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***FORMS AND ROLE OF THE CLUSTER
INITIATIVES IN FOSTERING INNOVATION
IN POST-INDUSTRIAL REGIONS:
A COMPARATIVE STUDY OF
ENVIRONMENTAL CLUSTERS IN BRITISH
WEST MIDLANDS AND SPANISH BASQUE
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Abstract

The objective of this research is to present cluster initiative approaches in post industrial regions characterized by similar economic history and challenges, with additional emphasis on their role in promoting innovation among regional businesses. The research is based on a comparison study of two environmental industry clusters: Environmental Technology Cluster (ET) from British West Midlands and ACLIMA from Spanish Basque Country.

The study analyzes clusters' design and their role in fostering innovation based on environment industry clusters. In both regions environmental industry clusters represent strong potential for further dynamic development with grow opportunities driven by legislation introduced at EU, national or regional levels. The paper compares clusters' heterogeneity, goals and priorities, financing schemes, management structure, types of projects, character of private-public partnerships, challenges, as well as clusters' collaboration at regional/national/international levels. Also focus is given on how the clusters enhance innovation and what types of projects are executed by the regions in this field.

Introduction

Deep and broad economic integration in Europe and especially within the European Union has been taking place mostly on an intra- and cross-regional basis transcending national frontiers and identities and being driven by affinities, complementarities and synergies at the regional level.

The presence, role and impact of this phenomenon as a driver of regional economic development and especially in the form of small and medium enterprise formation and growth is the motivation for this research. In particular, the focus of this research is on profiling, analyzing, benchmarking, and modeling in socio-technical terms, ways and means that creativity, invention and innovation are manifested and drive economic development in diverse regions such as for instance, the Balkan and Baltic regions within the EU as well as other parts of the world. Our focus is on deriving insights from comparing and contrasting similarities and differences and critical success and failure factors within and across the regions under study.

Particular focus is meant to be placed on the role that knowledge-based *innovation networks*¹ and *knowledge clusters*² (see definitions below) in this regard play as catalysts and accelerators of new, sustainable and scalable technological venture formation and growth. In this context, innovation-triggering *technological entrepreneurship* is viewed as a core element of local, intra-regional and cross-

¹ Carayannis, Elias G. and Jeffrey Alexander, Strategy, Structure and Performance Issues of Pre-competitive R&D Consortia: Insights and Lessons Learned, *IEEE Transactions of Engineering Management*, May 2004, vol. 52, no. 2

² Excerpts from "Mode 3" Knowledge Creation, Diffusion and Use in Innovation Networks and Knowledge Clusters: A Comparative Systems Approach across the United States, Europe and Asia', *Technology, Innovation and Knowledge Management (TIK-M) Series*, Elias G. Carayannis and David Campbell, Editors, Greenwood Press/Praeger Books. In Press, Due to appear August 2005

innovation systems, as well as 'glocal' (global/local) knowledge production and innovation-triggering networks³.

In this context, we consider to be significant the role of heterogeneity⁴ within regions (national differences within seemingly homogeneous regions such as the Nordic countries for example) as well as the role of homogeneity between seemingly heterogeneous regions to drive policy learning and identify successful catching-up strategies between leaders and followers or between countries with similar economic and societal challenges.

Moreover, EU-US comparative issues are of interest here, at the regional level. For instance, there are few studies on innovation practices and policies at the state level within the US and this is something we would like to mitigate with this special issue. For example, how do the state-based (not federal) innovation policies in Virginia, Maryland and Florida (or Texas) differ and why?

Other issues of interest and relevance could be framed by questions such as:

- Do innovation policies differ with the economic structure of a region or they remain more or less the same between regions and if so why?
- What does this say about the quality and the societal relevance of the innovation policy measures in the respective states or countries (within the regions)?

In this context, this research will promote the identification and articulation of insights that could inform both public sector policies and private sector practices to render them more effective and efficient. A series of recommendations for policy makers and practitioners would ideally emerge from this comparative, conceptual and empirical research contributing to the growing literature on the role of knowledge on technology, innovation and entrepreneurship and in particular with regards to the role of knowledge creation, diffusion and use in local, national, regional, and global innovation networks and knowledge clusters that form the underpinnings of the knowledge economy and society.

Key Working Concepts Defined⁵: We provide here a set of working definitions developed in the context of this and prior related research projects that are meant to inform the author contributions:

- **"MODE 3":** "Mode 3" for Knowledge Creation, Diffusion and Use⁶: "Mode 3" is a multi-lateral, multi-nodal, multi-modal, and multi-level systems approach to the conceptualization, design,

³ Carayannis Elias and Max Zedwitz (2005). Elias G. Carayannis and Maximilian von Zedwitz, Architecting GloCal (Global-Local), Real-Virtual Incubator Networks (G-RVINs) as Catalysts and Accelerators of Entrepreneurship in Transitioning and Developing Economies: Lessons Learned and Best Practices from Current Development and Business Incubation Practice, *International Journal of Technovation*, v. 25, no. 2, February.

