums and Intermediary Organizations Cooperation Agreements</b>		6
4	Number of <b>SMEs Cooperation Agreements</b>		20
5	Number of <b>SMEs Business Agreements</b>	Amongst SMEs in COSME countries and international SMEs, related to T3.1.	10
6	Number of <b>National workshops with SMEs</b>	To carry out T3.1 and T3.2, different events were organized, at national and international levels (including meetings with other clusters, companies, intermediary organizations and government agencies). This includes international events with clusters not initially included in the consortium. International meetings might be scheduled at the same time of partnerships meetings, interregional workshops and exploratory visits.	10
7	Number of <b>International meetings with other clusters, international companies, intermediary organisations or governmental organisations</b>		6
8	Number of other <b>international events</b> with clusters not initially included in the Consortium		6
9	Number of <b>cluster &amp; business matchmaking meetings supported</b>	This performance indicator is related to T3.1. At least one per country in WP3.	5
10	Number of <b>other sectors involved beyond mobility</b>	Number of sectors beyond mobility that were involved in the action through T3.1	3

**Table 0.** Performance indicators for work package 3

## 4. Cross-fertilisation Planning

On the following pages, there is described the planning that the ELCA COSME partnership carried out to achieve the necessary linkages, agreements, relations, meetings and workshops with organizations, Clusters, SMEs and other relevant stakeholders and initiatives during the WP2 and WP3 with the aim of enabling cross-fertilisation and achieving a cross-sectoral participation in the project.

To do so, there have been elaborated different tables according to the KPI's that the partnership must achieve during the period M6-M18. The different tables have a similar structure for each action, as detailed below:

- Type of action that needs to be accomplished
- Name of the organization/cluster/SME/etc involved in the action
- Cluster partner responsible of carrying out the action
- Description of the organization involved in the action
- Dates and location of the action
- Results and expectation of the action

Each cluster partner was responsible to achieve their own objectives assigned on the tables. On the same way, the leader of the task (MAV) made sure that the objectives were accomplished on a successful manner and on time. Those tables were used as a tool to monitor and control the progress of the performance indicators.

Tables have been filled according to the progresses of the project, in particular, the actions related to the exploratory missions. The tables were useful to monitor the KPIs.

The next sections of the document include a brief description of the action to be done and the related tables to describe and monitor the different actions.

## 4.1 Cluster Organisations and Business Networks

First, the cluster partners identified (**Table 1**) different cluster organisations from the five participating countries (from lightweight domain and cross sectoral) that could benefit from the supported actions during the project lifetime. Those partnerships and related initiatives have been involved in different activities during the project: events, involvement of experts, participation at international exploratory missions, etc. The network created during the first steps of the market study of the target regions were contacted before the exploratory missions to inform them about the project and every time that the consortium believed that there was an activity that could be interesting for both them and for the ELCA COSME; that relation has been kept for some of the member of this network.

1. Clusters and Business Networks from participating countries 12 in total	Responsible	Description	Dates & Location	Expectations & Results
<b>Composites United E-Germany (DE)</b>	AMZ	German-wide network of developers, producers and manufacturing companies, which focus on new composite materials.	26.05.21, online 03.09.21 online 19.11.2021 Dresden at LZS 04.02.2022 Online	<b>Expectations:</b> Direct engagement of network partners into the project activities, i.e., joint information events, involvement of experts, participation at missions. <b>Results:</b> The project has initiated a systematic collaboration with the network. CU members joined the innovation platform of ELCA and have participated actively in regional events as well as in missions and international roundtables. (Dubai, India, JEC Paris) CU received the consortium at 30.10.2021 in Dresden
<b>SenSa Sensor network (DE)</b>	AMZ	Sensor technology innovation cluster in Saxony.	10.03.2021 online 03.06.2021 Online	<b>Expectations:</b> SenSa includes a range of research institutes and companies, which

			19.10.2021 TU Chemnitz	<p>are important for the development and integration of innovative sensors into smart lightweight materials. We aimed to identify common fields of interest of our companies according to their strategies and resources.</p> <p><b>Results:</b> Finally, we have involved each other in activities, which have been aligned. SenSa members participated in our missions / events with USA and India. SenSa – members have been attracted to ELCA internationalisation activities.</p>
<b>C3 Network (DE)</b>	<b>AMZ</b>	Carbon Concrete Composite Consortium in Germany	30.07.2021 Dresden	<p><b>Expectations:</b> The C3 Network is a leading European partner in the field of lightweight materials for the construction sector (textile reinforced concrete). We aimed to attracting them to strengthen our position in the construction sector and to offer common products in the construction sector.</p> <p><b>Results:</b> Permanent working contacts established, mutual invitations to internationalization events, international workshops, and project consortia.</p>
<b>Leichtbau Baden-Württemberg (Leichtbau BW) and European</b>	<b>AMZ</b>	Industry driven Lightweight network, which is co-ordinating ELA (the	10.03.2022 online	<p><b>Expectations:</b> The objective was to align the activities and the capacities of both networks for more</p>

<p><b>Lightweight Association (ELA)</b></p> <p>DE and EU</p>		<p>other European lightweight initiative)</p>	<p>14.07.2022 Dresden, Freiberg</p> <p>31.08.2022 online</p> <p>30.09.2022, Berlin</p> <p>20.10.2022 online</p>	<p>visibility and synergies in Europe and at third markets.</p> <p><b>Results:</b> Finally, we have signed a co-operation agreement in a public signing ceremony at the K-Fair in Düsseldorf.</p> <p>The ELCA internationalisation project and the joint actions have been presented at the 9. National Lightweighting Forum in Berlin.</p> <p>Further common activities involving SMEs, RTOs and policy are scheduled.</p>
<p><b>Rail cluster Saxony DE</b></p>	<p><b>AMZ</b></p>	<p>Rail technology cluster in Germany</p>	<p>03.09. 2021 Dresden</p>	<p><b>Expectations:</b> to attract rail cluster members to our activities, as rail is one of the targeted sectors for lightweight applications</p> <p><b>Results:</b> information about opportunities forwarded to the cluster members, experiences exchanged on Cluster internationalisation projects (COSME), mutual involvement of cluster members into activities</p> <p>Establishment of working links with The European Rail Cluster Network ERCI</p> <p>i.e., meeting with BIC in Dresden 30.09.2021)</p>



