“Cluster approach and eco-innovation in four industrial clusters of Tuscany region (Italy)”

AUTHORS	Tiberio Daddi Maria Rosa De Giacomo Francesco Testa

ARTICLE INFO	Tiberio Daddi, Maria Rosa De Giacomo and Francesco Testa (2012). Cluster approach and eco-innovation in four industrial clusters of Tuscany region (Italy). *Environmental Economics*, *3*(2)
RELEASED ON	Tuesday, 10 July 2012
JOURNAL	"Environmental Economics"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **0**

NUMBER OF FIGURES **0**

NUMBER OF TABLES **0**

Tiberio Daddi (Italy), Maria Rosa De Giacomo (Italy), Francesco Testa (Italy), Sara Tessitore (Italy)

Cluster approach and eco-innovation in four industrial clusters of Tuscany region (Italy)

Abstract

The paper describes the approach followed by an European project named IMAGINE aimed at applying to industrial clusters some innovative tools that are typical of the environmental policy area, making them an effective and useful opportunity for SMEs and local communities to pursue sustainability objectives. In particular, the described approach encompasses the implementation of some methodological "steps" foreseen by the EMAS Regulation at the cluster level. The project focuses on four industrial clusters of Tuscany region (Italy) and on opportunities offered to implement local innovative environmental policies and tools to improve the competitiveness of the tenant companies. The project deals with the total quality of all productive process by focus on sustainability criteria. The innovative aspect of the study consists in the opportunity to create a model of environmental management to transfer in other supply chains and clusters.

Keywords: EMAS cluster approach, environmental management systems, life cycle assessment.
JEL Classification: Q56.

Introduction

The link between industrial and environmental policies in territorial clusters of companies is even more important. In the last years, European Small and Medium Enterprises (SMEs hereafter) operating in industrial clusters are increasingly tackling the effects of globalization process affecting their capacity to produce competitive products and achieve satisfying economic performance. Moreover, the new environmental challenges require a different and new territorial planning and management tool able to combine reduction of environmental impact and market opportunities.

Participative methods (for example Local Agenda 21 processes) today are not longer able to provide a proper link between local development policies and environmental concerns oriented to environmental sustainability (Battaglia et al., 2008).

In this perspective, a "territorial" approach based on EMAS can be considered as a new opportunity to pursue in a synergetic and mutually reinforcing way the public, private, social and industrial targets and interests emerging in the local context. In particular, this approach gains a great importance if we consider those territorial contexts that are known as industrial clusters and districts, typical of the industrial structure of many EU Member States. Clusters have been officially defined by the Final Report of European Commission Export Group on enterprise clusters and network as follows: "groups of independent companies and associated institutions that are collaborating and competing; geographically concentrated in one or several regions, even though the cluster may have global extensions, specialized in a particular field, linked by common technologies and skills, either science-based or traditional; clusters can be either institutionalized (they have a proper cluster manager) or non-institutionalized. The cluster has a positive influence on: innovation and competitiveness, skill formation and information and growth and long-term business dynamics". The industrial clusters and districts are forms of territorial "aggregation" between companies operating in the same sector or branch and characterized by specific technical and social relationships among private and public actors. As literature emphasises (Becattini, 1979; Becattini, 1990; Ferrucci and Varaldo,1997; Corò and Rullani,1998) the cluster "organizational structure" and entrepreneurial culture is characterized by the presence of systematic business and non-business relations among the local actors, sharing technical solutions for integrating the processes and technologies characterizing the local production and a sort of "collective identity", based on common values, also with respect to the way in which businesses are carried out.

In some experiences, a network has been created among SMEs within a 'cluster', in order to foster information exchange and experience diffusion and to define and apply common solutions to similar environmental, technical and/or organizational problems, or to share environmental management resources. A specific kind of co-operation within a cluster of organizations takes place in the supply-chain: when a large customer, for example, is willing to support small suppliers in EMAS implementation, then all the smaller organizations involved in the supply chain can benefit greatly from networking. The effectiveness of the networking approach particularly emerges among organizations operating in the same sector (such as the industrial sector, but even service sectors like tourism or public institutions operating at different levels) and between organizations operating in the same territorial area.

The first references to the cluster organizational model, an approach that can develop synergies resulting in more efficient production than would occur within a single large plant, are found in Marshall at the end of the XIX century. The benefits of agglomeration of economic activities have also been confirmed by the Austrian economist Shumpeter in the first half of the XX century. He stressed the importance of the cluster system in terms of business competitiveness. In 1991, Michael Porter in his Competitive Advantage of Nations (1991), states the "cluster theory" in which he identifies the most potential for growth and development for industrial clusters as opposed to the single enterprises, thanks to the presence of vertical relations [customer/supplier] and horizontal relations [common customers, technology, channels].

