

ECO-INNOVATION AT THE HEART OF REGIONAL DEVELOPMENT GREEN FOR GROWTH (G4G)

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INTRODUCTION

These days, eco-innovation presents interesting growth perspectives for an ever greater number of businesses thanks to a wide variety of niche market opportunities.

Since eco-innovation is emerging as an industry, it should attract the attention of regional decision-makers and RDAs as an up-and-coming sector in its own right and also as an interface between different industries.

For the purpose of the present document, we will use the term eco-innovation to describe all industries and services that deliver reduced pressure on the environment or lower energy and raw material consumption. We use the term eco-innovation in preference to terms including “environmental technology” or “alternative energy” because we want to instil the idea of business opportunities and dynamism rather than convey the image of a bad conscience labelled on polluters!

So, eco-innovation covers a wide range of activities including areas such as:

- alternative energy, including energy storage and supply infrastructure,
- energy savings,
- consultancy and innovative project/business engineering and finance services,
- environmental damage remediation, including brown field rehabilitation,
- transport,
- recycling,
- eco-innovative product engineering, i.e. factoring recycling from development,
- new ways of leveraging natural resources,
- construction, eco-construction and urban regeneration,
- new products, processes and business models and even possibly new uses and adaptations of existing products and materials (eco-design and eco-products), as well as new materials,
- environment-friendly agriculture, including production and breeding of natural organisms (ladybirds, earthworms, etc.),
- spatial planning,
- zero-energy housing, intelligent water management housing and housing built with sustainable construction products,
- the wellness industry, which in some regions can also include the development and processing of organic products, eco-tourism and therapeutic tourism as well as preventive medicine and medical care for the elderly.

Such a wide range of activities should theoretically enable all types of regions to generate competitive advantages in this sector.

From the perspective of regional development, eco-innovation can be the subject of one or more clusters and regional development strategies geared toward either the mainstreaming of green technology into strong regional industries or a niche-based approach.

In some regions, the impetus for the eco-innovation industry will be provided by the private sector, which will see it as a new Eldorado. This is true of the Silicon Valley, which leveraged its expertise in NICT “gazelle” development to seize opportunities generated by alternative energy sources.

A few regions are lucky enough to be home to business developers who have managed to turn their ideas or visions into gazelles. This is for instance the case of Vestas (DK) and QCells (D).

Every key regional development stakeholder should progressively become aware of the long term economic advantage represented by regional eco-innovation or eco-management. It will increasingly be in their best interest to avoid paying attention to these concepts only by reference to cyclic oil price changes, green lobbying or overall economic performance.

The aim of the present document is to summarise both regional practices aimed at mainstreaming eco-innovation and eco-management concepts into regional development strategies, and the growth potential that these concepts could represent for businesses and hence for regions.

While a number of key variables including taxation and some administrative or legislative factors fall outside the purview of regional stakeholders, it is undeniable that regional authorities can play a leading role in promoting the emergence of regional economies resting on eco-innovation, notably through their purchasing policies. This is all the more feasible since many products, services and business models in this field have not reached their maturity or decline stage yet and the degree of long-term product and service survivability varies considerably across countries. Thus, assuming that regional stakeholders can mediate the emergence of new markets, this offers regions very interesting perspectives indeed.

Several surveys valorise the eco-innovation market at around \$500 billion. This market is – and is expected to continue to be – a steadily growing market, as shown in the figures below:

Year	Value
2000	\$515 billion
2004	\$548 billion
2010	\$688 billion ^(e)
2015	\$800 billion ^(e)

^(e) Estimate

In the context of global economic crisis which became evident toward the end of 2008, RDAs should reflect on the growth potential of the eco-innovation sector. They should also think about the types of projects in this field that are worth supporting with resources earmarked in economic recovery plans (pursuant to the Keynesian approach to economic development). Worth underscoring in this context is that the European economic recovery plan presented by the European Commission on 26 November 2008¹ includes a range of eco-innovation measures such as:

- improving the energy efficiency of housing,
- expediting utilisation of green products,
- developing clean technologies in the car and construction industries.

The US also focuses its economic recovery strategy on clean technology.

Noteworthy in this context is that in a report entitled *The Green Rebound*, HSBC bank assessed projected investment by 15 countries in 2008 as part of recovery plans at €341 billion. Out of this amount, €287 billion (i.e. 84%) is earmarked for RTD, compared to €110 billion for the waste, water and pollution management industry and €43 billion for renewable energy sources and carbon capture respectively.

There is wide variation between countries regarding the share of total recovery plan resources dedicated to eco-innovation: 69% in South Korea, 34% in China, 19% in Germany, 18% in the US, 8% in France, 7% in the UK, etc.

¹ Doc. COM(2008)800.

CHAPTER 1 THE ECOSYSTEM OF ECO-INNOVATION-RELATED INDUSTRIES

The graph below seeks to introduce the different components of the eco-innovation industry value chain, which actually encompasses five industry clusters, i.e.:

- energy;
- clean technology;
- eco-construction;
- spatial eco-planning and eco-utilisation;
- environmental damage remediation.

Comparing this ecosystem with traditional market opportunities, it emerges that the eco-innovation sector provides opportunities in the following fields:

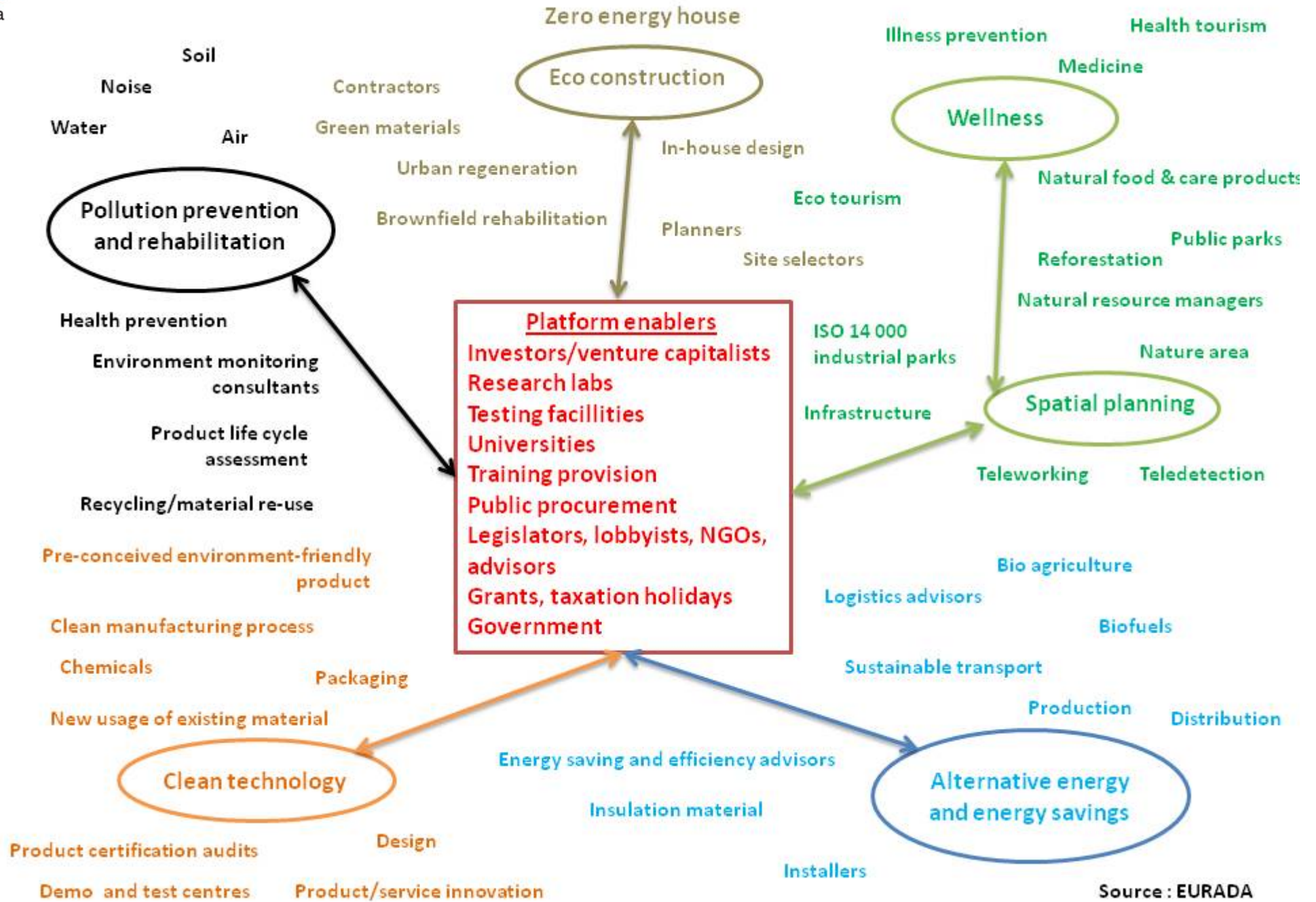
- ✓ New products through constant innovation, technology leaps or new uses for existing products (eco-construction, biofuels, etc.);
- ✓ New advisory, audit, consulting, certification, design, R&D, innovation, marketing, vocational training and other services, financial products, etc.;
- ✓ New business models including low cost, low energy consumption, maximum reduction of greenhouse gas emissions, organic farming, and specialist venture capital funds;
- ✓ New processes: automation, recycling, digitalisation;
- ✓ New administrative et legislative models through use of differentiated taxation, incentives, public procurement, spatial planning, building and operating licenses for industrial – and possibly commercial – activities, etc.
- ✓ Promoting the growth of “First Movers”, not only through grant allocations and public procurement steering but also by facilitating the distribution of products/services in a given test area.