<p><b>Saxony Economic Development corporation</b></p>	<p><b>AMZ</b></p>	<p>Government Economic Development corporation, linked with Germany Trade and Invest (GTAI)</p>	<p>Several meetings online Sept., Oct. 2021</p>	<p><b>Expectations:</b></p> <p>Awareness of the company on the ELCA internationalisation activities, mutual support</p> <p><b>Results:</b> expectations have been met, common matchmaking event with companies from Mexico 15.10.2021</p>
<p><b>Chamber of Commerce and Industry Dresden</b></p>	<p><b>AMZ</b></p>	<p>Chamber of Commerce and Industry, dpt. Innovations and tech transfer</p>	<p>Range of telf. and physical contacts, June 2022</p>	<p><b>Expectations:</b> Awareness and mutual information about opportunities and potentially interested companies</p> <p><b>Results:</b> stable informative contact established, invitations to regional events, where ELCA has been promoted, linkages with one potential partner company from Görlitz (bio-foams for car-interieur from wastes of leather ind.)</p>
<p><b>Enterprise Europe Network Saxony</b></p>	<p><b>AMZ</b></p>	<p>EEN Saxony and partners from the targeted third countries (India, Japan, USA, Chile)</p>	<p>Numerous contacts, monthly telcos, common event organisation</p>	<p><b>Expectations:</b> To create and to explore synergies, linkages with EEN-platform and databases (complementary) fast track to reliable partners in the targeted countries and to information for market access,</p> <p><b>Results:</b> highly efficient co-operation with EEN-partners in all target countries, matchmaking event with India realised together with EEN through the B2Match-platform, increased outreach to companies</p>

				and clusters because of the co-operation
<b>Cleantech Initiative East Germany</b>	<b>AMZ</b>	Initiative of the Federal Ministry of Economy and the German Chancellor to support cleantech-companies	Regular working contacts,	<p><b>Expectations:</b> to increase outreach of ELCA activities towards all East German regions, alignment of internationalisation activities</p> <p><b>Results:</b> Increased outreach, invitation by Federal Ministry of Economy to present the joint initiative with ELCA to the German lightweight community at the 9<sup>th</sup> National Lightweight Forum in Berlin (29.09.2022), increased visibility and new contacts to funding organisations and companies</p>
<b>IN-MOVE BY Railgrup</b> (Railway Cluster)	<b>MAV</b>	The railway cluster that represents the sector at all levels in Catalonia (Spain)	Regular contact	MAV contacted IN-MOVE in order to increase the outreach of ELCA activities sharing events and inviting members of IN-MOVE to meetings, missions and other activities of ELCA.
<b>CIAC</b> (Cluster of the Automotive Industry of Catalonia)	<b>MAV</b>	The Cluster of the Automotive Industry of Catalonia (CIAC) links the automotive sector based in Catalonia (Spain)	Regular contact	MAV contacted CIAC in order to increase the outreach of ELCA activities sharing events and inviting members of CIAC to meetings, missions and other activities of ELCA.
<b>HEGAN</b> (Aeronautics and Space Cluster Association)	<b>MAV</b>	HEGAN is an association that brings together the aeronautics and space sector in the Basque Country (Spain)	April 2022	MAV visited HEGAN in April 2022 in order to identify and explore synergies between clusters and to exchange best practices.

<b>Enterprise Europe Network</b>	<b>MAV</b>	International network to help SMEs to develop their innovative potential and grow internationally.	2 meetings per year	MAV is part of the EEN Catalonia. MAV and the contact person of EEN have meetings two times a year in order to put in common the MAV's international activities like the activities within the ELCA project. EEN supports MAV in dissemination actions and sharing relevant contacts.
<b>ACCIÓ - Agency for Business Competitiveness</b>	<b>MAV</b>	ACCIÓ is the Catalan Government's agency for business competitiveness.	Regular meetings	MAV is part of the Catalonia Cluster Programme of ACCIÓ. MAV and ACCIÓ are constantly in contact through a contact person of ACCIÓ. ACCIÓ helps MAV with its internationalization activities like the ELCA project.
<b>RIGHTWEIGHT</b>	<b>POL</b>	Network initiated by RIGHTWEIGHT Project. Polymeris met consortium partners to exchange findings and opportunities	On line meeting november 10 2021	As part of the contacts with RIGHTWEIGHT Project, it was expected a close contact between partners of both projects and, eventually, a business agreement between SMEs of the two projects
<b>Polish Chamber of Railway Equipment Manufacturers and Services</b>	<b>BIC</b>	Non-profit institution that brings together business entities related to the railway market	June 2022	The aim of the meeting was to integrate entrepreneurs associated in the Bydgoszcz Industrial Cluster Tool valley and Polish Chamber of Railway Equipment Manufacturers and Services and the scientific community of Bydgoszcz University of Technology, and to exchange of experience and good practices.

<b>Art-ER</b>	<b>MECH</b>	Non-profit agency fostering region's sustainable growth by developing innovation and knowledge, attractiveness and internationalisation	June 2021	Collaboration for promotion of initiatives in Emilia-Romagna region
<b>Clust-ER Green Tech</b>	<b>MECH</b>	Energy and sustainable development cluster of Emilia-Romagna	September 2021	Collaboration for promoting initiatives and activities for cross-sectoral potential interests

**Table 2.** Clusters and Business Networks from participating countries

## 4.2 Cooperation Agreements

As a result, from the supported actions and to involve other clusters, business networks, consortiums and SMEs to the project, a total of 38 cooperation agreements were expected to be signed during the execution of WP2 (exploratory visits) and WP3 (cross-fertilisation events) between ELCA COSME partners and relevant organizations, at the end of the project several agreements (20) were signed. Some of the members of the consortium are still working on future agreements to increase the cooperations with states not members of UE.