At European level, clusters have been formally recognized and defined in the Final Report of the European Commission Expert Group on Enterprise Clusters and Networks which offers a first "census" of the phenomenon, and in communication No. 652, October 2008, Communication from the commission to the council, the European Parliament, the European Economic and Social Committee and the committees of the region "Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy".

In those documents, clusters are defined as "geographic concentrations of specialized companies that have workforce with advanced abilities and skills, and "support" institutions that make possible the spreading of knowledge and indirect positive effects as a result of their proximity".

According to this definition, the elements that characterize the cluster concept can be identified in geographic proximity, specialization in production and interaction among different actors in the cluster. The cluster approach is, therefore, based on creation of SMEs network, resources sharing, innovation development and knowledge exchange. It has proved to be able to increase local environmental skills and to improve the environmental performances both in companies and in industrial local area (Biondi et al., 2000; Hillary, 2004).

The size of clustering in a local context has critical relevance in the analysis of the environmental impact of industrial activities. When assessing the impacting factors related to a particular type of production, the characteristics of different local contexts in which that type of production produces its environmental effects have to be taken into account.

There is no doubt that in terms of impacts on the environment, companies that operate in an industrial district have many elements in common. First of all settlement, production and sales activities of these enterprises influence the same local ecosystem, characterized by specific and defined environmental aspects. Moreover, companies operating in one district often face similar environmental problems, because they dump the emissions from their production processes into the same receptacle: waste water that drains into the same river or solid waste that goes into the same landfill.

On the other hand, the high specialization of production and the usually very small size of enterprises (with all the implications in terms of limited availability of human, technical and financial resources) allows us to think of the district as an industrial area sufficiently homogeneous also in terms of production methods, degree of technology and organizational and managerial choices.

Even relations with suppliers of equipment and components, according to the logic of "vertically integrated industry" that characterizes many districts, are often played at local level, thus also affecting the availability and appropriateness of the most innovative and advanced technological solutions for pollution prevention.

A final aspect to highlight is the relationship with local stakeholders: for businesses in the district, interacting with the same community, the same institutions, the same local supervisory bodies means to deal with the same needs and requests concerning the quality of the environment.

Other important partners for companies in the district are local institutions. Sometimes companies interact with local authorities and supervisory bodies which are open to dialogue and willing to leave some room for negotiation, or with institutions that are particularly strict as regards law enforcement and extremely demanding on the compliance with obligations and deadlines. The different attitude of institutions can mitigate or amplify the context pressure acting in the same direction for all firms in the district. Firms can be challenged with requests from local authorities that may focus on some environmental aspects (making them more problematic) or that may promote the application of certain environmental policy tools (e.g., voluntary agreements at local level).

Recent decades have shown the dynamic of those "common solutions" in industrial districts, connected to the different inputs and external forces that have enabled the development of strategies and tools to start up environmental management processes that could involve the whole district.

In some experiences a network has been created among SMEs within a 'cluster', in order to foster information exchange and experience diffusion and to define and apply common solutions to similar en-

vironmental, technical and/or organizational problems, or to share environmental management resources (Iraldo & Frey, 2007). This approach proved to be effective in some Member States as Germany ("Konvoi" approach), Spain (co-operation in the tourism supply chain), Nordic Countries (Denmark and Sweden) but in particular in Italy by means of the so-called APO "Ambiti Produttivi Omogenei", it has shown a real effectiveness in promoting the environmental compliance of SMEs.

The Italian experience is particularly relevant also from the methodological point of view. An operational path was outlined and experimented by several industrial clusters. It consists in different steps that lead the firms belonging to the same cluster and their local stakeholders in the implementation of an environmental management system at cluster level, mirroring the main requirements set by the EMAS Regulation EC/1221/2009 for individual organizations.

1. The IMAGINE project

The IMAGINE – *Innovations for a Made Green in Europe* – project is an European project funded by the CIP Eco-innovation program. The project started in October 2009 and would end in October 2012. It aims to develop and apply an innovative method, the *"EMAS Network Approach"*, to support the implementation of different steps provided by the EMAS Regulation to the cluster, so to create a common basis for all the individual organizations interested in using collective resources and a cooperative approach to achieve an individual EMAS registration.

One of the innovative aspects introduced by the project is that it is focused to four Tuscan clusters representatives of the whole fashion chain. The four industrial clusters represented in the project are:

- Industrial cluster of Prato (textile sector).
- Industrial cluster of Santa Croce sull'Arno (tannery sector).
- Industrial cluster of Empoli (clothing sector).
- Industrial cluster of Lucca (shoes production sector).