Another way of addressing the eco-innovation industry value chain is to consider the industrial lifecycle by breaking it down into four stages: Ideas/RTDI, Production, Infrastructures, and Consumption².

The activities associated with these four stages include:

- investigating and developing new energy sources (hydrogen, biofuels, etc.) and products with a small environmental footprint;
- manufacturing eco-innovative products and services;
- infrastructure and logistical systems providing products and services to customers, including alternative energy storage solutions;
- the different market segments of the eco-innovation industry.

² See *Clean Technology Investment Trends 2000-2004*, published by the Carbon Trust (UK).



To come to terms with the wide variety of industries and segments potentially involved with the concept of eco-innovation, regions could for instance root their regional development strategies in cross-sector platforms. The matrix below could be used as a reference to identify opportunities for the different industries operating regionally.

Trends/Sectors	Agriculture	Manufacturing industry	Commerce	Services industry	Financial services	Public services
Sustainable environment						
Knowledge						
ICT						
Ageing						
Energy						
Globalisation						
Purchasing power						
Low cost business model						

Source: EURADA base on discussions with Prof. Phil Cooke, Cardiff University.

Then, there is a need for each project to think about those types of regional policy intervention that will impact project delivery most strongly:

- RTD infrastructure;
- RTD projects;
- human capital;
- commercialisation of RTD outcomes and innovative ideas;
- entrepreneurship;
- networking support;
- access to sources of finance;
- direct support for productive investment;
- public procurement;
- taxation.

There is a further need to promote eco-innovation mainstreaming into the whole business supply chain because businesses very often need sources of cost savings. Worth highlighting in this context are the advantages to be derived from investment in fields including:

- energy and raw materials rationalisation,
- cradle-to-cradle, i.e. the development of products whose entire lifecycle is environment friendly,
- rationalisation of the physical supply chain.

When it comes to supply chains, the following action can be assumed to enable financial and environmental cost reductions:

- alternative product development (cradle-to-cradle);
- redefining component purchasing policies and production methods;
- analysis;
- reorganising logistics, transport and packaging;
- optimising storage and distribution platforms;
- redefining the last links in the distribution chain.

Further, regional authorities or industrial park managers could carefully examine the opportunities presented by eco-industrial synergies between economic players, e.g. by promoting:

- the flow of waste/resources between companies;
- the syndication of service and equipment;
- the detection of new activities.

Finally, regional authorities may also invest in an eco-innovation stream by specialising some of their community infrastructure, e.g. industrial parks, incubators and private investor networks. They can also improve the eco-attractiveness of some of this infrastructure.

As with all entrepreneurial growth industries, the issue of human resources arises sooner or later. Every link of the supply chain will require new skills. There will be a need to both look for RTDI talent and re-skill technical staff into new trades.

Worth noting is that a majority of US States have analysed the job creation potential of eco-innovation. Overall, these analyses involve:

- Characterising industry jobs;
- Assessing state employment numbers and growth prospects;
- Identifying skills requirements and correspondence with local labour supply;
- Mapping available training schemes and spotting asymmetric training supply and skills requirements;
- Improving information about employment potential and training provision.

In a joint report entitled "Green Jobs: Towards decent work in a sustainable, low-carbon world"³, the ILO (International Labour Organisation) and UNEP (United Nations Environmental Programme) present the following findings:

- Foreseeable employment trends include four main categories:
- *First, in some cases, additional jobs will be created—as in the manufacturing of pollution control devices added to existing production equipment.*
 - *Second, some employment will be substituted—as in shifting from fossil fuels to renewables, or from truck manufacturing to rail-car manufacturing, or from landfilling and waste incineration to recycling.*
 - *Third, certain jobs may be eliminated without direct replacement—as when packaging materials are discouraged or banned and their production is discontinued.*
 - *Fourth, it would appear that many existing jobs (especially such as plumbers, electricians, metal workers, and construction workers) will simply be redefined as day-to-day skillsets, work methods, and profiles are greened. It goes without saying that this last aspect is by far the hardest to document and analyze, and the hardest for which to foresee the full implications.*
- The main sources of new jobs will likely become available in the sectors listed in the table overleaf.

A French expert⁴ derived the following findings from this report:

³ http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_098503.pdf

⁴ Guillaume Sainteny, *La France risque de manquer le virage des technologies propres*, quoted in *Les Echos*, 7-8 August 2009, p. 8.

- France is a leader in mature industries including water and waste but is underrepresented in environmental technologies with genuine growth potential (renewable energy sources, energy storage technology, batteries for clean vehicles, etc);
- French eco-businesses specialise in curative – rather than preventive – technology.

The above remarks may encourage stakeholders in other countries and regions to look into their own position on this promising market.

Also worth underscoring is that when it comes to environmental patenting, Japan leads the US and the EU.

Energy Supply	
	Integrated gasification/ carbon sequestration
	Co-generation (combined heat and power)
	Renewables (wind, solar, biofuels, geothermal, small-scale hydro); fuel cells
Transport	
	More fuel-efficient vehicles
	Hybrid-electric, electric, and fuel-cell vehicles
	Car sharing
	Public transit
	Non-motorized transport (biking, walking), and changes in land-use policies and settlement patterns (reducing distance and dependence on motorized transport)
Manufacturing	
	Pollution control (scrubbers and other tailpipe technologies)
	Energy and materials efficiency
	Clean production techniques (toxics avoidance)
	Cradle-to-cradle (closed-loop systems)
Buildings	
	Lighting, energy-efficient appliances and office equipment
	Solar heating/cooling, solar panels
	Retrofitting
	Green buildings (energy-efficient windows, insulation, building materials, HVAC)
	Passive-solar houses, zero-emissions buildings
Materials Management	
	Recycling
	Extended producer responsibility/ product take-back and remanufacturing
	De-materialization
	Durability and reparability of products
Retail	
	Promotion of efficient products/ eco-labels
	Store locations closer to residential areas
	Minimization of shipping distances (from origin of products to store location)
	New service economy (selling services, not products)
Agriculture	
	Soil conservation
	Water efficiency
	Organic growing methods
	Reducing farm-to-market distance
Forestry	
	Reforestation and afforestation projects
	Agroforestry
	Sustainable forestry management and certification schemes
	Halting deforestation

CHAPTER 2 REGIONAL CHALLENGES

2.1 Characterisation

The emergence of an eco-innovation industry rests on the five parameters below:

- ✓ consumer behaviours, in terms both of their purchasing impulses and attitudes and their reactions to the NIMBY syndrome. The strongest resistance will undoubtedly come from the transport industry.
- ✓ genuine implementation of the concept of corporate social responsibility. Arguing that taking up eco-innovation will lead to extra investment costs and therefore a loss of potential competitiveness may severely hinder the development of certain segments of the eco-innovation market.
- ✓ Legislation. Some of it may create severe barriers to market access for new products. Others will prove to be powerful market growth accelerators.
- ✓ Human resources. The eco-innovation industry needs new skills to emerge in services, industry and crafts alike.
- ✓ Energy costs. Oil price levels strongly influence both business and private individual purchasing behaviours. Relatively cheap oil means that a number of alternative energy sources become less attractive. Public intervention geared toward cost reduction (direct grants, differentiated taxations, etc.) will therefore strongly impact the market.