⁴ *Diversity in The Knowledge Economy and Society: Heterogeneity, Innovation and Entrepreneurship* Edited by Elias G. Carayannis, Professor of Science, Technology, Innovation and Entrepreneurship, School of Business, George Washington University, US, Aris Kaloudis and Åge Mariussen, NIFU STEP Studies in Innovation Research and Education, Norway May 2008 c 384 pp Hardback 978 1 84720 211

⁵ Excerpts from "Mode 3" Knowledge Creation, Diffusion and Use in Innovation Networks and Knowledge Clusters: A Comparative Systems Approach across the United States, Europe and Asia', Technology, Innovation and Knowledge Management (TIK-M) Series, Elias G. Carayannis and David Campbell, Editors, Greenwood Press/Praeger Books, December 2005.

⁶ Carayannis et al (2006), Technological Learning for Entrepreneurial Development, *International Journal of Technovation*, 26, 419-443.

and implementation of Government-University-Industry Public-Private Research and Technology Development Co-opetitive Partnerships^{7 8}).

- **KNOWLEDGE CLUSTERS⁹:** Knowledge Clusters are agglomerations of co-specialized, mutually complementary and reinforcing knowledge assets in the form of "knowledge stocks" and "knowledge flows" and management of real and virtual, "knowledge-stock" and "knowledge-flow", modalities that catalyze, accelerate, and support the creation, diffusion, sharing, absorption, and use of co-specialized knowledge assets. "Mode 3" is based on a system-theoretic perspective of socio-economic, political, technological, and cultural trends and conditions that shape the co-evolution of knowledge with the "knowledge-based and knowledge-driven, gloCal economy and society"¹⁰.
- **INNOVATION NETWORKS¹¹:** Innovation Networks¹² are real and virtual infra-structures and infra-technologies that serve to nurture creativity, trigger invention and catalyze innovation in a public and/or private domain context (for instance, Governm that exhibit self-organizing, learning-driven, dynamically adaptive competences and trends in the context of an open systems perspective).

West Midlands (WM) and Basque Country (BC) are highly industrialized regions where manufacturing always has played a critical role in economic development¹³. Both regions have been strongly affected by decline in traditional industries (for instance, manufacturing, constructions, etc.) and have experienced deep economic restructurization in 1970s and 1980s. In both regions cluster initiatives has been created to address the regional economic challenges, support regional competitiveness through sectoral diversification and deployment of innovation.

This study focuses on BC and WM environmental industry clusters - ACLIMA created in 1995 and ET established in 2003. In both regions the environmental industry sector has been dynamically growing in recent years due to the expansion of environmental regulations, rising expectations on industry to improve its environmental performance, growing awareness of cost

⁷ Inter alia see: Carayannis, Elias G. and Jeffrey Alexander, Strategy, Structure and Performance Issues of Pre-competitive R&D Consortia: Insights and Lessons Learned, *IEEE Transactions of Engineering Management*, May 2004, vol. 52, no. 2

⁸ Inter alia see: Carayannis, Elias and Jeffrey Alexander, Winning by Co-opeting in Strategic Government-University-Industry (GUI) Partnerships: The Power of Complex, Dynamic Knowledge Networks, *Journal of Technology Transfer*, vol. 24, no. 2/3, pp. 197-210, August 1999. Note: Awarded 1999 Lang-Rosen Award for Best Paper by the Technology Transfer Society

⁹ Carayannis et al (2006), Technological Learning for Entrepreneurial Development, *International Journal of Technovation*, 26, 419-443.

¹⁰ Carayannis Elias and Max Zedwitz (2005). Elias G. Carayannis and Maximilian von Zedwitz, Architecting GloCal (Global-Local), Real-Virtual Incubator Networks (G-RVINs) as Catalysts and Accelerators of Entrepreneurship in Transitioning and Developing Economies: Lessons Learned and Best Practices from Current Development and Business Incubation Practice, *International Journal of Technovation*, v. 25, no. 2, February.

¹¹ Carayannis et al (2006), Technological Learning for Entrepreneurial Development, *International Journal of Technovation*, 26, 419-443.

¹² Networking is important for understanding the dynamics of advanced and knowledge-based societies. Networking links together different modes of knowledge production and knowledge use, and also connects (sub-nationally, nationally, trans-nationally) different sectors or systems of society. Systems theory, as presented here, is flexible enough for integrating and reconciling systems and networks, thus creating conceptual synergies.

¹³ In the West Midlands with about 5.3 million population, 30% of the region's GDP comes from manufacturing industry engaging over 27% of the regional workforce. Similar phenomenon is in the Basque Country with population of 2.1 million where industrial sector represents Industrial sector represents about 32% of the Basque GDP and employing 29% of the Basque Country workforce

savings achievable by industry through environmental good practice and the increasing adoption of economic instruments (such as the Landfill Levy, the EU Packaging Directive and the Climate Change Levy) which raise the costs on industry of 'poor' environmental performance.¹⁴

The world market for environmental goods and services is expected to grow by 45% by 2015 with world markets growing to \$688 billion by 2010 and just under \$800 billion by 2015.¹⁵ In the WM it is estimated that employment in the environmental industry will be increasing annually by 5% by 2010 and the highest growth will be in sub-sectors such as waste management¹⁶. Also, in the Basque Country annual growth of environmental industry sector is anticipated to be at the level of 6% in the period 2006-2010.¹⁷