Cluster MAV, as leader of the WP3, prepared a cooperation agreement template and provided it to the rest of partners. The template was delivered in August 2021. Each partner was responsible to contact and interact with the identified clusters, SMEs and other organizations to obtain the cooperation agreements with them.

The following tables (**Table 3, Table 4 and Table 5**) were filled by Cluster MAV as soon as the cooperation agreements were signed.

<b>2. Clusters Cooperation Agreements (from our countries)</b> 12 in total	<b>Responsible</b>	<b>Description</b>	<b>Expected date of signature</b>
<b>Composites United E-Germany (DE)</b>	<b>AMZ</b>	German-wide network of developers, producers, and manufacturing companies, which focus on new composite materials.	Start of co-operation 2021. <b>SIGNED</b>
<b>SenSa Sensor network</b>	<b>AMZ</b>	Sensor technology innovation cluster in Saxony.	Started Jan. 2021 <b>SIGNED</b>
<b>Leichtbau Baden-Württemberg / ELA</b>	<b>AMZ</b>	Leichtbau Baden-Württemberg/ ELA	20.10.2022 <b>SIGNED</b>

<b>CDI</b> <b>Cluster Dekarbonisierung der Industrie</b>	<b>AMZ</b>	CDI is a Cluster of the German Energy intensive industry. ELCA and CDI intend to collaborate in projects to promote European lightweight materials and technologies for applications that save CO2-emissions.	Started Nov. 2022 <b>TO BE SIGNED JAN.23</b>
<b>RAILGRUP</b> (Railway Cluster)	<b>MAV</b>	The railway cluster that represents the sector at all levels in Spain	Not defined signature day <b>NOT SIGNED</b>
<b>CIAC</b> (Cluster of the Automotive Industry of Catalonia)	<b>MAV</b>	The Cluster of the Automotive Industry of Catalonia (CIAC) links the automotive sector based in Catalonia (Spain)	Not defined signature day <b>NOT SIGNED</b>
<b>HEGAN</b> (Aeronautics and Space Cluster Association)	<b>MAV</b>	HEGAN is an association that brings together the aeronautics and space sector in the Basque Country (Spain)	Not defined signature day <b>NOT SIGNED</b>
<b>RIGHTWEIGHT</b>	<b>POL</b>	Network initiated by RIGHTWEIGHT Project	Not defined signature day <b>NOT SIGNED</b>
<b>CIMES</b>	<b>POL</b>	The French competitiveness cluster dedicated to Manufacturing and Productive performance and efficiency.	Not defined signature day <b>NOT SIGNED</b>
<b>TECHTERA</b>	<b>POL</b>	Techtera is the competitiveness cluster dedicated to the French textile industry	Not defined signature day <b>NOT SIGNED</b>
<b>Polish Chamber of Railway Equipment Manufacturers and Services</b>	<b>BIC</b>	Non-profit institution that brings together business entities related to the railway market	04.04.2022 <b>SIGNED</b>
<b>Art-ER</b>	<b>MECH</b>	Non-profit agency fostering region's sustainable growth by developing innovation and knowledge, attractiveness and internationalisation of the region	Not defined signature day <b>NOT SIGNED</b>
<b>Clust-ER Green Tech</b>	<b>MECH</b>	the energy and sustainable development cluster of Emilia-Romagna	Not defined signature day <b>NOT SIGNED</b>

**Table 3.** Clusters Cooperation Agreements

3. Other Clusters or Consortiums & Intermediary Organizations Cooperation Agreements 6 in total	Responsible	Description	Expected date of signature
ELA	AMZ	During ELCA consortium meeting held in Dortmund ELCA and ELA signed a cooperation agreement.	20.10.2022 <b>SIGNED</b>
EBTC	AMZ	Agreement on implementation of common events and strategic projects beyond COSME -project	15.12.2021 <b>SIGNED</b>
ACMA	BIC	Automotive Components Manufacturers Association, exploratory meetings started in May 2021	November 2021 <b>SIGNED</b>
Automotive Cluster Detroit	AMZ	Network of automotive companies in Detroit region.	October 2021 <b>SIGNED</b>
Austrian Advanced LightWeight Technology (A2LT)	AMZ, BIC, MECH, MAV	Association of Austrian companies and research centres about lightweight part of ELCA (European Lightweight Clusters Alliance)	Not defined signature day <b>NOT SIGNED</b>
Moravian Silesian Automotive Cluster (MSAK)	AMZ, BIC, MECH, MAV	Automotive Cluster of Czech Republic part of INNOSUP AMULET project and ELCA (European Lightweight Clusters Alliance)	Not defined signature day <b>NOT SIGNED</b>
LIGHTer Arena	AMZ, BIC, MECH, MAV	Swedish multi-sectorial lightweight cluster part of ELCA (European Lightweight Clusters Alliance)	Not defined signature day <b>NOT SIGNED</b>
Cluster Automotriz de Nuevo León	MECH	Mexican cluster for the development of automotive sector in the Nuevo Leon region	Not defined signature day <b>NOT SIGNED</b>
Enterprise Europe Network	MAV	EEN supports the ELCA project and it is involved in the implementation of actions and contributes to the dissemination.	July 2021 <b>SIGNED</b>
MSME Chamber of Commerce and Industry in India	POL	Memorandum of Understanding signed by the PERCY project in which Polymeris is a partner during the exploratory mission in India	08/04/2022 <b>SIGNED</b>

<b>Greater AKRON Chamber of the USA</b>	<b>POL</b>	Memorandum of Understanding signed by the PERCY project in which Polymeris is a partner during the exploratory mission in India	22/06/2022 <b>SIGNED</b>
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**Table 4.** Clusters/Consortiums & Intermediary Organizations Cooperation Agreements