2.2 Regional Intelligence

In order to remove as many of the barriers preventing a harmonious and speedy development of eco-innovation as possible, public authorities and RDAs alike should use a checklist seeking to constantly assess the industry's business environment and so progressively remove the barriers and hurdles hindering its development.

Eco-innovation can be the subject of a regional intelligence strategy providing answers to questions dealing both with indigenous strengths, e.g.

- What incentives, schemes and support services are available to businesses? Who benefits from them?
- How is the regional market evolving? What trends are in evidence when it comes to public procurement?
- Is there a directory of businesses and laboratories specialising in eco-innovation? Does the region have an event of national/international magnitude promoting eco-innovation?
- What is the business birth/fatality rate among regional businesses operating in the eco-innovation industry?
- How many university spin-offs have been developed? What trends are in evidence when it comes to the commercialisation of RTD outcomes?
- What are the volumes and trends regarding venture and seed capital investment in eco-innovation?
- What types of measures are taken to encourage businesses to join a "waste-to-raw-material" scheme either within an industrial park or on a regional scale?
- What are the prevailing trends when it comes to employment and occupational skills requirements? To what extent does training provision adjust to the needs of the eco-innovation industry?

- What are the prevailing trends when it comes to certification, audit, enterprise quality certification, products and buildings?
- Who is active in one or more eco-innovation-related clusters? What are their priorities and needs when it comes to support services?
- What are the weak links of the value chain? Why are they weak and how can such weaknesses be overcome?
- Is there a lack of symmetry between the different key stakeholders (businesses, private individuals, administrations, investors, etc.) when it comes to innovation and practices?
- Is there a specialist design centre aiming to integrate – from product development and prototyping – recycling possibilities or substitute components to include a higher share of recyclable materials in product manufacturing?
- What parts of the different regional strategies can/must be adapted to promote the – preferred – use of eco-innovative products and services?
- What trends are in evidence when it comes to organic farming and eco-tourism?
- What additional action could the public sector take in order to stimulate RTDI in eco-innovation?
- What action is taken at regional level to improve market solvency? Are any structural market failures in evidence in the region?
- What demonstration and awareness activities have a strong impact on key stakeholders – including private individuals?
- What public support services have the best cost/benefit ratio?
- How do eco-innovation operators interact with other regional economy stakeholders? Can they be mapped?
- What are the lessons to be learned from a regional business performance benchmarking system and from benchmarking the attitudes of institutional players toward eco-innovation?
- What niche markets are emerging outside the region? How can similar competitive advantages be generated?

and with :

- What are the biggest market opportunities untapped by regional businesses?
- What types of FDI have been attracted to the region? Is eco-innovation a strong message in regional marketing?
- What products/services developed in the region have a strong internationalisation potential?
- Who are the players who deserve special attention in a regional attractiveness strategy?

In order to deploy such a regional intelligence system, an Eco-Advantage Competitiveness Steering Committee or Eco-Advantage Competitive Governance Club should be established to ensure objective evaluation of the aims pursued and analyses conducted as part of such a regional intelligence tool. Such a body could also conduct benchmarking exercises with other regions and produce annual reports/diagnoses on eco-innovation trends in the regional economy.

2.3 Eco-innovation Strategy Assessment Scoreboard

Regional strategies need to be assessed in relation to framework conditions, financial resources provided to the different stakeholders and the number of support recipients. To do this, RDAs may use the scoreboard below:

R&D

- Incentives for RTDI activities
- Patents
- Technology transfer
- University spin-offs

Entrepreneurship

- Access to venture capital
- Investment subsidies
- Number of new businesses
- Number of foreign businesses attracted
- Preference for eco-innovation in public procurement
- Premiums for consumption or production of eco-innovative products/services
- Exports of eco-innovative products

Catalysts

- Number of clusters
- Number of cluster partners
- Business / university / RTD centre interfacing
- Nature of demonstration centres
- Types of eco-innovation awareness campaigns
- Internationalisation actions

Employment and vocational training

- Number of trainees in eco-innovation training schemes
- Observatory of occupational skills requirements

2.4 Quick eco-innovation regional readiness check list

0. Regional strategy

- Vision
- Emblematic project
- Local brand based on local initiative

1. Proxi infrastructure

- Incubator
- Demo centres and permanent product exhibition
- Fairs

2. Financial tools

- Grant
- Guarantee
- Seed and venture capital
- Third party finance
- IPR protection and valorisation
- Public procurement

3. Networks

- Clusters
- Enterprise/University cooperation
- Transnational partnership
- Innovation vouchers
- Meet-the-buyer fair / Tech tour

4. Regional intelligence

- Market trends
- Market opportunities
- Product catalogue
- Proof of concept

5. Technology / knowledge transfer

- IPR protection and valorisation

6. Human capital

- Talent
- Skills needs

CHAPTER 3 THE COMPETITIVE ADVANTAGES OF ECO-INNOVATION-BASED BUSINESS STRATEGIES

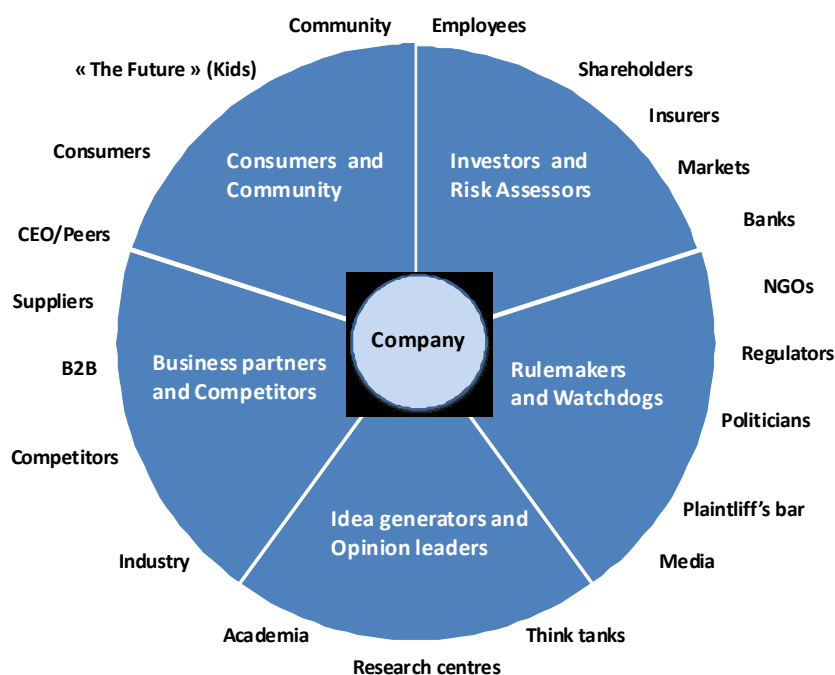
In order to facilitate the emergence of a regional eco-innovation industry and promote business membership, it is in the best interest of RDAs – through the support services they provide – to show SMEs that there are competitive advantages to eco-innovation as such and investment therein.

Indeed, according to economic theory, competitive advantages mainly derive from two sources, i.e. (for memory):

- a cost differential compared to the competition,
- product differentiation through innovation quality or branding.

It can safely be assumed that businesses that control environmental risks while innovating and efficiently managing their value chain can more or less significantly reduce the cost of guarding against the risk of potential damage to the environment, i.e. the cost of both compliance with legal and administrative control requirements and insurance.

This is namely explained in the pie chart below (taken from *Green to Gold* by Daniel C. Esty & Andrew S. Winston⁵).



Source: *Who's behind the green waves?*, in *Green to Gold*, D.E. Esty & A.S. Winston.

As for the advantages stemming from differentiation, they essentially fall into two categories: marketing new products or services and increasing the value of intangible assets (branding).

⁵ Yale University Press, New, 2006.