Heterogeneity and geographical concentration

ACLIMA and ET's enterprises are geographically concentrated within the region and mostly operating at regional markets, however, aiming at national/international markets. The clusters mainly consist of SMEs and are characterized by high level of heterogeneity reflected in the engagement of variety of environment industry sub-sectors presented in Table 1. With respect to ACLIMA, the cluster presents high participation in sub-sectors of waste, water and soil. However, from the perspective of income distribution, the most profitable have been waste management and recycling, water treatment, and renewable energy sub-sectors. In case of Envirade, a special attention is given to renewable energy and waste markets due to the region's strong performance in this areas, sub-sectors dynamic growth and future potential.¹⁸

Moreover, both clusters are characterized by their horizontal nature that cuts across a number of sub-sectors as transport, energy, constructions, etc. Both clusters cooperate with other regional cluster associations., e.g. ACLIMA is involved in a join project with Energy and Transport Clusters on sustainable transportation. Also ET cooperates with other clusters on specific opportunities, for instance with ICT cluster on photonics, Automotive on Low Carbon Vehicle infrastructure and Building Technologies on low carbon technology.

Table 1. Environmental industry sub-clusters in Basque Country and West Midlands

ACLIMA		ET	
• Waste Mangement	32%	• Waste Management	43%
• Water treatment	14%	• Air pollution control	9%
• Soil Decontamination	14%	• Water & waste water treatment	19%
• Air quality	8%	• Environmental Consulting	11%
• Consulting	17%	• Environmental Monitoring	1%
• Measurement and control	2%	• Energy Management	6%
• Other areas	13%	• Renewable energy	5%
		• Contaminated Land Remediation	3%
		• Cleaner processes	2%
		• Noise and vibration control	1%

¹⁴ The ET Business Plan 2005-08, Environmental Technologies Cluster Opportunities Group, p.5

¹⁵ The Department for Business, Enterprise and Regulatory Reform (BERR), *Environmental Goods and Services (EGS) - Core Script* available at <http://www.berr.gov.uk/files/file39024.pdf>

¹⁶ The ET Business Plan 2005-08, Environmental Technologies Cluster Opportunities Group, p.5

¹⁷ Plan Estrategico de Actuacion de Aclima (Fase II) 2004-2010, p.74

¹⁸ The ET Business Plan 2008-2011, Environmental Technologies Cluster Opportunities Group, p.

Although ACLIMA and ET have a similar goal, they represent very different cluster approaches

ACLIMA and ET, have similar goal to improve competitiveness of their enterprises. Nonetheless, they differ tremendously with respect to cluster model, objectives and priorities, project types, key networks, challenges, financing schemes, approaches infostering innovation, and well as indicators used to monitor their performance.

Cluster models

ACLIMA is an exclusive business association, managed entirely by the private sector where a company in order to take advantage of the cluster services has to become its formal member, pay an annual quota (which depends on a firm's size and revenue), actively participate in the cluster's activities and collaborate with other associated members. ACLIMA is strongly based on collaboration and cooperation among its members to create synergies and address strategic challenges that cannot be addressed by actions carried out by a single company on its own, for instance related to internationalization or development of new technologies. To date, ACLIMA comprises 98 members including 16 honorary partners such as the Basque public institutions, universities and all Basque technology centers. The cluster comprises about 25% of Basque eco-industry businesses which are responsible for about 70% of overall income in Basque eco-industry employing about 16 thousand workers, where about 4 thousand are dedicated to environmental activities¹⁹.

With reference to ET, the cluster is led by regional development agency Advantage West Midlands (AMW) in cooperation with private sector as well regional institutions associated with environmental industry. There is no cluster membership and all programs launched by the cluster are open to any interested and qualified enterprises from the region. ET due to its "open" structure comprises about 1600 companies based in WM that employ about 29,000 people.²⁰

Considering differences between these two clusters, ACLIMA adopted approach based on strong private sector collaboration. On the contrary, collaboration has not been the most important priority for ET, where special emphasis has been given to development of regional supply chains as well as linking them to new markets. This type of cluster approach was considered as the most suitable model to the region's difficult economic situation related to profound crisis in automotive sector at the beginning of 2000s, pivotal for regional economy. This model could affect a greater number of enterprises in a shorter time in comparison to ACLIMA's model based on collaboration, which requires development of trust among competing enterprises in order to introduce joint projects.

¹⁹ Aclima's website: www.aclima.net

²⁰ The ET Business Plan 2005-08, Environmental Technologies Cluster Opportunities Group, p.3

Clusters' objectives and priorities

Both clusters are obliged to develop a cluster strategy with objectives, priorities, challenges, actions to be taken, and criteria against which clusters are evaluated. In case of ACLIMA, the cluster sets up a long term strategy, presently it is the Strategic Plan for 2005-2010. Additionally, ACLIMA prepares annual management plans which are coherent with the strategy and include a list of criteria to be met. Referring to ET, the cluster introduces a three-year Strategic Plan. To date, two strategic plans have been developed – for 2005-2008 and 2008-2011.

Overall, ET and ACLIMA have similar goals - to improve their firms' competitiveness. The objective of ET is to grow environmental technology industry to exploit attractive markets where the region has existing or potential strengths. ET is focused on linking regional business to new markets and on innovation. It concentrates on few industrial areas that give the best opportunities for its businesses, in particular, it covers the growing markets for renewable energy, waste management and resource recovery²¹.