These sectors have been involved in the experimentation of the approach through the creation of a series of tools and models which will be imitable and transferable in other similar supply chains and in other European clusters. The idea of the project to establish a cooperation on environmental issues among four cluster that are linked the one with the other due to the same supply chain. The products of Prato (textile fabrics) are used in Empoli for the clothing sector, the leather produced in the cluster of Santa Croce is used in Lucca for the shoes and in Empoli for the leather clothing. With this kind of cluster the project aims to develop tools and eco-innovations method to be transferred in other fashion supply-chain.

2. Methodology

The methodology proposed in the IMAGINE project fosters a co-operative and integrated approach for environmental management at the cluster level, by involving all the relevant local actors and stakeholders in the actions for the improvement of environmental performance. This approach relies on the nature of the technical and economic processes, social relations and tight interactions between stakeholders existing within the "industrial cluster".

2.1. The application of EMAS cluster approach. The methodology encompasses the implementation of the different steps foreseen by the EMAS Regulation at the cluster level; in particular the foreseen phases are the following:

- set up of a *Promotion Committee*;
- carrying out a *Cluster Environmental Review*, identifying and evaluating the most significant environmental aspects in the cluster;
- definition, by the Promotion Committee of an *Environmental Policy* for the whole industrial cluster, identifying the commitment of all the main local actors towards the continual improvement of the environmental performance;
- elaboration and drafting of a *Cluster Environmental Program* containing the detailed actions and measurable targets for operationally pursuing the continuous improvement;
- promotion and carrying out of specific initiatives addressed to local actors (SMEs, suppliers in the local chain, service providers, Local Authorities, etc.) aimed at satisfying the commitments undertaken with the shared program.

In the mentioned framework the methodology of the project aims to allow that European SMEs of the fashion branch to use same guidelines to address their innovation strategies towards sustainability goals, taking part in a new common EU trademark, featured by environmental excellence: this is what it is proposed as a "green made in Europe". In this way the European fashion products can distinguish themselves versus extra EU competitors.

Final markets of fashion products are more and more choosing environmental quality: this kind of consumers appreciate and reward sustainability-oriented producers.

In addition to the total quality of products, the second strategic pillar is focused to the quality guarantee and control. The identified tools – EMAS, EPD, Ecolabel – have all an European origin and diffusion. They define an EU standard quality and are

commonly recognized as a safer and higher standard than other international equivalent ones (let's think to comparison between ISO 14001 and EMAS). So the new "boundaries" for European product competitiveness can be the so called "environmental competitiveness", founded on ecological attention and sustainability of process and product.

The projects aims also to the acquisition of the EMAS Recognition of the Italian EMAS Committee for the four involved clusters. This special kind of Recognition is issued by the national EMAS Committee only in Italy. It represents a further national development of the article n. 37 of EMAS Regulation n. 1221/2009 (European Commission, 2009) that entitled "Cluster and step-by-step approach" stated: "Member States shall encourage local authorities to provide, in participation with industrial associations, chambers of commerce and other concerned parties, specific assistance to clusters of organizations to meet the requirements for registration as referred to in Articles 4, 5 and 6. Each organization from the cluster shall be registered separately (…)".

The project foresees three level of application of the activities in order to improve the eco-innovation in the involved industrial clusters.

The first level is the territorial level. With the obtainment of the mentioned EMAS Recognition of the Italian EMAS Committee, the industrial clusters will be able to improve their competitiveness activating green marketing actions and attracting external investments. This recognition could be used by the cluster toward those companies that want be located in an area with a high environmental management capacity (Tessitore et al., 2011).

The second level is referred to the environmental management developed at firm's level. The project has selected the EMAS certification as a tool to disseminate in the involved clusters to improve their environmental performance (Daddi et al., 2011) and competitiveness.

3.2. The methodologies applied in the product-related activities. Another level of activities is related to the product-related policies to implement in the clusters. This group of activities regard the dissemination of the LCA thinking approach in the companies. The project is supporting the four cluster in the elaboration of four different LCA of the typical products and in the elaboration of Environmental Product Declaration (EPD).

To this aim the first phase encompasses the implementation of the necessary steps for the EMAS regulation to the cluster in order to create shared resources and cooperation among organizations of the same cluster that allow them to achieve the individual EMAS registration of the tenant companies. In each cluster the "EMAS cluster approach" is applied and thanks to it by the end of the project 12 organizations will obtain the EMAS registration as single organizations.

The second phase includes the realization of the life cycle analysis of the typical product of each cluster. A product for each cluster has been analyzed and evaluated. Main environmental pressures of the product linked to the production process in a supply chain context have been identified. Moreover specific marketing and communication tools will be elaborated by the end of the year. In particular the Environmental Product Declaration (EPD) of typical products of the clusters will be drafted to communicate the main environmental data related to each product. This phase has also the objective to contribute to the development of new Ecolabel criteria for product of fashion supply chain.