Regions may leverage both to increase their attractiveness compared to domestic and foreign businesses, talent and people.

In this context, both businesses and public authorities may act by:

- developing new markets or promoting their emergence;
- stimulating product and service redesign to meet the specifications of the eco-innovation market;
- forcing their suppliers to provide eco-innovative products and solutions;
- establishing benchmarks for every link of the eco-innovation industry value chain;
- investing in human resources.

While all businesses theoretically face this issue, they should especially strive to develop strong eco-innovative competitive advantages if they have to confront situations⁶ including:

- ✓ branding issues;
- ✓ a large environmental footprint;
- ✓ strong dependence on raw materials;
- ✓ exposure to existing legislation;
- ✓ threats arising from new legislation;
- ✓ environmental reputation;
- ✓ shortage of talent and staff with unique skills (who could prefer employment with businesses that are comparatively better positioned when it comes to eco-innovation)
- ✓ market followers – mostly regional SMEs;

and should therefore receive specific attention from regional public authorities.

Regions can also leverage their human capital to differentiate themselves. Worth emphasising in this respect is the initiative launched by a group of Paris universities and industrial groups (Alstom, GDF-Suez, Italcementi, SAUR and SNCF) to create an international chair of eco-innovation⁷. The aims include (i) expediting the transition between the different areas of science and their respective industrial applications; (ii) meeting the skills requirements of present and future trades in connection with the development of eco-innovation; and (iii) facilitating the development of new eco-businesses on the back of newly-identified services, products and trades. One of the unique features of this chair is that it brings together the expertise of teaching scientists, industry managers and practitioners in finance and venture capital.

In summary⁸, RDAs and regions should carefully assess the advantages they can get from:

- anticipating compliance with new regulations,
- making any key sectorial value chain sustainable,
- supporting the design of sustainable products and services,
- developing new business models,
- creating next practice platforms.

⁶ See *Green to Gold*, D.E. Esty & A.S. Winston.

⁷ *Generating Eco-Innovation* chair of UniverSud Paris (www.universud.fr).

⁸ Harvard Business Review, September 2009, pp. 60-61, "Sustainability Challenges, Competencies and Opportunities"

CHAPTER 4 EXAMPLES OF REGIONAL ECO-INNOVATION STRATEGY CONTENTS

To illustrate the efforts of some regions and RDAs in support of the eco-innovation industry, below are the key components of a few regional eco-innovation strategies. These examples may inspire the players of other regions in their strategy development or review processes.

4.1 West Midlands (UK)

The strategy of the West Midlands focuses on the 11 industries below:

- Renewable energy
- Waste management
- Water and waste water treatment
- Environment consulting
- Energy management
- Air pollution control
- Cleaner processes
- Contaminated land remediation
- Environmental monitoring
- Noise and vibration control
- Marine pollution control

The aim of this strategy includes the seven priorities below:

- Support innovation in environmental technologies
- Link regional companies to new environmental markets
- Promote low-carbon technologies in the region
- Collaborate in building the region's profile in this sector
- Lead regional activities in resource efficiency
- Identify skills gaps
- Collaborate in internationalising the region.

These activities are presented in detail in section 5.2.2 below.

4.2 Oakland (California, USA)

The strategy developed by the City of Oakland to stimulate the emergence of an eco-innovation cluster break down into 15 items grouped into the 7 areas below. As is the case in the whole of California, the number one priority is access to venture capital.

1. Green finance
2. Green industry attraction
3. Green building
4. Renewable energy and energy efficiency
5. Green workforce development
6. Sustainable transportation
7. Regional collaboration

4.3 Envirolink (Northwest, UK)

As early as in the year 2000, Northwest Regional Development Agency (UK) identified a strong regional growth potential in environmental technology and services. Thus, ad hoc strategies were developed to support the productivity and competitiveness of businesses operating in industries including:

- Air pollution control
- Rehabilitation of contaminated land
- Cleaner technologies and processes
- Energy management
- Environmental consulting
- Environmental watch
- Landscape services
- Control of marine pollution
- Noise and vibration control
- Renewable energies
- Waste management and recycling
- Water and waste water treatment
- Eco-tourism

4.4 Rhône-Alpes (F)

Rhône-Alpes is a region that delivered a scheme to support SME conversion to eco-innovation, with the following characteristics:

- advice and studies in SMEs;
- investment in clean technology;
- investment in pollution prevention;
- RTDI.

There is a network of experts supporting businesses in fields including:

- early diagnosis;
- SME support/advice;
- joint action.

4.5 Aquitaine (F)

The main aim of the strategy of the French region of Aquitaine is to:

- set up and coordinate a network of regional eco-businesses (directory);
- promote the growth of exports among eco-businesses;
- set up dedicated business nurseries;
- support systematic progress of regional products toward eco-certification. Support campaigns of measures to validate innovative eco-products;
- increase the leverage of public authorities in charge of eco-conditionality of subsidies.

To back this strategy, the Region organises an eco-innovative business developers competition with the following features:

Scheme Presentation

With the aim of detecting and promoting the development and growth, in Aquitaine, of new services, technology and equipment to measure, prevent, minimise and remedy environmental damage, the Conseil Régional d'Aquitaine and OSEO Aquitaine are launching in 2009 an open national competition to support the development of eco-innovative businesses in Aquitaine.

- *Stage 1 – at business development project design: support for eco-innovative business project developers;*
- *Stage 2 – at eco-innovative business activity development: support for newly-developed eco-innovative businesses (enterprises or units having operated in Aquitaine for up to three years).*

Competition winners will be supported in their business development and growth projects by Conseil Régional d'Aquitaine and OSEO Aquitaine.

Furthermore, the best among them will be eligible for a prize awarded by one or more of the competition sponsors.

Priority eco-innovative activities in Aquitaine

These include:

- *energy efficiency and renewable energy;*
- *sustainable construction and spatial planning and management;*
- *prevention of pollution and environmental nuisances;*
- *management of waste and polluting emissions;*
- *measuring and environmental assessment tools or assistance with the decision-making process.*

Support provided to competition winners

Stage 1 – support for eco-innovative business project developers

According to eligible spending applications submitted by the business developers who win the competition, support can take the form of:

- *Individual support for business developers by a science park to finalise their business development plan (investment rounds, partnership building, matching with experts, etc.);*
- *Financial intervention toward the internal and external costs incurred by business developers in preparing incorporation: grants for preliminary studies, eco-innovation subsidies, compensation of business developers' time, etc.;*
- *Loans on trust.*

Stage 2 – support for new eco-innovative businesses locating in Aquitaine

According to eligible spending applications submitted by the eco-innovative businesses that win the competition, support can take the form of:

- *Individual support for newly-developed businesses by a science park (investment rounds, partnership building, matching with experts, etc.);*
- *Financial intervention toward the internal and external costs incurred by businesses to grow the eco-innovative activity and or support the commercial launch of their product or service (time-limited [one year] business development subsidies, eco-innovation grants).*

Competition awards

On recommendation by the jury, prizes may be awarded under both stages to projects deemed of showcasing value according to the criteria below:

- *breakthrough innovation, innovative design method;*
- *involvement of scientists, cooperation with research laboratories;*
- *adherence to (social, economic, environmental) sustainable development principles;*
- *project relevance to the Aquitaine region (user streams, ton of avoided CO₂ emissions, jobs created, etc.);*
- *profit and team complementarity;*
- *activity growth strategy;*
- *international dimension of markets;*
- *regional rooting of businesses (historical, partnerships, outsourcing networks, identified demonstration sites, coherence with regional stakeholders and needs).*

Awards

On recommendation by the jury, the private financiers and partners of the competition may choose to award prizes taking the following forms:

- *one year free accommodation in an Aquitaine science park for the winning business developer;*
- *“innovative start-up” grant;*
- *advice, mentoring, equity investment, letters of purchase, free provision of services, etc.*

Source: <http://eco-innovation.aquitaine.fr/fr/le-concours-dreation/modalites-du-concours-creation.html>

In addition to this strategy, the Aquitaine region is home to the three clusters below:

a) *Pôle Pin Maritime*, whose priorities include:

- leveraging the thermal potential of tree stumps (150MW);
- innovative uses for local tree species in wood-based construction;
- second-generation biofuels.

b) *Pôle AVENIA*, whose priorities include:

- carbon capture and storage (CCS);
- energy storage materials.

c) *Pôle Construction Durable* whose efforts focus on:

- High energy-efficiency materials;
- Technology for sustainable rehabilitation;
- Resource centre for sustainable construction.