<b>4. SMEs Cooperation Agreements</b> <i>20 in total (4 per partner)</i>	<b>Responsible</b>	<b>Description</b>	<b>Date of agreement</b>
<b>IMA</b> (innovation in advanced manufacturing)	<b>MAV</b>	Close contact during Chile mission preparation and interested in advanced manufacturing technologies of MAV partners	Teleconference meeting during Chile mission, potential agreement in future. <b>NOT SIGNED</b>
<b>EURECAT</b>	<b>MAV</b>	They participated actively in Chile mission and there is a close contact with them and the Spanish company	Teleconferences before Chile mission, they also participated the Spanish company is already a MAV partner <b>SIGNED</b>
<b>LEITAT</b>	<b>MAV</b>	They participated actively in Chile mission, they also helped by contacting different governmental institutions for dissemination and there is a close contact with them and the Spanish company	Teleconferences before Chile mission, they also participated the Spanish company is already a MAV partner <b>SIGNED</b>
<b>Research innovation centre of advanced polymers</b>	<b>MAV</b>	They were contacted for its participation as a partner in Chile mission with an oral presentation, finally they did not present the institution	They were contacted several times by email, it is expected to interact with MAV partners SMEs <b>NOT SIGNED</b>
<b>Lightore GmbH</b>	<b>AMZ</b>	German SME, which provides water saving and cleaning technologies and equipment for the clean production of polymers, the technology is extremely interesting for regions with a lack of water and the need of saving process	Meeting with potential clients in Abu Dhabi and Dubai during the mission to UAE <b>NOT SIGNED</b>

		water for manufacturing purposes	
<b>LZS GmbH Dresden</b>	<b>AMZ</b>	LZS GmbH provides of special know-how with regard to fibre-reinforced plastics and circular technologies. That know-how is interesting for potential partners from India (EU-India aviation cluster), UAE (Khalifa University) and the US Battery Valley (Michigan, USA).	Reported on 28.08.2022, After initialisation by ELCA, LZS has started to explore details of innovation and business opportunities with the partners. <b>SIGNED</b>
<b>NanoSen Chemnitz</b>	<b>AMZ</b>	NanoSen is going to collaborate with Indian partners in the field of functionalised lightweight materials for health care applications	20.10.2022 Agreement during the matchmaking event in Düsseldorf <b>SIGNED</b>
<b>Silbaerg GmbH</b>	<b>AMZ</b>	Silbaerg provides circular technologies for lightweight applications in sports and health care sector. Silbaerg started activities with Global Inroads GBI from Karnataka, India	15.11.2022, first meeting initialised by AMZ after matchmaking event at 08.11.2022 <b>SIGNED</b>
<b>Baruffi Engineering</b>	<b>MECH</b>	Composites producer located in Italy, actively participated to UAE mission and India-EU matchmaking	Collaboration already started and roadmap is under conversation. <b>NOT SIGNED</b>
<b>TEC Eurolab</b>	<b>MECH</b>	Service provider for characterization and modelling, actively participated to missions	Strong relationship with CLUST-ER MECH and collaboration already started <b>NOT SIGNED</b>
<b>Consorzio M USP</b>	<b>MECH</b>	Participated in India-EU matchmaking	Strong relationship with CLUST-ER MECH and collaboration already started. <b>SIGNED</b>
<b>Crossfire Srl</b>	<b>MECH</b>	Participate to Chile mission	Strong relationship with CLUST-ER MECH and collaboration already started <b>NOT SIGNED</b>
<b>MITSUBISHI CHEMICAL GROUP</b>	<b>POL</b>	Meeting at their headquarters during the Japan Mission	We are in contact for potential agreement in the future. <b>NOT SIGNED</b>



<b>SUMITOMO CHEMICAL</b>	<b>POL</b>	Meeting at their headquarters during the Japan Mission	We are in contact for potential agreement in the future. <b>NOT SIGNED</b>
<b>NITTO</b>	<b>POL</b>	Meeting at their headquarters during the Japan Mission	We are in contact for potential agreement in the future. <b>NOT SIGNED</b>
<b>TOYOINK</b>	<b>POL</b>	Meeting at their headquarters during the Japan Mission	We are in contact for potential agreement in the future. <b>NOT SIGNED</b>
<b>MAKINO J. CO., LTD</b>	<b>BIC</b>	Participated in Japan Mission	Relation with BIC during Japan Mission. <b>NOT SIGNED</b>
<b>NIKON Corporation</b>	<b>BIC</b>	Participated in Japan Mission	Relation with BIC during Japan Mission. <b>NOT SIGNED</b>
<b>KIWA Machinery CO., LTD</b>	<b>BIC</b>	Participated in Japan Mission	Relation with BIC during Japan Mission. <b>NOT SIGNED</b>
<b>NTD Data Xam Technologies corporation</b>	<b>BIC</b>	Participated in Japan Mission	Relation with BIC during Japan Mission. <b>NOT SIGNED</b>

**Table 5.** SMEs Cooperation Agreements

### 4.3 Business Agreements

ELCA COSME consortium expected to sign 10 business agreements with SMEs from participating countries and from other international countries according to the missions. Nowadays, consortium members and cluster partners are still working on the signature of some business agreements.

Cluster MAV prepared a cooperation agreement template and provided it to the rest of partners. The template was delivered in August 2021. Each partner was responsible to contact and interact with the identified SMEs to obtain the business agreements with them.

The following table (**Table 6**) was filled by Cluster MAV and the other cluster members of the consortium when the results of the networking were fruitful and the business agreements were signed, some of them are under conversation and is expected to be signed in future. Those tables were useful to monitor and control the progress of this action and are still useful after the closure of the present project.