The sustainable planning and chain traceability is focused on the production of a manual of sustainability aiming to define the environmental performance and to foster the environmental improvement of the typical products.

All these phases provide the development of specific tools for clusters. These tools will be implemented to create a model imitable and replicable in other supply chains and in other clusters.

Figure 1 summarizes the main phases of the methodological approach of the project and the provided outputs.

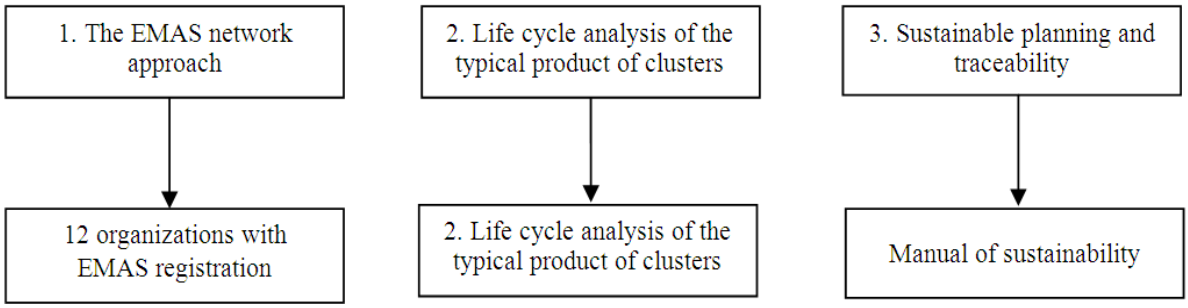

Fig. 1. The methodological approach of the IMAGINE project

The IMAGINE project aims to propose a suitable approach to enhance competitiveness in a high-quality industrial sector (fashion, including textile, clothes, shoes and tanneries) as well as in the other "typical" traditional sectors that characterize the whole European productive system, to make it more integrated and booster towards external competitors. Taking into account the European relevance of the industrial sectors involved in the projects, the authors retain the experience transferable to other territorial contexts and clusters. Figure 2 shows the European localization of clusters interested by the project.