4.6 US Cities

The Americans positively love rankings of all kinds. So much so that there is one on the US cities with the best eco-innovation strategies⁹, which delivered the following order for 2008:

- | | |
|----------------------|---------------------|
| 1. Portland, OR | 6. Boston, MA |
| 2. San Francisco, CA | 7. Minneapolis, MN |
| 3. Seattle, WA | 8. Philadelphia, PA |
| 4. Chicago, IL | 9. Oakland, CA |
| 5. New York, NY | 10. Baltimore, MD |

⁹ Source: Sustain Lane City ranking US 2008 – www.sustainlane.com.

It is based on a set of 16 parameters falling into eight different categories:

- | | |
|---------------------|--------------------------|
| 1. Air and Quality | 5. Green biz economy |
| 2. City programmes | 6. Water supply |
| 3. Waste management | 7. Built environment |
| 4. Transportation | 8. Natural disaster risk |

Performance indicators for two of those categories (“city innovation” and “green economy”) namely include:

City innovation :

- Environment preferable purchasing programmes
- City commercial green building incentives
- City residential green building incentives
- Car sharing programmes (private, public)
- One other significant innovation in another area

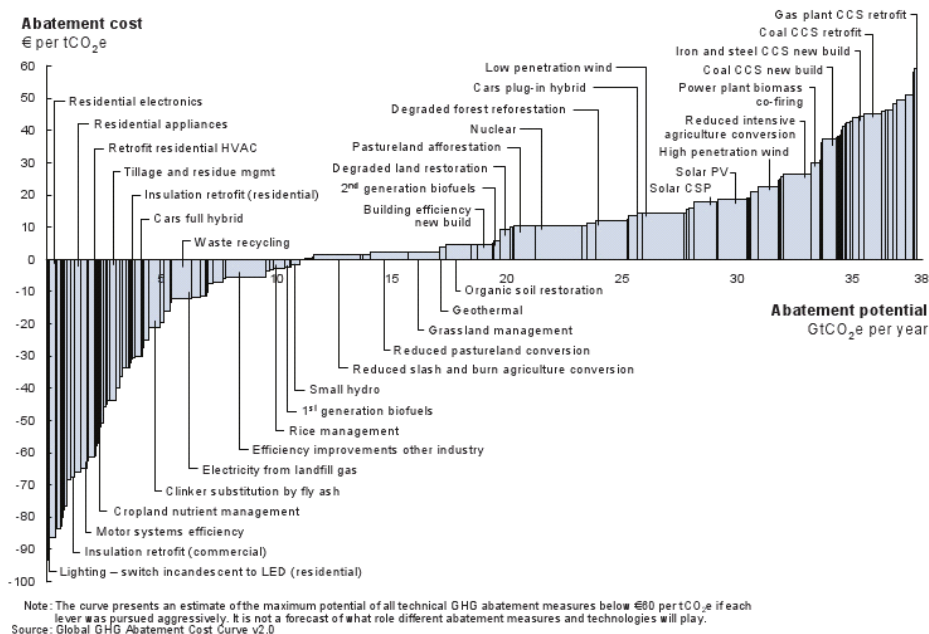
Green economy

- Green building per capita
- Farmers' markets per capital
- Presence of a city or public-private incubator for clean technology industries
- Presence within the city of a green business directory either public or private.

4.7 Regional Strategy Development Potential

In early 2009, McKinsey published a report introducing a list of 200 measures aimed at mitigating the impact of global warming and seeking to sort them according to cost from cheapest to most expensive (the cost of a third of them is actually negative)¹⁰ (see the graph below).

Global GHG abatement cost curve beyond business-as-usual – 2030



This thinking could inspire regional strategy developers in the quest for measures with a high return on investment.

¹⁰ Pathways to a low carbon economy.

CHAPTER 5 CLUSTERS

5.1 Inventory

Below is an illustrative – rather than exhaustive – list of clusters addressing one or more links in a possible eco-innovation value chain.

Cluster	Industry	Region
Advancity	Environment	Seine-et-Marne (F)
ENIN Környezetipari Klaszter	Environment	North Hungary
Slovenian Environmental Cluster	Environment	Slovenia
Aclima	Environment	Basque Country (E)
EnCluster	Environment	East of England (UK)
Yorkshire & Humber environmental cluster	Environment	Yorkshire (UK)-
EnviroLink Northwest Ltd	Environment	North West (UK)
Cluster Rhône-Alpes Ec-Energies	Energy	Rhône-Alpes (F)
Reiso 77	Energy	Seine-et-Marne (F)
EnergieRegion Nürnberg e.V.	Energy	Nuremberg (D)
ENG-NET	Energy	Baden-Württemberg (D)
Fuel Cell and Hydrogen Network Nordrhein-Westfalen	Energy	Nordrhein-Westfalen(D)
ArchEnergy	Energy	Hungary
Interregionális Megújuló Energia Klaszter Egyesület	Energy	Hungary
Pannon Termál Klaszter	Energy	Hungary
District Energy Cluster of Slovenia	Energy	Slovenia
NWDA	Energy	North West (UK)
Eco-Construction	Energy/ environment	Wallonia (B)
Clusterland Umwelt	Environment	Lower Austria
Axelera	Environment	Rhône-Alpes (F)

Source: EURADA Database

5.2 Description of the Strategies of a Few Regional Clusters

Worth recalling is that according to US literature, the ultimate cluster rests on the three pillars below:

- seed and other venture capital including business angels as well as access to a network of investors and mentors;
- active involvement of universities and public and private laboratories in the cluster;
- a key role assigned to regional authorities through provision of high value-added services (testing, prototyping, pilot schemes) and miscellaneous incentives.

It emerges clearly from the examples below that the first pillar is not really taken into account outside the US.

5.2.1 Clean Technology Cluster, Central Puget (Seattle, Washington, USA)

a. Cluster description

The clean technology cluster spans many industry sectors, including manufacturing, consulting, and utility and architectural services. In the central Puget Sound Region, the areas of particular expertise and strength are green building and green energy technologies and services. The Pacific Northwest region has a significant concentration of businesses specialising in energy and environmental technologies and services, offering great potential for partnering and collaboration.

b. Cluster vision

Underlying the clean technology cluster's vision are the concepts of growing local businesses and local demand in order to increase export potential, helping transform other clusters' technologies and processes, and achieving – and then maintaining – cutting-edge research, development and commercialisation capacities.

The vision for the clean technology cluster is to :

- Be a global leader in the clean technologies and services industry.
- Consistently innovate and advance the production of new sources of energy, pollution prevention and clean-up technologies.
- Focus on markets in both developed and developing countries, recognizing that expanding local markets will be a critical first step for growing the cluster.
- Thrive in a social and economic environment of rising energy costs.
- Create a regulatory environment that positively affects clean technology cluster products and services.
- Produce and promote cost-effective, quality clean technology products and services, allowing them to effectively compete on price against other more traditional products and services.
- Assist the region's other clusters to find new "clean" market-making solutions for their products.
- Create a financial environment in which an ever-increasing share of capital decisions are made with life-cycle cost frameworks, so that clean technology products and services can more fairly compete for investment.
- Ultimately capture a large share of this emerging cluster's national growth potential, so that the clean technology cluster will represent an increasingly larger share of the region's total employment.

c. Cluster issues and strategy

In order to establish a vibrant clean technology cluster that captures some of the industry's significant forecasted growth potential (particularly in the alternative energy arena), the region must take a coordinated approach. Bipartisan, visionary legislation, reasonable regulation, favourable market forces, and popular support each will play a part.

The critical theme for this emerging industry is increasing business – meaning more customers. In the short term, growth can come from increasing demand locally. Tactics could include creating sustainable business parks, doing demonstration projects, providing services and technologies to the region's other clusters, and developing public purchasing strategies. In the long term, the cluster must grow by

becoming more competitive in national and international markets and increasing the export of services, products, and technologies.

Cluster growth will also depend on strong foundations:

Human resources

Strong workforce training will be needed to support the growth of this cluster, which will be based in science and other technical fields.