ACLIMA's goal is to improve the competitiveness of its members based on cooperation, focusing on the competitive strategy. The cluster forms its policy along three pillars: competitiveness, sustainability, and innovation. In addition, ACLIMA's members act according to particular principles as growth; cooperation; and R&D, in dimension internal; on the other hand key are sustainable development; public-private cooperation; orientation to the market; and internationalization, in dimension external.

To conclude, both clusters have an objective to enhance regional competitiveness. Their activities are market driven, emphasizing the importance of innovation, and internationalization. However, the role of collaboration varies across the clusters. Collaboration is key for ACLIMA in every field of its activities, not only with public and R&D institutions (what is also observed in ET), but particularly among the cluster's enterprises in introducing joined projects.

Types of projects

ACLIMA's members cooperate and develop joint projects involving usually few members with similar challenges/objectives. Subsequently, the project is introduced to available funding programs in order to be implemented. ACLIMA does not finance directly projects developed by their members. It rather redistributes information among associated members on available funding programs and projects at regional, national, European, or global level, as well as provides assistance in project preparation and promotion/result dissemination. An example here can be the REMIX project, described more detailed in the innovation section. The project is executed by ACLIMA responsible for project promotion, two enterprises belonging to ACLIMA and two subcontracted research centers with the objective of developing a new technology. The project cost is about 1 million euro and is financed from the Basque Government innovation fostering program which covers about 35-45% costs of involved enterprises and ACLIMA.

A different project approach characterizes ET, where projects are developed by COG or introduced by private sector representatives and once approved by the cluster, implemented on a large scale, engaging a number of businesses. These projects are primarily financed from ET

²¹ Advantage West Midlands policy paper, available at http://www.advantagewm.co.uk/Images/business-clusters-policy-summary_tcm9-5867.pdf

budget or national funding schemes. Joining a cluster project is very easy usually through attendance at an event. What is worth noting, majority of cluster projects are accessible by all WM enterprises and sectors, not only by eco-industry enterprises. Moreover, there is no cost for joining the project. An example of ET project can be EnviroINNOVATE a business support project which offered access to funding and environmentally-focused experts from West Midlands Universities. The project with budget of £1.74 million among 3 years assisted 121 businesses, contributing to protection/increase of employment and sales, and others.

As presented above, ET and ACLIMA differ tremendously in types of realized projects. Differences refer to project nature, mainly technology development versus business support; financing source; scale, as well as the way of a project initiation.

Differences in the clusters' organizational structure

ACLIMA is characterized by a sophisticated organizational model. Cluster management structure includes General Assembly, Board of Directors, and the President. *General Assembly* is the association's highest governing body containing all associated members. It meets at least once a year to debate and approve procedures, results and programs previously developed by the Board of Directors and the Specific Committees. *Board of Directors* is ACLIMA's executive body consisting of 16 members – 12 representatives of ACLIMA members and four work positions: president, vice-president, general secretary and treasurer of the cluster. The president is responsible for enforcing collaboration between the associated members as well with other external important for the cluster institutions.

In addition, ACLIMA has an *Executive Committee*, three *Strategic Committees* and several *Groups of Interest*. The Executive Committee is in charge of urgent themes that appear at time periods between gatherings of Board of Directors and comprises of ACLIMA's president, vice-president, general secretary, treasurer and invited enterprises important for the cluster development. Three Strategic Committees are accountable for creating a strategy and actions in the most important areas for the cluster, i.e. sustainability, competitiveness, and innovation. Additionally, there are *Groups of Interest* that could be defined either as working groups or projects involving a fixed number of firms associated within the cluster. Depending on the subject/project participation in these groups can be accessible for all members or be very specific, limited to a certain number of associated enterprises.

For ACLIMA, collaboration with local institutions is crucial. The Basque County regional government actively participates in cluster's activities through civil servants who attend all the Boards of Directors and Committee meetings. Their role is to support decisions, give an advice, nonetheless, they cannot vote and therefore participate in cluster decision taking process. Involvement of the public sector in cluster initiatives takes shape of a "matrix scheme" that consists of vertical heads (one per cluster), horizontal heads (1 per strategic area e.g. marketing, internationalization, etc.), and general coordination of the whole matrix. As vertical heads are at the same time heads for region's horizontal policies, the government links cluster policy and horizontal industrial policy.

With reference to ET, only two organizational bodies are involved in cluster management and development - Cluster Opportunity Group (COG) and Cluster Executive Group (CEG). COG is in charge of identifying challenges, developing cluster's objectives and priorities. Moreover, its

purpose is to inform AWM about specific needs of businesses concentrated in the cluster. In turn, CEG is responsible for execution of COG's decisions. Its efforts relate to project development and management and other critical activities as collaboration with a number of institutions in the context of projects delivery.

With respect to the structure, COG consists of private sector representatives either individual enterprises or trade associations selected for their ability to make strategic decisions on behalf of all the industries in the cluster, and public sector bodies engaged in delivering support to business, as well as in process oversight and administration. In turn, CEG is composed only of public institutions representatives.

The structure of both groups ensures that key local stakeholders play a critical role in both development and delivery of programs aimed at implementing regional policy. Through this composition public institutions are strongly engaged in cluster decision taking process. A particular role has AWM which leads the cluster, providing support, advice and direction needed for the cluster to succeed and seize key opportunities.