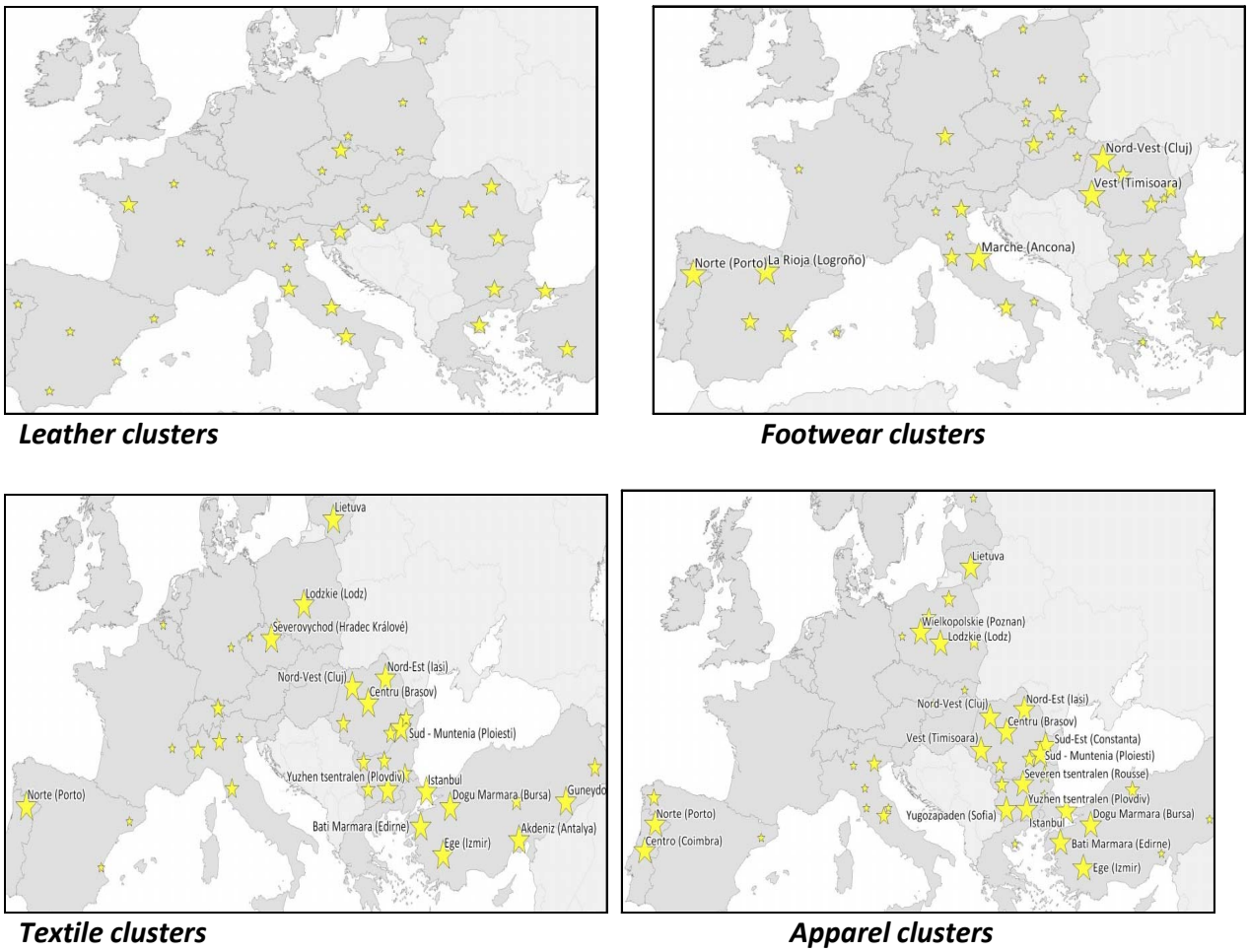

Fig. 2. The European localization of clusters interested by the project

3. Results

The cluster approach allows to obtain some important results from the project implementation.

The application of EMAS regulation at cluster level is one of the main important results of the project. The constitution of strong partnership between public and private actors (Municipalities, trade associations, representatives of industrial sector, Environmental Agency, etc.) to apply Emas Cluster and to negotiate and agree upon the environmental policies for the area has been obtained. Shared tools and policies have been applied with reference to the local territorial context and to its key characteristics and properties. The activities of the project determined a higher stakeholder involvement, with particular reference to the local communities and citizens. The cluster approach determined also *eco-product responses.*

3.1. The application of EMAS to the four involved clusters. In the four involved clusters all the steps of the EMAS cluster approach has been applied. In particular in order to guarantee a co-ordinated and integrated management of environmental issues within the cluster, Promotion Committee in each cluster has been created. This Committee is coordinating the environmental management initiatives by the different local actors, to favor the synergies and coordination among them. The Promotion Committee identified the priorities, the main actions for the improvement of the environmental performance and the possible ways of their implementation. The Committee in the clusters has the following functions:

- actively and concretely promote the improvement of local environmental performances;
- achieve the objectives and targets fixed and shared in the Environmental Program;

- carry out the activities relevant to EMAS application at the cluster level.

Each cluster has carried out an Environmental Review. The results of this analysis have been discussed and agreed upon by all the Promotion Committee members. The Cluster Environmental Review has identified the most important environmental aspects for the cluster and should represent a useful tool for SMEs operating in the cluster, to support them in the identification of the environmental aspects that are important for them.

The Cluster Environmental Reviews have allowed to:

- provide a thorough and in-depth description of the cluster territorial area, both from a geomorphological point of view (e.g.: lithologic peculiarities) and form a socio-economic one (resident population, overview of the sector(s) characterizing the industrial cluster, environmental collective services available in the area, etc.);
- identify the main environmental problems of the area, by examining the potential environmental pressures and the connected impacts. This analysis should focus on all the relevant environmental aspects (such as air, soil, water, wastes, energy, etc.) and should use a consistent set of pressure and state environmental indicators;
- analyze the local production processes and evaluate all the environmental aspects directly and indirectly linked with each phase of these processes;
- provide an overall picture of the projects and initiatives carried out or planned by the local actors to prevent the described environmental impacts.

The third step of the application of the "cluster approach" to the involved cluster has been related to the drafting of an Environmental Policy that includes the commitment of all the main local actors towards the continuous improvement of the environmental performances within the cluster. This Policy is developed by the Promotion Committee and is strictly consistent with the territorial context and with the specifities of the local industrial sector. With the Policy, the Committee has established the key principles and general priorities for the whole cluster.

The Cluster Environmental Policy is the milestone for all the environmental actions to be carried out in the clusters, and the point of reference for the policies to be drafted by every company operating in the cluster that wants to contribute to these actions.

On the basis of the Environmental Policy, each cluster has drawn up a Cluster Environmental Program. The Program includes the commitments for carrying out strategic actions for environmental improvement in the cluster. Such a Program establishes these actions at the operational level and contains the detailed planning for their implementation. It is important that the Program is continuously monitored, revised and updated.