Technology

Access to local sources of clean technology research, ranging from basic science to applied research, as well as local systems for commercialising technology, will be key to the growth and development of this cluster.

Access to capital

The cluster would benefit from a proactive approach to funding for basic research and the creation of mechanisms for commercialising that research.

Business climate

The business climate for clean technology could be improved by having a tax code that supports investment strategies based on life-cycle cost frameworks and financing, regulatory reforms, and a complete set of policies and strategies that support growth of the cluster.

Physical infrastructure

Infrastructure investments, including development of clean technology centres of excellence, will be needed.

Quality of life and social capital

As in the information technology sector, clean technology work can be done anywhere in the country – if not the world. As the region's cluster competes for a share of this growing industry, it requires a strong, vibrant, health community where businesses and employees want to work, live and play.

d. Summary of cluster action initiatives

The issues especially important to the clean technology cluster are addressed by the cluster initiatives described below. These action initiatives were developed by the cluster working group. These are first steps towards growing this cluster as well as helping to transform other clusters. These initiatives are intended for immediate action, possibly followed by other initiatives in the months and years to come. These action initiatives should support and leverage existing efforts and programs

1. Determine the need for and feasibility of creating a clean technology advocacy organization.

A bottleneck exists in this industry in that there is no trade association to promote its goods and services. A key first step in growing this cluster will come from the development of such an organisation. Initially, the focus should be on "green building" and "clean energy" – areas where the region is already strong. The organisation would seek to improve the climate for growth of this sector by articulating a sharply focused policy framework that supports cluster growth, organising the cluster and launching outreach and advocacy efforts. Some of the first activities of this organisation would be to implement many of the action initiatives identified by the cluster working group, including the following :

- *Enhance cluster through sharing of capacity and technology.* Research and showcase the most promising subsectors (e.g., green building, clean energy) in

local and broader markets. Promote a "cluster ambassador" (serving as both a chief business developer and rainmaker) to enhance other cluster' utilisation of clean technologies, and helps them identify and commercialise their own clean technology-related business opportunities.

- *Develop innovative financing funds to build demonstration projects.* Innovative financing tools will be necessary to build demonstration projects that comprehensively deploy clean technology. These tools would enable long-term savings on operational costs (e.g., energy, water) to show how upfront investments in clean technology products and services and lead to net savings to customers.
- *Develop cluster narrative and brand.* The brand identity should be based on information about the region's existing strengths and should have the potential to apply to other clusters as well. Opportunities to include other regional partners from Portland and Vancouver, BC, should be considered.

2. Increase clean technology demonstration projects.

The cluster's success depends upon the region's ability to achieve, and then maintain, cutting-edge research, development, and commercialisation capacities. Creating demonstration projects, or "idea factories", helps to improve the region's ability to compete for business in this cluster. The region is fortunate to have a number of projects that are already underway, including the following :

- *Create an Institute for Innovation and Sustainable Development.* This institute would identify, develop and implement resource-wise, sustainable solutions to the most critical problems facing Washington.
- *Create a centre for Coatings and Materials in Energy Systems.* This centre would help create jobs by providing resources to support the region's growing and start-up companies. It would focus on companies that develop new products employing specialty or unusual materials. The centre will increase availability of new technologies, provide proof of concept, promote research, facilitate joint programs and develop user facilities.
- *Create an Urban Waters Centre of Excellence for Applied Marine Research and Development.* To be located next to the Thea Foss Waterway in Tacoma, this centre of excellence would employ a team of world-class researchers to solve problems facing urban bay communities. The centre would emphasize research in three areas: ballast water and invasive species, urban water runoff and marine biotechnology, and aquaculture.
- *Create the Kitsap SEED Project.* This would be a world-class centre in Kitsap County that would develop commercially and environmentally sound technologies and services, and promote market expansion.

5.2.2 Environment Technology Cluster of West Midlands (UK)

The vision that underlies the cluster is that "the West Midlands will be an internationally recognised region for the supply and use of environmental technology products and services by 2010".

To achieve this vision, the following action programme was defined for the period 2008-2011:

1. Support innovation in environmental technologies

Projects supported will provide brokerage between presenting SMEs and resources within the region's HEI base. The cluster component will also include a focus on business to business innovation.

2. Link regional companies to new environmental markets

Typically market linkage projects will :

- Analyse the requirement of a particular market and seek to recruit companies with appropriate competence to supply.
- Seek to then engage these companies with the marketplace directly by :
 - Collaborative workshops to review the opportunity in question;
 - "Meet the buyer" events;
 - Overseas missions to trade shows or similar networking;
 - Innovation networking around OEM/ "first trier" suppliers.
- Facilitate appropriate collaboration between companies.

Market linkage projects have to address the following markets :

- Wind and marine energy
- Sustainable urban drainage
- Small renewable energy devices
- Biofuels
- Waste processing equipment
- Water treatment
- Contaminated land remediation
- Mechanical engineering supply chains for anaerobic digestion.

3. Promote low carbon technologies in the region

Projects proposed here include a continued thread on work with industrial symbiosis, which has a strong track record in developing "low carbon" businesses in resource recovery, together with enabling actions that will facilitate the deployment of new or renewable energy. Candidate projects in the energy theme will need to reflect alignment with both sustainable development and rural policies.

4. Collaborate in building the region's profile in this area

The major element here is the continued support for the "Sustainability Live". "Sustainability Live" has become the premier UK show for environmental technologies and has developed considerably in size and presence. High profile participation in this show :

- Provides an opportunity to work directly with cluster companies in marketing themselves; agency presence is normally supplemented by 30 to 40 regional companies exhibiting in an Advantage West Midlands "village".
- Builds the profile of the region as a lead region for ET businesses, both nationally and internationally; the show is a major beacon for the cluster serving as focus for UKTI and inward investment activities.
- Secures and develops a major trade show in a rapidly growing area of business activity within the region.

5. Lead regional activities in resource efficiency

The ET cluster activities will support the development of markets for specific environmental technologies, such as those around energy efficiency or pollution control.

6. Identify skills gaps in ET companies and develop remedial actions

There is no doubt that the skills dimension to cluster activities is of increasing significance and needs attention. There are three aspects to the ET skills issue :

- Common issues with other businesses: ET businesses are not special and share general skills issues with business as a whole;

- Mainstream issues in industries such as waste, where growth is compounding skills shortages; and
- New ET specific skills, in areas such as renewables installation, where the virtual absences of skills pose a clear barrier to market development.

7. Collaborate in internationalising the region

UKTI collaboration is centred on cluster representation at overseas trade fairs and similar events. For convenience, expenditure it is taken with the UK budget. There is also strong linkage with the agency's inward investment activity, especially in the renewable energy and resource recovery area.

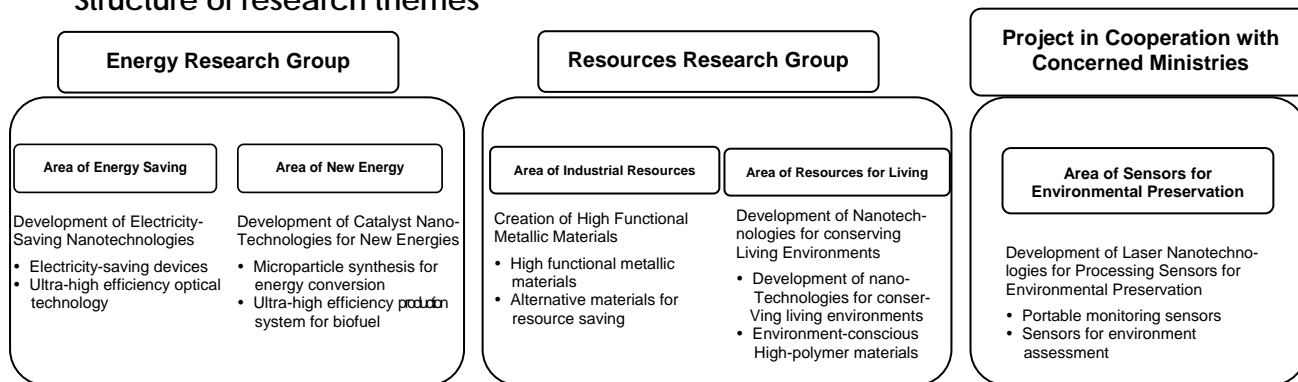
5.2.3 Environment Nanotechnology cluster of Kyoto (JPN)

The cluster aims at revitalizing the regional industries by applying nanotechnology to the development of high-performance industrial components that will help saving energy and resources. The cluster is part of the Knowledge Cluster Initiative (Stage 2) of MEXT¹¹.