5. SMEs Business Agreements 10 in total (2 per partner)	Responsible	Description	Dates & Location	Expectations & Results
<b>COMPOXI</b>	<b>MAV</b>	Compoxi's SME CEO travelled to Dubai and participated in Dubai mission with a presentation which allowed them to exposure their solutions and attracted the attention of local companies	Dubai January 2022	The SME Compoxi member of MAV participated on the Dubai mission and established a business agreement with a company in Dubai. Compoxi is working in a project to develop a product for the Dubai company. <b>SIGNED</b>
<b>ATE COMPOSITES</b>	<b>MAV</b>	ATE Composites presented their solutions for lightweight materials related with mobility	On line event November 2022 Chile Mission	Chilean partners showed interest on ATE technology, they have the opportunity to establish a conversation and future collaborations by email contacts assisted by MAV and ACCIÓ Chile <b>SIGNED</b>
<b>MaiCom Quarz &amp; EBTC</b>	<b>AMZ</b>	MaiCom Quarz GmbH has started a co-	08.09.2022	Indian partners (members of aviation

		operation with EBTC in order to identify business partners in India for the development and supply of new smart materials	Agreed procedure meeting with A.Suri and G. Sharma, moderated by ELCA	cluster) are interested in acquiring and applying new materials technologies from MaiCom. Next step for 2023 – requirements engineering for the adoption of processes according to applied and available raw materials, development of the financing concept for common development work. <b>NOT SIGNED</b>
<b>A&amp;E Produktionstechnik GmbH &amp; EBTC</b>	<b>AMZ</b>	The company aims to provide low-cost modules to injection moulding machines, that enable universal machines to process recycled materials for new parts (sandwich injection moulding). These parts as well as the related know-how are very interesting for the Indian markets because it helps to save CO2-emission and to comply with new regulations.	08.09.2022 Agreed procedure as result of a meeting with A.Suri and G.Sharma, moderated by ELCA	A&E strives to sell its modules and know-how to Indian companies which are working with injection moulding machines. Next step: Identify groups of applicants, which might be interested to purchase the modules as shared equipment pool. Process has been moderated by EBTC. <b>NOT SIGNED</b>
<b>PROMOTEC SRL &amp; EBTC</b>	<b>MECH</b>	Promotec Srl is a consortium of Italian company working in the automotive sector, considering to enhance its relationship with the Indian market	Online after matchmaking event	Moderated by MECH, Promotec and EBTC started the discussion in order to find best condition to promote opportunities in both market within the automotive sector. <b>NOT SIGNED</b>
<b>ANSER &amp; ARIC (Aerospace Research and Innovation Center)</b>	<b>MECH</b>	ANSER is a consortium of more than 20 companies from Emilia-Romagna working in components for Aerospace	Online after UAE mission	Mediated by MECH, ANSER started gaining contacts in Abu Dhabi economic area concerning R&D activities within the Aerospace sector

				through first contact with the Aerospace Research and Innovation Center of the Khalifa University. <b>NOT SIGNED</b>
<b>MKBL ME FZE</b>	<b>BIC</b>	Support in the field of business networking opportunities in UAE markets	11.01.2022, Warsaw	Organization of the economic program, including an economic mission, visits to local companies, organization of meetings with representatives of special economic zones. <b>NOT SIGNED</b>
<b>Ras Al-Khaimah Economic Free Zone</b>	<b>BIC</b>	Establishing cooperation in the field of business contacts and educational activities in the UAE	07.02.2022, Dubai	1. business meetings - analysis of the possibilities of opening and conducting business in a special economic zone, including legal, cultural and economic issues 2. cooperation on educational activities in the field of higher education. <b>NOT SIGNED</b>
<b>TOYOINK</b>	<b>POL</b>	A major producer of inks is looking to expand in France and Europe, to see how we can help them promote their conductive inks and green inks to our network	November 2022	Business meetings for future collaborations in France. They'll come to France to meet some members of our cluster in January 2023. <b>NOT SIGNED</b>
<b>MITSUBISHI CHEMICAL GROUP</b>	<b>POL</b>	Company very active on the recycling of PMMA with a need to know the available deposits of PMMA in France and Europe.	November 2022	Business meetings for future collaborations in France. <b>NOT SIGNED</b>

**Table 6.** SMEs Business Agreements

## 4.4 Events

A total of 38 different events were organized by ELCA COSME partnership. Those meetings were at national and international level and included meetings with other clusters, companies or government agencies, workshops with SMEs, international events, and meetings, etc.

To prepare the exploratory visits to the different targeted countries, each partner organized 2 workshops with national SMEs (**Table 7**).

<b>6. National workshops with SMEs</b> 10 in total (2 per partner)	<b>Responsible</b>	<b>Description</b>	<b>Dates &amp; Location</b>	<b>Expectations &amp; Results</b>
<b>MAV Strategic Immersion</b>	<b>MAV</b>	Annual meeting of MAV members and stakeholders	9/06/2022, Barcelona (Spain)	The meeting was an opportunity to present the ELCA activities and explain the possibilities for SMEs and other relevant agents. 50 members attended to the event.
<b>Lightweight materials Workshop with MAV members</b>	<b>MAV</b>	Workshop in the frame of the Lightweight materials working group of MAV.	15/09/2022, Barcelona (Spain)	20 members attended to the workshop organised by MAV where the activities of ELCA were discussed.
<b>Business opportunities for automotive suppliers in USA</b>	<b>AMZ</b>	AMZ workshop for companies, which are interested in developing business in USA	Online 05.10.2021	10 AMZ members attended the workshop, support offer to explore market opportunities in USA
<b>Offers of the European lightweight community</b>	<b>AMZ</b>	Workshop with companies and representatives of Composites United	03.09.2021 online	Workshop with 12 members of composites United, information about opportunities to explore international lightweight markets, ideation of potential common products/services with ELCA-partners from EU (in third markets)
<b>MECH ordinary General Assembly</b>	<b>MECH</b>	Annual meeting of MECH members and stakeholders	14.07.2021 (online)	Within the General Assembly of clust-ER MECH, the ELCA project