The Environmental Program elaborated in the four clusters specifies the following items:

- **Objectives.** The Committee has set medium-term targets referred to the cluster territory, aiming at improving the Cluster most significant environmental aspects.
- **Targets.** The Committee has also set short-term targets, consistent with the objectives that are quantified and measurable whenever possible, and clarifies the implementation responsibilities for the actors operating in the cluster.
- **Actions and sub-actions.** The Program designs in detail the activities to be carried out in order to achieve the foreseen objectives and targets.
- **Resources.** The Program defines the human, economic and technical resources that are necessary to carry out each action.
- **Timetable.** The Program also specifies the deadlines for each objective and target.
- **Actors involved.** The Committee points out who are the local actors (institutional or private ones, single companies or their consortia, etc.) that should be involved in carrying out the described actions for each target.

The Program has been signed and approved by all Committee members.

To conclude the path of the application of EMAS to the cluster the four clusters have been verified by an independent accredited EMAS verifier. The cluster of Santa Croce sull'Arno has obtained the EMAS recognition during the year 2011 while the other 3 clusters has passed the environmental audit and are going to be validated by the Italian EMAS Committee. After this last step the clusters will be included in an official list of the certified clusters hold by the Italian Minister of Environment. To this date only few clusters have obtained this important certification.

Table 1. List of Italian clusters certified according to the EMAS cluster approach by the Italian EMAS Committee

Cluster	Sector	Date of certification
Cluster of Ravenna	Chemical	12/07/2006
Cluster of Livenza	Furnishings	06/07/2006
Cluster of Vicenza	Tannery	26/07/2007
Cluster of Capannori	Paper	19/09/2008
Chemical industrial area of Ferrara	Chemical	19/09/2008
Cluster of Solofra	Tannery	12/06/2009
Cluster of Polesine	Tourism	12/06/2009
Cluster of Santa Croce sull'Arno	Tannery	14/12/2010
Cluster of Frosinone	Paper	14/03/2011

As we can observe the number of certified clusters is low but there are some clusters of the same industrial sectors listed in the table. This means that after the achievement of the certification by a specific clusters start a process of emulation of similar clusters in order to achieve the same competitiveness advantage given by the certification.

3.2. Environmental products policies activities. The activities linked with the environmental product policies have allowed the elaboration of 4 LCA – life cycle assessment – one for each typical products of the 4 involved clusters.

The results about final impact indicators deriving by the 4 LCA about the following 4 typical products, are indicated in Table 2. The LCA is referred not to a single organization, but aims to represent all the industrial cluster with its organizations and in this way all environmental aspects linked to the product production in the territorial area of the cluster. Results have been obtained through the use of Boustead Software.

Table 2. Results about impact categories (EPD International System) deriving by LCA of the 4 typical products

Leather shoes production			
Impact category	Indicator	Result – Leather shoe (a pair of packed leather shoes)	
Potential global warming	kg CO_2 eq.	6,53	
Potential acidification	kg SO_2 eq.	0,07	
Potential ozone depletion	kg CFC 11 eq.	0,00	
Potential ground level ozone	kg ethene eq.	0,02	
Eutrophication	kg PO_4--- eq.	0,002	
Wool textile made with recycled wool (100% recycled or with pure wool – 100%)			
Impact category	Indicator	Result	
		Recycled wool 100% (1 kg of textile)	Pure wool 100% (1 kg of textile)
Potential global warming	kg CO_2 eq.	27,95	34,16
Potential acidification	kg SO_2 eq.	0,10	0,34
Potential ozone depletion	kg CFC 11 eq.	0,00	0,00
Potential ground level ozone	kg ethene eq.	0,01	0,01
Eutrophication	kg PO_4--- eq.	0,21	0,21
Leather shoes			
Impact category	Indicator	Result	
		Leather (1 square meter)	Leather shoe (1 kg)
Potential global warming	kg CO_2 eq.	26,77	0,28
Potential acidification	kg SO_2 eq.	0,28	0,02
Potential ozone depletion	kg CFC 11 eq.	0,00	0,00
Potential ground level ozone	kg ethene eq.	0,11	6,88
Eutrophication	kg PO_4--- eq.	0,01	0,004
Leather and wool coats			
Impact category	Indicator	Result	
		Wool coat (n. 1 coat)	Leather coat (n. 1 coat)
Potential global warming	kg CO_2 eq.	48,14	161,62
Potential acidification	kg SO_2 eq.	0,64	1,33
Potential ozone depletion	kg CFC 11 eq.	0,00	0,00
Potential ground level ozone	kg ethene eq.	0,02	0,47
Eutrophication	kg PO_4--- eq.	0,07	0,07

Table 2 includes 5 impact categories (potential global warming, potential acidification, potential ozone depletion, potential ground level ozone, eutrophication).

Among all considered products, the leather coat is the typical product which represents the main contribution to potential global warming and to potential acidification.