1. Establishment of a hub for developing environmental nanotechnology materials

Regarding nanotechnology as the core, the research and development focus will be on "Environmental nanotechnology (energy and resources)" and "Environmental sensing", aimed at early business deployment of research products. With local small and mid-sized companies and venture companies as the core, leading companies will be invited from all over the country, to concentrate industries relating to environmental nanotechnology.

Structure of research themes



2. Enhancement of the support system for business deployment by the entire region

A system will be constructed for promoting business deployment and intra-venture business, based on the business deployment strategy of this project, and a "Total Process Management of Business Deployment Supporting System" will be established, model for efficient development of business inauguration, business deployment and commercialisation. To support technical transfers to small and mid-sized companies and venture companies, and business deployment by them under the "All Kyoto" framework, a cross-sectional support organisation consisting of local banking establishments, investing institutions, industrial support organisations, official experiment and research institutes etc. will be formulated. We will develop research products in cooperation with the Industrial Cluster Project and the neo Cluster Promotion Consortium. As well, in cooperation with universities and the

¹¹ Ministry of Education, Culture, Sports, Science and Technology

industrial world, we will work widely and deeply to foster human resources ranging from young researchers and business persons to younger people, who serve as basis for the regional cluster.

3. Establishment of global "Environmental Nanotechnology Hub"

As a hub for expansion and international collaboration, the "Kyoto Environmental Nanotechnology Center" will be created for the overseas development of research products, overseas business support of local companies, support of research hub establishment in foreign countries (developing countries, in particular) and mutual exchange, with foreign countries, of information relating to nanotechnology. We will work with established regions, universities, research institutes, corporations etc. throughout the world to gain further world recognition as the environmental nanotechnology hub in Kyoto and thereby invite more information, human resources and businesses from all over the world.

5.2.4 Kyushu Recycle and Environmental Industry Plaza (JPN)

Purposes of founding

Kyushu Recycle and Environmental Industry Plaza (K-RIP) was founded in 1999 as an organisation offering industry-academia-government networking for parties involved in environmental and recycling businesses in the Kyushu region.

Through development and promotion of environmental businesses in the Kyushu region, K-RIP aims to make the region a practical model for the merging recycling-oriented economy and society. It also aims to vitalize the regional economy by promoting "commercialization of the environment" so as to lead the recycling and environmental industry, a new industry, toward becoming a major industry in the Kyushu region.

K-RIP services

K-RIP offers a wide range of services which meet the various needs of the members. There are no restrictions on membership.

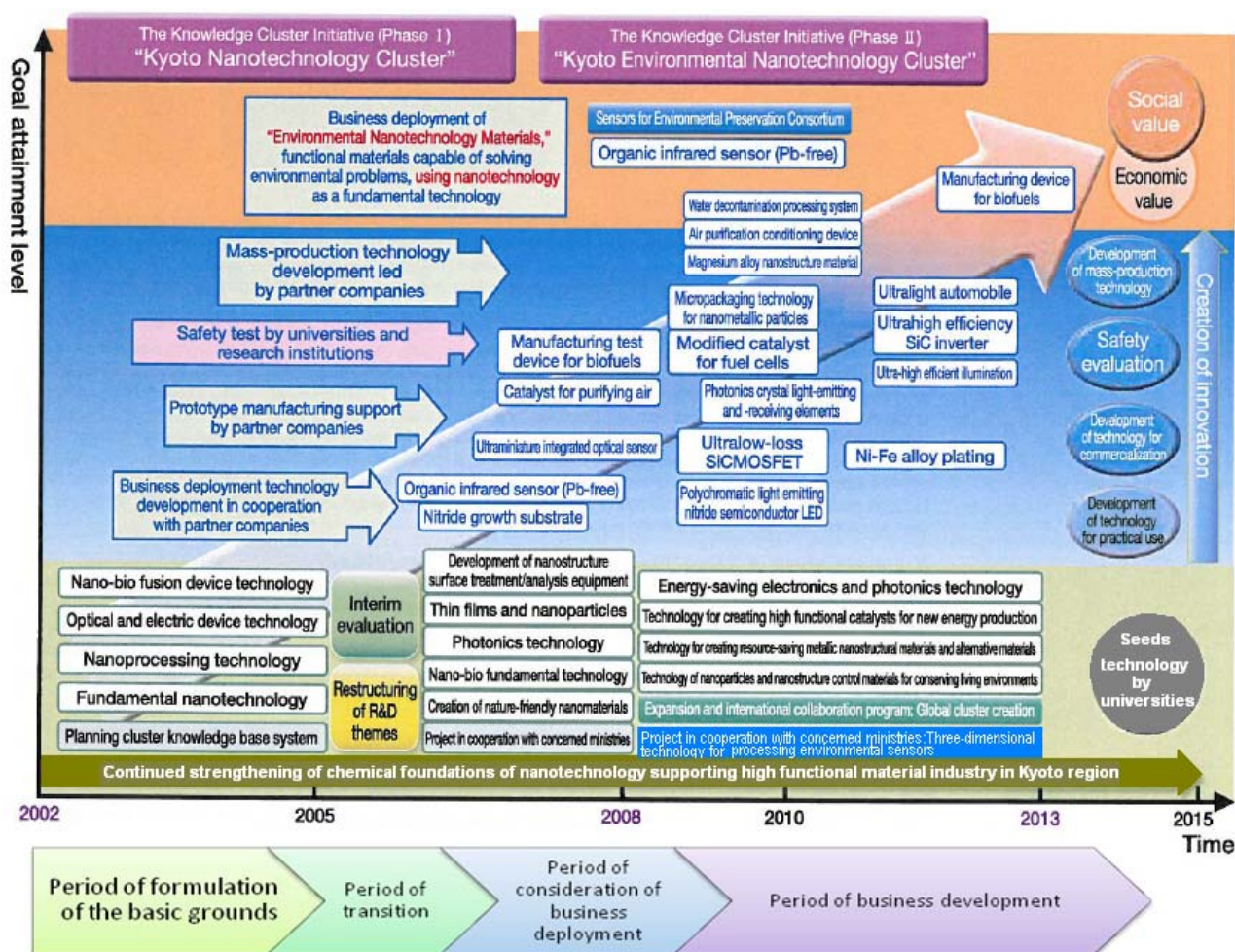
The services provided are :

- Seminars on market trends*
- Seminars and study sessions on special technologies*
- E-mail information provision service*
- Advice and consulting service by specialists*
- Website of this project*
- Seeds/needs matching between universities and companies, or between companies*
- Offering site for exchange among companies/ between universities and companies*
- Organising/participating in trade exhibitions / fairs*
- Visiting individual companies*
- Services relating to human resources development*
- Assistance in launching industry-academia-government joint research project*
- Organising international conferences, interaction with overseas*
- Database of member companies of this project*
- Application assistance for and selection of technical development supporting systems*
- Introducing trade companies, matching sessions*

K-RIP member outline is as follows :

<u>Sectors</u>		<u>Members (31.10.08)</u>	
Waste disposal / recycling	25 %	Corporates	285
Environment related services	14 %	Academics	82
Waste recycling equipment	11 %	Individuals	75
Environmentally conscious products	9 %	Public bodies	41
Environment related materials	9 %	Others	9
New energy, efficient use of energy	8 %	TOTAL	492
Environmental restoration	6 %		
Building	5 %		
Sewage and human waste treatment	4 %		
Pollution prevention equipment	3 %		
Environmental analysis equipment	3 %		

The lifecycle of the Environmental Nanotechnology Cluster in Kyoto can be flowcharted as follows:



Source: *The Knowledge Cluster Initiative, MEXT (Phase II). Kyoto and Keihanna.*

5.2.5 AXELERA Competitiveness Centre, Rhône-Alpes (F)

The nine projects of the Rhône-Alpes Regional Competitiveness Centre belong to two categories: technology projects focusing on five themes, and cross-cutting projects.