The role of each institution involved in COG or CEG is more broadly described in *Clusters' networks* section of this study.

In summary, ACLIMA and ET significantly vary in the governance models. The differences stem from cluster distinct models, priorities, and types of realized projects. ACLIMA approach is adjusted to intensive collaboration among its members in order to generate numerous joint projects in variety of fields as well as to execute them. In turn, ET is focused on implementation of few selected projects but on a large scale. Therefore, its structure is much simpler than ACLIMA's, as does not require intensive collaboration between its private sector members. Referring to common features among ACLIMA and ET, both clusters are led by strong public – private partnership what insures that cluster activities are demand driven.

Challenges in cluster development

Both clusters recognize challenges in their development. ACLIMA's main constraints as a business association relate to existence of a number of institutions at the regional/national level which have very similar functions, for example related to internationalization, innovation and sustainable development. That results in providing enterprises with a similar offer from a number of institutions, an example could be internationalization which is promoted by SPRI, chambers of commerce, ICEX, and other agencies.

This problem has been already recognized by local institutions, and the Basque Government attempts to address this issue by grouping the variety of regional actors along to certain topics, e.g. quality management, research and development, competitiveness, etc.

The cluster recognizes challenges in poor cooperation culture and identification of potential fields of cooperation given wide heterogeneity of the environmental sector. Additionally, a number of Basque enterprises do not recognize the role of ACLIMA in improving their competitiveness, neither are aware of benefits coming from cluster membership or have limited resources (including staffing) to actively engage in cluster's activities. Also one major concern is low percentage of associated enterprises actively participating in ACLIMA's actions which amounts only to 25%.

In regard to Basque environmental sector, challenges stem from differences in requirements and regulations between autonomic communities particularly with reference to waste management. As the Basque Country's waste management law is better developed than in surrounding autonomous communities, that permits these communities to offer lower prices for their services (dumping).

Also an issue to be addressed is low level of internationalization, particularly with reference to Basque water sector.

With respect to ET, main two challenges are associated with interpretation of environmental regulations what effect companies' investment, as well as poor understanding of the role of environmental technologies sector and grasping opportunities in the region. Moreover, skills shortage is a rapidly emerging issue and is being addressed to a certain degree with new initiatives. One particular barrier that the cluster is grappling with in the Public Sector marketplace is the lack of understanding of what particular technologies can do and how to specify them. This then leads to procurement difficulties. In comparison to ACLIMA's challenges, identification of areas for collaboration have not proved to be a problem to date, in fact ET has more opportunities that can respond to.

ACLIMA and ET recognize challenges in their development, however, they are different. A number of issues identified by ACLIMA refer to the cluster as an enterprise association and collaboration among its members. In turn, main challenges for ET are related to poor understanding of the role of environmental technologies in the region as well as skills shortage. Both clusters acknowledge a challenge in complex environmental law and issues related to its interpretation or implementation.

Financing schemes

ACLIMA's activities are financed by both, the Basque Government and the private sector. Every year the BC government signs agreements with the cluster on the amount not higher than €2400. This amount is spent for daily interactions between civil servants and head of the Cluster Association. These resources finance 60% of cluster's internal costs and 50% of external ones (e.g. subcontracted market studies, etc.). Additionally cluster has income from members' annual fees which cover 40% of the internal costs and the 50% of the external costs ²².

Referring to ET, expenses related to the cluster administration or conducted programs are primarily financed from the AWM budget. ET's budget is directly linked to the ET's strategic plan and covers few years. To give an example, in period 2005-2008 ET budget amounted to about 6 million GBP.

Additionally, projects which are implemented by the cluster as national demonstration are financed by accountable for them institutions.

²² Aranguren J.M., Larrea M., Navarro I., Navarro M. *Cluster versus spatial network supporting policies: learning from experience in the Basque Country*, ESTE-Deusto University

ACLIMA and ET significantly differ in projects and daily activities financing schemes. About 50% of ACLIMA's budget comes from membership fees. In case of ET, its activities are primarily financed by AWM or other public institutions. Moreover, enterprises are not charged for participation at ET programs.

Clusters' networks

a. West Midlands Environmental Technology Cluster

The ET's structure composed from COG and CEG guarantees collaboration among key regional players, these include: key private sector representatives; AWM; Business Link West Midlands; Learning and Skills Council (LSC); UK Trade and Investment (UKTI); the Environment Agency, Government Office for the West Midlands; and regional Higher Education Institutions.

As mentioned before, AWM is accountable for cluster supervision and administration, it also provides ET with financial support. Through the Business Link West Midlands, which is the WM one-stop shop for all SMEs seeking support, the cluster disseminates information on cluster initiatives and works with particular companies involved in projects. Referring to LSC, its role is concentrated on organizing the provision of skills to fill identified needs in ET cluster. In that respect both organizations collaborate on major survey work. Nonetheless LSC has a national role, thus does not respond to ET needs quickly.

Collaboration with UKTI is critical for the cluster. UKTI provides ET with potential world wide opportunities for international development, on the other hand, the cluster can adjust its wide-scale projects to identified by UKTI opportunities. Furthermore, through this collaboration the cluster ET can promote its activities in the world and gain new markets for development. Moreover, ET can impact UKTI national priorities.