All products registered a value of 0,00 as regards the contribution to potential ozone depletion. The leather shoe production provides the main contribution to potential ground level ozone out of all considered products.

Finally, in the case of eutrophication, the main contribution is represented by the wool textile.

The results of LCA will be used to define the environmental requirements of a local product brand allowing to combine eco-friendly productions and competitive advantages for local producers. This represents a pilot experience for a certification scheme that is being developed by the national government together with several regional authorities.

The data identified with the LCA will be used to develop the EPD of the 4 typical product.

Another important result is the creation of Promotion Committees in the 4 clusters involved and the obtainment of APO – *Ambiti Produttivi Omogenei* – Official recognition. It is a cluster national certification that is comply with the article 37 of the EMAS regulation EC/1221/2009. It is issued by the Italian EMAS Committee.

It is important to point out that no project has previously encompassed this recognition, and no fashion-related cluster has ever obtained this recognition before today.

Conclusion

The paper aimed to describe a method adopted in an European project named IMAGINE to apply to industrial clusters some innovative tools making them an effective and useful opportunity for SMEs and local communities to pursue sustainability objectives. The specific targets were related to three levels of activities. The first level aimed to apply the so called EMAS Cluster Approach to the four participating clusters in order to obtain an official recognition by the Italian EMAS Committee. The second level aimed to disseminate among the SMEs located in the Clusters the EMAS registrations and Ecolabel certifications as tools to improve the environmental performance of the single organizations. The last group of activities aimed to spread among SMEs the life cycle thinking approach elaborating LCA and EPD of typical products of the clusters.

The results of the IMAGINE project show that the opportunities offered by new innovative environmental policies and tools could be very effective if applied taking into account the cluster approach.

Within the end of the project 12 organizations will obtain the individual EMAS registration. The focus on the cluster implies that SMEs of the same local territory have a specific commitment both internally and towards the other organizations of the cluster to which they belong. In this way the positive aspects and the advantages that can emerge from the cluster approach can be fulfilled.

Another aspect to consider is the importance of the opportunities derived by the methodological approach implementation. The implementation of different innovative tools (the EMAS approach, the LCA, the EPD) allows to foster an innovative approach toward the environmental management of organizations. These tools represent real territorial policy instruments able to integrate industrial development targets and environmental quality ones.

It also worth mentioning the high synergies that can be obtained at the managerial and technological level to promote the diffusion of innovative elements based on the partnership between many firms operating within the same territorial area.

Since the firms are similar and have to tackle the same environmental problems, it is then possible to rely on other synergies already existing at cluster level, on the exploitation of the same advantages linked to the same environmental targets, on the presence of the same environmental problems affecting the same territorial areas. Moreover organizations that belong to the same cluster have to face with the same regulations, interact with the same stakeholders, with the same supply chain and with the same environmental problems.

A further consideration is about the high potential of transferability of the methodological approach.

These similar aspects that characterize a cluster, make the project methodology reproducible in homogeneous territorial areas.

References

1. Andrews R.N.L, Amaral D., Keiner S., Darnall N., Gallagher D.R., Edwards J.D., Hutson A., D'Amore C., Sun L., Zhang Y. (2003). Environmental management systems: do they improve performance? Project final report for US EPA, Office of Water and Office of Policy, Economics and Innovation.
2. Annandale D., Morrison-Saunders A., Bouma G. (2004). The impact of voluntary environmental protection instruments on company environmental performance, *Business Strategy and the Environment*, 13, pp. 1-12.
3. Arimura T., Hibiki A., Katayama H. (1979). Is a voluntary approach an effective environmental policy instrument? A case for environmental management systems, *Journal of Environmental Economics and Management*, 55, pp. 281-295.
4. Battaglia M., Daddi T., Ridolfi R. Environmental territorial management: a new approach for industrial clusters, in Environmental Management, Robert H. Theobald, 2008, Nova Science Publishers, Inc.
5. Becattini G. (1979). Dal settore industriale al distretto industriale. Alcune considerazioni sull'unità di indagine dell'economia industriale, *Rivista di Economia e Politica Industriale*, 1.
6. Becattini G. (1990). The Marshallian District as a Socio-Economic notion, in Pyke F., Becattini G., Sengenberger W. "*Industrial Sectors and Inter-firm Cooperation in Italy*", ILO, Geneva.
7. Biondi V., Frey M., Iraldo F. (2000). Environmental management systems and SMEs: barriers, opportunities and constraints, *Greener Management International*, 29.
8. Cainelli G., Zoboli R. (2004). *The Evolution of Industrial Districts: Changing Governance, Innovation and Internalisation of Local Capitalism in Italy*, Contributions to Economics, Physica, Heidelberg, New York.