				has been presented with an anticipation of the future exploratory missions. More than 50 members attended the online meeting
<b>MECH ordinary General Assembly</b>	<b>MECH</b>	Annual meeting of MECH members and stakeholders	28.06.2022 (Forlì, Italy + online)	The general assembly has been the opportunity to present the main results from previous exploratory missions to MECH stakeholders. Circa 55 members attended the meeting
<b>Railroad to Cooperation – meeting co-financed by the ELCA Internationalization project</b>	<b>BIC</b>	Networking meeting was organized by Bydgoszcz Industrial Cluster Tool Valley, Polish Chamber of Railway Equipment Manufacturers and Services and Bydgoszcz University of Technology. During first part of the event organizers presented themselves. Then participants went to the laboratories of the Department of Mechanical Engineering to show research capabilities of the university.	21.06.2022, Bydgoszcz (Poland)	The meeting was an opportunity to present the members of the organizations – both in the form of traditional presentation, as well as on stands. The participants (about 40 people) had a possibility to exchange information and experience as a basis for achieving synergy of science and business in the railway sector.
<b>Regional conference</b>	<b>BIC</b>	Participants of the conference had the opportunity to see presentations related to European sources of funding and support for	17.11.2022, Żnin (Poland)	The conference was attended by around 80 people, including representatives of toolmaking and plastics processing industries and scientific bodies (universities and

		enterprises. In addition, specialists from EDORADCA sp. z o.o. presented the topic of relief for robotization. An important part of the conference was the cooperative exchange, where participating entities had a space to present their products and services.		institutes), as well as delegates of the industrial park in Bydgoszcz and representatives of financial institutions. The meeting was an extraordinary opportunity to integrate and make new contacts.
<b>Polymeris General Assembly</b>	<b>POL</b>	ELCA presentation at the Polymeris General Assembly;	18/12/2022 (online)	At the Polymeris General Assembly, we presented the ELCA project to the participants. Among the 184 participants, 147 were SMEs, 2 were clusters, 12 were local politicians and 23 were RTOs).
<b>ELCA Explanatory Session</b>	<b>POL</b>	Explanatory session to get an overview of what the ELCA is and how it was developed.	09/07/2021 (online)	This session was the opportunity to show how the ELCA creates value for Polymeris members and to develop the structure and actions of the network.

**Table 7.** National workshops with SMEs.

At least 12 international meetings and events with other cluster, intermediary organizations, etc. were carried out before and during the missions to promote and present them and to exchange experiences and best practices.

7. International meetings 6 in total	Responsible	Description	Dates & Location	Expectations & Results
<b>E-LASS</b> <b>European network for Lightweight applications at Sea</b>	<b>AMZ</b>	Network of 521 players from 32 countries focussing on lightweight materials and design in the maritime sector, co-ordinated by RISE Sweden	Mutual information, first contact in May 2021, Participation at E-LASS annual event Jun. 2022	Mutual support agreed, presentation of the project at networking events, to offer participation at ELCA-events and missions.
<b>ELBE</b>	<b>AMZ, MAV</b>	European strategic cluster partnership in blue energy (COSME project ELBE Plus (GA 951148))	First initial telco Ma 2021, next actions tbd	Exchange of experience, linking activities in the fields of energy efficiency and use of renewable energies.
<b>EU-Japan Centre for Industrial Cooperation</b>	<b>POL</b>	EU organization to implement industrial cooperation between the EU and Japan	July 2022	Presentation of the EU-Japan Centre organization which aims to promote all forms of industrial, trade and investment cooperation between the EU and Japan and to improve the competitiveness and cooperation of European and Japanese companies by facilitating the exchange of experience and know-how between European and Japanese companies.



				Exchanges on possible collaborations regarding the ELCA Japan mission.
<b>EU-India Centre for Industrial Cooperation</b>	<b>BIC</b>	This event offered by ELCA and the European Business and Technology Centre New Dehli (EBTC) contained inspiring and informative presentations about European lead lightweight opportunities for Indian businesses as well as targeted Business-to-Business (B2B) sessions where one could gain new valuable knowledge and create new business contacts.	24.03.2022, B2B on-line session for European and Indian SMEs	Joining this event companies could gain insights of the growing business opportunities of lightweight technologies in the automotive and aerospace market of India. They also had the opportunity to meet entrepreneurs, cluster managers and business supporters from India and Europe. That B2B event was a part of a joint strategic collaboration of ELCA, the European Business and Technology Centre New Dehli and their local EEN supporters.
<b>COSME INTERNATIONAL - PERCY</b>	<b>POL</b>	Partnership for PolymER ReCYcling collaboration between 4 European clusters around the recycling of plastic and rubber as well as eco-design.	April 2021, on going	Linking activities in the fields of internationalization, exchange of good practice, experiences on the sector of advanced materials
<b>GSSC ESCP-4i Green small smart Cities</b>	<b>AMZ/ELCA</b>	COSME Internationalization consortium on green small smart cities, partnership in fields of new lightweight materials and	Online 09.02.2022, F2F 26.09.2022 Prague	Common exploration of new market opportunities, synergies through complementary target countries,

		technologies for the sustainable development of cities		Exchange of experience regarding the implementation of the COSME project, mutual invitations to events and workshops, identification, and exploration of synergies
<b>International CHILE mission for lightweight electromobility</b>	<b>MAV</b>	MAV contacted different business agents as ACCIO CHILE, CORFO, CAMACOES, LEITAT or EURECAT to stablish relations among European SMEs and Chilean RTOs, SMEs and technological centres by showing different technologies and solutions in lightweight area.	On line several times during November 2022	Several governmental institutions cooperated with MAV and participated in Chile exploratory mission. There is a close contact with ACCIÓ which assist Catalan SMEs to generate business relations with Chilean institutions and companies. Other institutions as technological centres and universities are now in contact for future opportunities.
<b>General Assembly 2021</b>	<b>ELCA</b>	Annual meeting of the whole Pan-European network, discussion of strategic objectives and activity planning	28.01.2022 online	21 participants from 13 organisations (RTOs and clusters)  Expected to enlarge and to develop further the European network and cross-fertilisation activities
<b>General Assembly 2022</b>	<b>ELCA</b>	Meeting of the Pan-European network at 19-20.10.2020,	20.10.2022 Dortmund	30 participants from 23 European RTOs, Clusters, further partners

		presentation and discussion of findings and results of the project, presentation of cornerstones of the internationalisation strategy	Physical and online	attracted to the internationalisation activities, active involvement of further partners to the strategy development and follow-up actions beyond the project runtime
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**Table 8.** International meetings.