Collaboration with Regional Higher Education Institutions takes place through CEG where one of its members is a representative of a knowledge exchange network consisting of all regional Universities. Also ET attends meetings of this network group.

With respect to higher education institutions/incubators/research centers, ET cooperates with most of regional universities. Particularly strong collaboration has been developed with Birmingham University City, Birmingham, Warwick, Aston and Staffordshire universities. The collaboration is directly related to execution of specific joint projects.

ET also works with the Environment Agency – a leading public body for protecting and improving the environment, however, the collaboration is limited given the role of the Environment Agency as a regulator. Similar situation is with WM Government Office - accountable for developing government programs and initiatives in the region, GOWM has a limited role with respect to ET activities as it is focused on interpreting national policy.

Apart from institutions directly involved in cluster development, the cluster collaborates with other entities at regional, national and international level (see Table ...) in order to promote regional businesses and support regional competitiveness.

At the regional level, the cluster intensively collaborates with Innovation and Technology Council (ITC) - an institution created by AWM that brings together leaders from the region's science technology and industry to champion innovation. The Council is among other the primary source of advice on opportunities for investment in areas of regional, national or international significance in technological innovation.

To some degree ET interacts with all regional chambers of commerce indirectly through WM Business Link services, UKTI (since the chambers hold the UKTI regional contracts), and Inward Investment projects. Also the cluster has some contact with West Midlands Local Government Association²³, where primarily interacts with the Economic Development officers, among other on projects of joint interest.

Also ET has some interactions with regional R&D centers Qinetiq, specializing in electronics; and MIRA specializing in automotive industry. Given that they both are the private sector organizations, ET can only collaborate with them on specific projects. Moreover, ET has some contacts with West Midlands Rural Affairs Forum focused on integration of the rural dimension in strategies and action plans. ET interacts with the forum within AWM.

At the interregional level, the cluster collaborates with most of other Regional Development Agencies and Devolved Administrations (in Northern Ireland, Scotland and Wales) on specific projects. For instance, ET works with East Midlands Development Agency on the Energy Technologies Institute which is supported jointly by both institutions.

At the national level, besides the UKTI, ET strongly cooperates with UK Federation of Environmental Industries - an inter RDA body which exchanges good practice and promotes the cluster. Through its Special Interest Group for overseas trade it plays a major role in delivery of ET international trade plan. It also is a useful mechanism for influencing national policy as has links to Department for Business, Enterprise & Regulatory Reform (BERR) and UK Department for Environment, Food and Rural Affairs (DEFRA).

ET has robust connections with UK Business Council for Sustainable Development, where the cluster is the only affiliated branch in the UK of the World Business Council for Sustainable Development (WBCSD). In this context, ET is focused on practical implementation of sustainable development values and the promotion of sustainable development as key to world class business standards and new business opportunities. BCSD has also delivered some of the cluster's projects, most notably the NISP project, described more broadly in the following sections of this research study.

As a subject of renewable energy is very important to ET, it collaborates to some extent with Renewable Energy Group within the BERR, principally as UK Forum for Environmental

²³ West Midlands Local Government Association promotes and supports constituent authorities and influences regional policies which affect the economic, social and environmental well being of their communities

Industries²⁴. Through this forum regional institutions gained the ability to present an integrated UK position to the Wind Industry.

At the international level ET intensively collaborates with the WM in Europe Office, which is a cross-sectoral partnership that represents the interests of the WM in Europe by ensuring it plays an active role and makes the most of opportunities. In that respect, ET collaborates in a range of activities including innovation support and regional promotion.

Also, to a certain extent ET interacts with World Business Council for Sustainable Development (WBCSD)²⁵ through UK Business Council for Sustainable Development. WBCSD provides a platform for companies to explore sustainable development, share knowledge, experiences and best practices, and to advocate business positions on these issues in a variety of forums, working with governments, non-governmental and intergovernmental organizations. In that respect, links between WBCSD and UKBCSD are pivotal for ET activities.

Overall, ET has always had an international perspective and has been active in international markets. The main delivery body for ET international development is UKTI, other stakeholders include BERR, UK Federation of Environmental Industries and additionally UK Department for Environment, Food and Rural Affairs (DEFRA). So far the cluster has been active in EU Accession States with specific missions aimed at waste and water. ET also tries and uses public sector links, like twin cities, as much of environmental technology market is heavily public sector influenced. It has also taken industrial symbiosis missions to a number of countries as USA, China, Brazil and Mexico and programs in US and China, and others.

Table ..ACLIMA and ET's major collaboration partners

ACLIMA			Environmental Technology Cluster		
Regional networks					
	Strong	Some		Strong	Some
EUSKALIT	○		Innovation and Technology Council (ITC)	○	
IZAITE -Basque Country Enterprise Association for Sustainability	○		West Midlands Local Government Association		○
INNOBASQUE	○		QINETIQ – R&D Center in electronics		○
EUSKADINNOVA	○		MIRA – R&D Center in automotive industry		○
Eusko Ikaskuntza	○		WM Chambers of Commerce		○
ENVIRONMENT BASQUE CONTACT POINT BCP	○		West Midlands Rural Affairs Forum		○
Interregional collaboration					
Collaboration with other regions is project based			Collaboration with other regions is project based		
National relations					
Ministry of Environmental	○		UKTI	○	

²⁴ The UK Forum for Environmental Industries is working to develop the environmental industries sector by establishing stronger links and a greater level of cooperation between the nine regions of the UK and the three devolved Assemblies of Scotland, Northern Ireland and Wales.