9. Carnimeo G., Frey M., Iraldo F. (2002). *Integrated product policy at the company level: how to create synergy between the product dimension and the environmental management system*, Milano, Franco Angeli.
10. Cellura, M., Ardente, F., Longo, S. (2012). From the LCA of food products to the environmental assessment of protected crops districts: a case study in the south of Italy, *Journal of Environmental Management*, Vol. 93, No. 1, pp. 194-208.
11. Corò G., Rullani E. (1998). Capitale Sociale e sviluppo. *La fiducia come risorsa*, Franco Angeli, Milan.
12. Daddi T., Testa F., Iraldo F. (2010). A cluster-based approach a san effective way to implement the ECAP (Environmental Compliance Action Program): evidence from some good practices, *Local Environment*, 15(1), pp. 73-82.
13. Daddi, T., De Giacomo, M.R., Frey, M., Iraldo, F., Testa, F. (2011). The implementation of IPPC Directive in the Mediterranean Area. In Elzbieta Broniewicz (ed), *Environmental Management in Practice*, pp. 119-144.
14. Daddi T., M. Magistrelli, M. Frey and F. Iraldo (2011). Do environmental management systems improve environmental performance? Empirical evidence from Italian companies, *Environment, Development, Sustainability*, 13(5), pp. 845-862.
15. Darnall N., Jason Jolley G., Handfield R. (2008). Environmental Management Systems and Green Supply Chain Management: Complements for Sustainability? *Business Strategy and the Environment*, 18, pp. 30-45.
16. European Commission (2009). Regulation (Ec) No 1221/2009 of the European Parliament and of the Council of November 25, 2009 on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC, [Online]. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:342:0001:0001:EN:PDF.
17. Fantin, V., Buttol, P., Pergreffi, R., Masoni, P. (2011). Life cycle assessment of Italian high quality milk production. A comparison with an EPD study, *Journal of Cleaner Production*.
18. Ferrucci L., Varaldo R. (1997). A cura di. Il distretto industriale tra logiche di impresa e logiche di sistema, Franco Angeli, Milan.
19. Finnveden, G., Hauschild, M.Z., Ekvall, T., Guine´ E.J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D., Suh, S. (2009). Recent Developments in Life Cycle Assessment, *Journal of Environmental Management*, Vol. 91, pp. 1-21.
20. Fruergaard, T., Astrup, T. (2011). Optimal utilization of waste-to-energy in an LCA perspective, *Waste Management*, Vol. 31, pp. 572-582.
21. Hillary R. (2004). Environmental management systems and the smaller enterprise, *Journal of Cleaner Production*, 12, pp. 763-777.
22. Hillary, R. (1999). *Evaluation of Study Reports on the Barriers, Opportunities and Drivers for Small and Medium Sized Enterprises in the Adoption of Environmental Management Systems*, Routledge, London.
23. Ingwersen, W.W., Stevenson M.J. (2012). Can we compare the environmental performance of this product to that one? An update on the development of product category rules and future challenges toward alignment, *Journal of Cleaner Production*, Vol. 24, pp.102-108.
24. Iraldo, F., Testa, F., Frey, M. (2009). Is an environmental management system able to influence environmental and competitive performance? The case of an eco-management and audit scheme (EMAS) in the European Union, *Journal of Cleaner Production*, 17, pp. 1444-1452.
25. Marshall A. (1923). *Industry and Trade*, Macmillan, London.
26. Montini A., Zoboli R. (2003). Environmental impact and innovation in industrial districts, in Cainelli G, Zoboli R. (Eds) "*The evolution of Industrial Districts*", Physica – Verlag.
27. Porter, M.E. (1990). *The Competitive Advantage of Nations*, Free Press, New York.
28. Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS).
29. Sanyé, E., Oliver-Solà, J., Gasol, V.M., Farreny, R., Rieradevall, J., Gabarrell, X. (2011). Life cycle assessment of energy flow and packaging use in food purchasing, *Journal of Cleaner Production*, Vol. 25, No 3, pp. 51-59.
30. Schumpeter J.A. (1939). *Business cycles*. *A Theoretical, Historical and Statistical Analysis of the Capitalist Process*, McGraw-Hill, New York.
31. Steger, U. (2000). Environmental Management Systems: Empirical Evidence and Further Perspectives, *European Management Journal*, Vol. 18, No. 1, pp. 23-37.
32. Testa, F., Iraldo, F., Frey, M. (2011). The effect of environmental regulation on firm's competitive performance: the case of building and construction sector in some EU regions, *Journal of Environmental Management*, Vol. 92, pp. 2136-2144.
33. S. Tessitore, T. Daddi, M. Frey (2012). Eco-innovation and competitiveness in industrial clusters, *International Journal of Technology Management*, pp. 49-63.