<b>8. Other International events</b> 6 in total	<b>Responsible</b>	<b>Description</b>	<b>Dates &amp; Location</b>	<b>Expectations &amp; Results</b>
<b>Dubai Expo 2020</b>	<b>MECH</b>	Within the context of the EXPO in Dubai, the ELCA partners (in presence: MECH, AMZ, MAV) organized a hybrid event “Lightweight for sustainability” from the Austrian Pavillon, streaming online the workshop. In the morning, the partners went to Abu Dhabi to visit the ARIC (Aerospace Research and Innovation Center) of the Khalifa University, strongly working on metal alloys 3Dprinting	4-8.02.2022, Dubai	During the morning visit the partners had the opportunity to get a deep understanding of the research activities of the Khalifa, ranked #1 technological university for the Middle-East, and established important contact with the research leaders. The workshop has been an opportunity to present different European lightweight solution within the international context of the EXPO
<b>World Exhibition EXPO Dubai 2020</b>	<b>BIC</b>	The mission of entrepreneurs	4-8.02.2022, Dubai	During the mission,

		<p>representing the tool and processing industry from the Kuyavian-Pomeranian Voivodeship took place to the World Exhibition EXPO Dubai 2020. The trip was organized by the Kujawsko-Pomorskie Voivodeship, and the Bydgoszcz Industrial Cluster Tool Valley which was responsible for the preparation and implementation of the economic program.</p>		<p>participants had the opportunity to visit the Polish Pavilion, visit the entire EXPO site, participate in business seminars, as well as learn about the rules of doing business in the UAE and establish new business contacts.</p>
<p><b>Plastpol International Fair 2022</b></p>	<p><b>BIC</b></p>	<p>PLASTPOL Fair is one of Europe's most important events crafted around plastics processing and converting returns to Targi Kielce on its traditional date.</p>	<p>24-27.05.2022, Kielce (Poland)</p>	<p>The XXVI International Fair of Plastics and Rubber Processing PLASTPOL followed its many-year tradition: the expo is the focal point for the latest technological advancements and the most exciting market offers.</p>
<p><b>5th International Cooperative Trade Fair of Tools and Processing Industry INNOFORM</b></p>	<p><b>BIC</b></p>	<p>The INNOFORM is the only event in Poland devoted to injection moulding and its peripheries. It is an unrivalled</p>	<p>27-29.09.2022, Bydgoszcz (Poland)</p>	<p>The event was an arena for premieres and new products as well as a place for conferences, during which scientists and</p>

		place that is dedicated to specialists from the tool and processing industry. This is a complete event with deep technical and educational significance. Producers and distributors present the latest technologies, machines and tools.		practitioners discuss current difficulties related to the processing of polymer materials. The only fair in Poland brought together bidders and decision-makers responsible for the development of the tool and processing industry in Poland. About 200 exhibitors and co-exhibitors during this year's INNOFORM® fair were visited by over 2000 visitors.
<b>JIMTOF Japan International Machine Tool Fair</b>	<b>BIC</b>	A delegation of our Cluster together with the 4 member companies were on an economic mission in Tokyo.	4-13.11.2022	As part of the mission, a representative of the Cluster met with Ms. Ayuko Nagami from PAIH. During the meeting, possible forms of cooperation in the area of the tool and processing industry were discussed.
<b>K FAIR 2022</b>	<b>POLYMERIS, BIC, MAV, MECH, AMZ</b>	The K fair is the most important fair in the world dedicated to plastic and rubber.	8-15.10.2022	All the partners had the opportunity to meet different clusters and companies that were showing their solutions related with polymeric materials

<p><b>JEC 2022</b></p>	<p><b>POLYMERIS</b></p>	<p>JEC WORLD is the international trade show that unites the global composites industry, offering users a complete overview of processes, new materials and dedicated solutions.</p>	<p>03/05/2022 to 05/05/2022 Paris, France</p>	<p>In response to environmental challenges, every year in Paris, the JEC World event takes place, which welcomes all the major players in the world of innovation, business and exchange.</p> <p>This event was an opportunity to meet some of the players who are working in this direction by generating or using recycled or bio-based materials.</p>
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**Table 9.** Other International events

## 4.5 Matchmaking Meetings

After the international missions, 5 clusters and business matchmaking meetings were comprehended.

<p><b>9. Cluster &amp; business matchmaking meetings supported</b> 5 in total (<i>1 per partner</i>)</p>	<p><b>Responsible</b></p>	<p><b>Description</b></p>	<p><b>Dates &amp; Location</b></p>	<p><b>Expectations &amp; Results</b></p>
<p><b>European Business and Technology Centre New Delhi (EBTC)</b></p>	<p><b>ELCA</b></p>	<p>This event offered by ELCA and the European Business and Technology Centre New Delhi (EBTC) contained inspiring and informative presentations about European</p>	<p>24.03.2022, 09:00 – 17:00 – B2B Meetings</p>	<p>Joining this event companies could gain insights of the growing business opportunities of lightweight technologies in the automotive and aerospace market of India. They also had the opportunity to</p>

		lead lightweight opportunities for Indian businesses as well as targeted Business-to-Business (B2B) sessions where one could gain new valuable knowledge and create new business contacts.		meet entrepreneurs, cluster managers and business supporters from India and Europe. That B2B event was a part of a joint strategic collaboration of ELCA, the European Business and Technology Centre New Delhi and their local EEN supporters.
<b>European Lightweight Association</b>	<b>AMZ/ELCA</b>	Meeting of ELCA with the management of the European Lightweight Association (ELA), preparation of the co-operation agreement, strategy development and activity roadmap	14.07.2022, Dresden	Representatives from ELCA ( K. Schöps, R. del Valle, A. Hornes, T. Hipke) met with W. Seeliger (Leichtbau BW and manager of ELA in Dresden for a half-day workshop on cooperation synergies, next steps fixed, co-operation agreement prepared and signed
<b>P4GE Projects4 Green Energy. Connected</b>	<b>AMZ, EEN</b>	Matchmaking event, organised by EEN, supported by Cleantech Initiative East Germany, presenting solutions for green energy and offering partnerships, ELCA participated for projects	09.11.2022 B2match online	Raised awareness on ELCA and opportunities for lightweight materials and solutions, matchmaking with partners from target countries, Insights into market needs and perspectives for new materials for energy