²⁵ For more information visit WBCSD website www.wbcsd.org

Protection (MIMAM)					
Biodiversity Foundation	○		UK Federation of Environmental Industries	○	
The Spanish Institute for Foreign Trade (ICEX)		○	UK Business Council for Sustainable Development	○	
			BERR Renewable Energy Group		○
International cooperation					
FIEMA	○		West Midlands in Europe Office	○	
Enterprise Europe Network	○		World Business Council for Sustainable Development		○
EUCETSA		○			

b. ACLIMA

ACLIMA apart from Basque private sector representatives comprises 16 honor members as regional technology centers, public institutions and universities. These entities collaborate in order to improve business competitiveness, promote innovation and sustainable development, enhance links between regional administration, private sector and technology/research centers. Among ACLIMA's honor members are three departments of the Basque Government - Department of Education, Universities and Research; Department of Industry, Commerce and Tourism; and Department of Environment and Regional Planning. Through frequent interactions with these departments ACLIMA can impact region's respective policies key for cluster development.

ACLIMA intensively collaborates with the Public Society of Environmental Management (IHOBE) – an entity executing policy developed by Department of Environment and Regional Planning. The collaboration has a broad character and includes organization of conferences, forums, working groups, development of agreements between enterprises and Basque public administration, generation research and innovation projects, etc.

A very important role plays also SPRI – Basque business development agency which offers a variety of innovation and research programs as well as assists in internationalization activities, collaborate in market research, etc. In the area of internationalization ACLIMA also have interactions with regional chamber of commerce. Moreover through the chambers ACLIMA approaches new members or organizes meeting with business delegations from other regions/ countries.

Additionally ACLIMA collaborates with three Basque provincial councils, in particular with provincial council of BIZKAIA where 80% of ACLIMA's members are based. Strong collaboration with this council relates to its Xertatu program promoting Corporate Social Responsibility. Collaboration with other two provincial councils is based on financial support of specific activities developed by ACLIMA.

With respect to higher education institutions and research centers, to ACLIMA's honor members belong four main Basque universities which collaborate on research projects developed by cluster's businesses. Also ACLIMA's private sector members are technology centers Gaiker, Leia and TECHNALIA (a corporation of 7 regional technology centers).

Despite interactions with honor members, ACLIMA collaborates with other institutions at regional, national, and international level in the strategic areas, mainly in sustainable development, innovation, and competitiveness (including internationalization).

In the area of sustainable development, at the regional level the cluster strongly cooperates with EUSKALIT - The Basque Foundation for Quality, through which promotes culture of Total Quality (TQ). In that regard, ACLIMA encourages its member to create working groups in various areas of TQ and to participate in courses/workshops organized by EUSKALIT.

In the area of promotion of sustainable development, the cluster intensively collaborates with Eusko Ikaskuntza (the Basque Studies Society), Izaite (Basque Country Enterprise Association for Sustainability) as well as ACLIMA's honor member - provincial council of Bizkaia (program Xertatu). Overall, the role of these organizations is to promote values of sustainable development among corporations, enterprises as well as all persons in their decision taking process as well in all other activities. In this context, ACLIMA organizes joint activities, participates in conferences, and disseminates information on activities and executed projects.

In the strategic area of innovation, ACLIMA has strong regional and international networks. The cluster attentively oversees project opportunities at the European market and monitors technology offers and demand related to environmental sector. In this field it intensively collaborates with regional entities as the Basque Agency for Innovation INNOBASQUE, SPRI, and the Environment Basque Contact Point BCP (BCP aims to coordinate regional players with EU VII Framework program). At the international level cluster strongly cooperates with Enterprise Europe Network – European initiative providing integrated innovation and business support to small businesses across the European Union and to a certain extent with EUCETSA - European Committee of Environmental Technology Suppliers²⁶. These institutions provide ACLIMA with detailed information on available European projects, including projects within EU Framework programs, which give ACLIMA's members opportunity to engage and gain new markets. Moreover, INNOBASQUE has recently become a part of ACLIMA's advisory body on technological innovation. Also the cluster belongs to EUSKADINNOVA - the Basque Country innovation portal, where despite promoting innovation agendas among individual enterprises, ACLIMA also plays the role of sectoral facilitator by its engagement in creation a sectoral innovation agenda in order to identify innovation projects to be led by ACLIMA in short, medium and long time framework.

With reference to the area of internationalization, besides cooperation with SPRI and chambers of commerce at the regional level, the cluster interacts to some degree with the Spanish Institute for Foreign Trade (ICEX) at the national level and EUCESTA at the international level. Also, over recent few years ACLIMA has developed Latin American Federation of Environmental Protection (FIEMA) where the cluster plays the role of Secretariat. The Federation was created to promote business development between the Basque Country and Latin America through collaboration of enterprises and regional institutions.

Beside ACLIMA's collaboration networks in specific areas, particularly strong collaboration is taking place with Ministry of Environmental Protection (MIMAM) with reference to financial

support of ACLIMA's budget or specific projects. Also, ACLIMA participates in ministerial working groups associated with creation of environmental law at the national level. To some extent the cluster cooperates with other ministries as Ministry of Industry or Ministry of Education and Science in order to clarify rules for potential application for national funding programs, as well as law interpretation that applies to cluster's projects/investments. Cluster has strong cooperation with Biodiversity Foundation which supports ACLIMA's activities financially.

With respect to interregional networks, collaboration is project based. In this context, ACLIMA interacts for instance with Andalusian Association of Environmental Industry AESMA, Foundation for Research & Innovation of the Catalonia FITEC, and Association of the environmental technology enterprises Aproema from Galicia.

Both cluster have well developed collaboration networks and identified strategic partners. Nonetheless, as the Basque Country region is much more powerful in its own policy, and to a large extent independent on the national institutions, network of ACLIMA is much more regionally and internationally based. The opposite situation is observed in case of ET, where cluster's key partners are national public institutions or their regional departments.

Innovation

One of the clusters' main objectives is fostering innovation. However, ACLIMA and ET use different approaches in this field.

Between 2005-2008 ET has had an objective to promote innovation through business support based on maximizing engagement of local resources both material and intellectual. Cluster's programs were aimed at implementation of nationally significant demonstrators (pilot projects) for innovation in technology areas of world-wide growth potential (e.g. renewable energy) as well as creating linkages between regional companies and specific marketplaces drawing on regional innovation resources. Basically, ET promotes innovation in three ways by: (a) providing innovation business support, typically from Universities, to undertake a small (usually few days) program of work; (b) supporting of innovation through funding of individual firm's activities by access to AWM grants or (c) supporting capital base for innovation through financing important regional projects aiming at development of new technology.

With reference to capital base support an example is the Birmingham Science City initiative which is intended to reinforce regional universities capability to win EU and other opportunities for research funding. All its funding streams look for business involvement and part of ET support requires business engagement.

Innovation is a top priority for ACLIMA. Nonetheless, the clusters does not finance innovative projects directly, it plays rather a role of information center on existing market needs and potential projects. It motivates members to cooperation and development of joint projects. The cluster has created a special innovation committee that aims to develop the Basque ecoindustry based on innovation. The committee identifies technology niches where the firms can engage. Also, the committee meets with the members to develop innovative projects in cooperation, prepare project application which are submitted to regional, national, European funding programs on research or technology development. Moreover, the role of ACLIMA is to collect

and distribute knowledge between the members about various available innovation financing programs, promote and coordinate project ideas among firms, as well as promotion/information diffusion of project results.

Examples of innovation projects realized by ACLIMA and ET are presented in the tables x..y...

In general, ACLIMA's projects are directed at development and delivery of a specific technology or a research study where only few entities are involved. ACLIMA's projects are based on consortiums consisting of agents with expertise in general and in every technical, industrial and managerial aspect of a project. The participants complement each other and therefore ensure the capability of achieving the objectives, usability and exploitation of the results. Projects are financed from various programs either regional or international. Also projects' participants contribute financially.

ET's projects are mostly directed at business support at a large scale to help SMEs exploit new markets and grow sales of environmental goods and services. They engage a large number of enterprises and are almost entirely funded by regional institutions or central government. Moreover, enterprises engaged in the cluster's projects do not contribute financially.

In case of ACLIMA, projects are related to development of new technology, where costs amounted to about 1-2 million euro per project. They are financed from various programs including EU framework programs, Basque Government programs, provincial councils' funding scheme which cover a substantial part of the project's costs, depending on program type and involved entities. For instance within the project SORMEN costs of enterprises are financed in 60% from the EU budget, whereas costs of the research centers are covered by EU or the involved in the projects companies. ACLIMA's projects usually engage few entities where each of them has a specific role, e.g. technology creation, development, implementation, project coordination, promotion and results dissemination. In general, ACLIMA's role as an association is promotion of project results and their dissemination at different forums.

Different approach has been adopted in WM, where cluster policy does not have as long history as the Basque cluster policy does. The cluster is concentrated at business support activities, the examples could be EnviroINNOVATE²⁷ and The National Industrial Symbiosis Program (NISP) projects. EnviroINNOVATE priorities are to help SMEs exploit new markets and grow sales of environmental goods and services, and to encourage interactions between SMEs with local academia. The project budget was £1.08m including about £200k from the ERDF. Eventually 121 businesses participated in the project where subsequent investment by firms in new projects originated under EnviroINNOVATE levered to £1,711,000. Also, in case of NISP business support was promoted with the priority to facilitate industrial symbiosis projects among regional businesses through brokering activities as networking events, facilitating direct introductions between interested firms, and coordinating in-depth consulting projects with individual firm.

As has been presented, both clusters identify innovation as top priority, however, they use different approaches in fostering innovation. ACLIMA's project aim to deliver a specific technology/research. These projects are based on strong collaboration between a small number of entities and are financed from variety of funding programs, always with contribution from the private sector. In case of ET, projects are carefully designed by the cluster and implemented at large scale. These projects do not intend to develop a certain technology, but e.g. encourage enterprises to explore new markets or create links with regional research base.

²⁷ The Envirotrade project won a RegioStars 2008 award for the most innovative regional project in the category 'Energy Technology transfer from research institutes to SMEs'