		concerning new lightweight materials for energy applications,		applications, 262 participants signed up for the online sessions, 3 potential companies from DE and one more cluster identified
<b>AMULET (Advanced Materials &amp; Manufacturing Technologies United for Lightweight)</b>	<b>MAV</b>	Amulet partners meet ELCA COSME partners to discuss new materials, technologies and market opportunities among SMEs of the different clusters	14.12.2022 meeting in Barcelona with some member connected on line	Different on-line meetings among partners of different European countries were scheduled in order to establish business collaborations buy any signed agreement has been still signed
<b>Networking Cocktail</b>	<b>POL</b>	International networking event held at the Polymeris booth at the K trade show.	20/10/2022 & 25/10/2022  K Fair, Düsseldorf, Germany	On the occasion of the "K", the world's #1 plastics and rubber trade show, we worked with the Auvergne-Rhône-Alpes Region, Business France and Polyvia to offer SMEs visibility, innovation paths and networking moments to encourage meetings. In this context, we have raised awareness among our partners in Germany, Italy, Spain, Canada, the United States, India and Saudi Arabia.



				<p>This networking event was an opportunity to raise awareness of the ELCA project and the possibilities offered by lightweight materials and solutions. The opportunity was also used to establish contacts with partners in the target countries.</p>
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**Table 10.** Cluster & business matchmaking meetings supported

## 4.6 Beyond Mobility Sectors

During the project, other clusters and organisations related to other sectors were involved to foster cross-sectorial collaborations and mutual learning at different levels.

<b>10. Other sectors involved beyond mobility</b> 3 in total	<b>Responsible</b>	<b>Description</b>	<b>Dates &amp; Location</b>	<b>Expectations &amp; Results</b>
<p><b>Civil engineering/construction,</b></p> <p><b>Energy generation, energy efficiency</b></p> <p><b>Cluster Decarbonization of Industry (CDI)</b></p> <p><b>Any energy- intensive industries (production of cement, building industry, energy, chemical ind.)</b></p>	<b>AMZ</b>	<p>CDI is a cross-industry cluster, which facilitates transformation processes of energy intensive industries towards decarbonization, It promotes also transformation processes of regions towards sustainability and resilience of regional structures</p>	<p>09.11.2022 online</p> <p>15.11.2022 Berlin</p>	<p>Better outreach of the project to German companies in non-mobility sectors, synergies based on aligned activities, common follow-up activities</p> <p>Results: mutual information about activities, first brainstorm on potential joint activities and synergies for lightweight materials and</p>

				technologies, further meetings scheduled to identify next steps of co-operation and activities to support market access to third markets.
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**Table 11.** Other sectors involved beyond mobility.

## 5. Cross-fertilisation Timeline

To monitor the cross-fertilisation planning, there has been elaborated a timeline (**Table 12**) with deadlines related to general actions and control of status.

Considering the calendar of visits, some actions needed to be done during the months 19 and 20.

Deadline	Activity	Status
M6 - Feb 2021		
M7 - Mar 2021		
M8 - Apr 2021		
M9 - May 2021		
M10 - Jun 2021		
M11 - Jul 2021	Identification of clusters, networks and relevant organizations	Done
M12 - Aug 2021	Elaboration of Cooperation and Business Agreements template	Done
M13 - Sep 2021		
M14 - Oct 2021	Cooperation Agreements with Clusters signed	Done
	Cooperation & Business Agreements for mission in Michigan (USA) signed	
	National Workshops with SMEs for mission in Michigan	Done
	International Meetings and Events for the mission in Michigan	Done
M15 - Nov 2021	Cooperation & Business Agreements for mission in India signed	Done
	National Workshops with SMEs for mission in India	
	International Meetings and Events for the mission in India	Done
M16 - Des 2021		
M17 - Jan 2022	Cooperation & Business Agreements for mission in Dubai signed	
	National Workshops with SMEs for mission in Dubai	Done
	International Meetings and Events for the mission in Dubai	Done
M18 - Feb 2022	Cooperation & Business Agreements for mission in Japan signed	Conversations started
	National Workshops with SMEs for mission in Japan	Done
	International Meetings and Events for the mission in Japan	Done
M19 - Mar 2022	Cooperation & Business Agreements for mission in Latin America signed	Conversations started
	National Workshops with SMEs for mission in Latin America	Done
	International Meetings and Events for the mission in Latin America	Done
M20 - Apr 2022	Cooperation & Business Agreements for mission in Ohio (USA) signed	
	National Workshops with SMEs for mission in Ohio	
	International Meetings and Events for the mission in Ohio	

**Table 12.** Cross-fertilisation planning

## 6. Conclusions

During the project several interactions with different actors of all the value chain allowed to meet clusters ecosystem SMEs of with different agents as governmental institutions of different EU countries or from the local mission countries. Moreover, the missions were a perfect tool to gather SMEs, RTOs and other entities of the market value chain which made possible several agreements and relations for future business plans: Cluster participating of this project have been a key actor introducing the network space to produce the fertilization of the agreements already signed and those that are under conversation for the future of lightweight agreements between European cluster partners and target mission countries.

Modern markets are dynamic, flexible and adapt quite easily to changing economic conditions. The internationalization strategy of SMEs is different in function of the sector, the competitiveness, even depending on the base country and the target country, due to different factors as, for example legislation or national resources. Its means at each SME will face several barriers to human resources, product quality, and financial resources as internal barriers, as well as the business environment, government barriers, and socio-cultural barriers as external barriers but clusters will partner them, being an extremely useful tool as has been seen during the last decades.