The **thematic technology projects** tackle issues including:

- *Chemistry as a tool to address major societal challenges*
Chemistry as a driver of progress in innovation in the broadest sense with the aim of improving human quality of life and welfare whilst respecting the environment: materials, health, clean energy and information technology.
- *Preserving the wilderness*
Preserving natural areas and their biodiversity, especially soil and water bodies.
- *Full material recyclability*
"zero raw material loss" and "material recyclability" streams and processes that reduce raw material input and promote systematic end-of-life material recycling.
- *Chemurgy (or Vegetable-based chemistry)*
Chemurgy, in particular the use of resources of renewable origin.
- *Factory of the future*
Micro-technology, eco-design of materials and products, energy and environmental efficiency.

On the other hand, **Cross-cutting projects** include:

- *Societal image, dialogue and involvement*
Developing a chemo-environmental identity and initiating a dialogue with all stakeholders in Rhône-Alpes.
- *Skills training and forecasting*
Contributing to competences and skills management to anticipate sector needs.
- *Economic intelligence and watch*
Informing the Competitiveness Centre's strategic planning and deploying a multi-stakeholder watch system for the benefit of project developers.
- *Spin-offs and entrepreneurship*
Being a driver of regional job creation and industrial added value.

5.2.6 "Rhône-Alpes Eco-Energies" Cluster (F)

In 2004, the region of Rhône-Alpes launched a cluster called "Rhône-Alpes Eco-Energies". Targeting the construction industry, the aim of this initiative was to improve business competitiveness to meet changing eco-construction market requirements. This project fits within an ambitious regional policy in the field of support for renewable energy sources and energy savings. The objective is to implement an action programme and to promote the emergence of a sophisticated and competitive regional eco-construction industry and supply.

Six working groups have been set up. Their objective is to develop practical projects with field players in as many areas:

- **Innovation.** The triple aim of this initiative is to (i) define the criteria for sophisticated construction demand as part of a concept called "building of the future" ", (ii) leverage the outcomes of research projects carried out in Rhône-Alpes, and (iii) test the most accomplished solutions.

- **Training.** The aim is to improve construction industry professionals' awareness of and training about, the challenges of eco-construction.
- **Rural tourism accommodation ("gites").** This initiative seeks to stimulate the demand for rural tourism accommodation based on a pilot project aiming to provide green rural tourism accommodation. The goal is to generate profitable and reproducible solutions.
- **Business clusters.** The aim is to set up local business consortia to develop a packaged offer of specific eco-construction products and solutions.
- **Development of an eco-construction marking scheme.** The aim of this initiative is to develop a marking scheme targeting the real estate market to give visibility to the range of available regional products and services in the fields of energy savings and integration of renewable energy sources in the construction industry.
- **Development and internationalisation.** The aim of this group is to make support available to regional businesses and coordinate collective initiatives in the fields of promotion, commercial development and management.

Notable is that the cluster finances 80% of the services provided by consultants supporting "virgin" exporters. Out of 130+ partners, the cluster includes 100 businesses, most of which are small enterprises and craft companies. Over 75% of partners report having formed ties with other cluster members. The cluster is looking into closer ties with Tenerdiss, a competitiveness centre focusing on RTD in fields including hydrogen fuel cells, solar energy and biomass.

5.2.7 Finland

Within the framework of its policy on "Centres of Expertise" adopted in 2007 for the period 2007-2013, the Finnish Government supports a project called Finnish Cleantech Cluster¹², which hinges on the expertise of four regions: Kuopio, Lahti, Oulu and Uusimaa.

These four regions provide the following competences:

- Kuopio: health, environment and welfare;
- Lahti: waste management, water and soil;
- Oulu: Water purification materials;
- Uusimaa (Helsinki): environmental monitoring and energy efficiency in the urban environment.

One of the main aims of this programme is to enable clustered businesses to achieve an international dimension.

5.2.8 San Diego (USA)¹³

New funding to expedite the commercialisation of research products in the field of clean energy has just been granted to scientists in San Diego as part of the Clean Tech Innovation Challenge, thereby contributing to powering up a new tech centre in San Diego.

Historically, San Diego has been associated with research on clean energy. The original motive was a political desire for energy independence which, due to growing interest for such technology in the US, progressively turned into a local

¹² OSKE – Centre of Expertise Programme www.oske.net and www.cleantechcluster.fi.

¹³ Source: *BE Etats-Unis numéro 148* (21 Novembre 2008) – French Embassy in the USA / ADIT.
<http://www.bulletins-electroniques.com/actualites/56720.htm>

economic development tool leveraging the city's resources and lead in the field of clean energy. In order to marshal and rally local competences and turn San Diego into an industrial pole, a formal policy initiative was developed in 2007.

The received definition of a technology cluster is "a geographical concentration of different industry stakeholders leading to cross-cooperation and infrastructure sharing among them and synergies at supply chain level" (see Michael Porter). This requires both the presence of different stakeholders (from academia, industry, finance) and interactions among and between them. These players are already in evidence in San Diego: excellent energy research and training, an economic fabric that is both established (148 businesses as of 2007) and structured (networks including CONNECT and Clean TECh San Diego) and rather active public and private funding sources. De facto connections also exist but in a difficult context of strong competition and financial crisis, San Diego needed a way to make a difference and speed up the production of wealth through the Cluster.

Thus, a PFI consortium was set up involving the City of San Diego, the State University in San Diego and Von Liebig Center (a business development centre specialising in the proof-of-concept stage of business development) to develop the Clean Tech Innovation Challenge with the aim of facilitating the transition between research and commercialisation of clean energy products. The Clean Tech Innovation Challenge provides \$50,000 grants to support prototyping and feasibility studies. The winners are supported for twelve months with advisory services provided by Von Liebig Center consultants and MBA graduate student teams (from the University of San Diego and Alliant International University). These students work with researchers on market research studies and the implementation of business plans for their technology. Thus, they dedicate those twelve months to demonstrating both the technological feasibility of their project and its commercial survivability. The aim is simple: project developers need to be able to raise equity, start their business and so contribute to the cluster's virtuous circle. Given the existing reluctance of venture capitalists when it comes to investing very early stage finance, the usefulness of such a scheme is self-evident.

5.2.9 Paris

*Paris Développement*¹⁴, the Paris development agency, coordinates a cluster called Eco-Innovations. In late October 2008, this agency moderated a seminar introducing the technical and economic challenges of the sector, which were – among other presentations – summarised as follows:

In the world of Clean Techs, there are major differences between countries, namely when it comes to economic development, reliance on fossil fuels (or nuclear power), electricity prices and supplies, regulatory context (e.g. statutory power buy-back rights and prices), policy and geo-strategic objectives as well as compliance with environmental and climate requirements.

Let us take a look at the strengths of our European neighbours:

In Germany: appropriate legislation, proximity of academia and short funding and financial channels have stimulated the emergence – in the space of just a few years – of a number of global leaders, as shown by the example of solar photocell technology.

¹⁴ www.parisdeveloppement.com

The UK is characterised by easy access to equity (it concentrates more than half of all IPOs in the world in these sectors), the availability of start-up equity promoting a culture of risky business ventures and a local market that is empowered by appropriate legislation.

And finally in Spain, we have witnessed the rapid emergence of national champions on the back of world-class events and its showcasing as a European reference in the field of thermal solar power.

France on the other hand, is lagging behind in most key areas including wind, solar and geothermal energy and hybrid/electric cars despite an existing potential, notably in fields including engineering, materials and dedicated software which represent a huge potential for wealth generation and competitiveness through innovation in the field of Clean Techs.

As a large city, Paris has a key role to play for "green growth" and eco-tech. Indeed, it is an innovative region concentrating all the strengths of a potentially effective ecosystem (industries, innovative business developers, scientific experts, R&D laboratories, investors, etc.).

Thus the challenge for the region is expressed in eco-development terms: to successfully take up the challenge of innovation and position itself as a Clean Techs pioneer, there would notably be a need to provide permanent, quality coordination of all stakeholders in order to improve the effectiveness of the community by marshalling it around shared ambitions and improving its visibility (e.g. via regular large-scale events showcasing the Paris Region and affording visibility to the initiatives taken by the capital region in the field of eco-innovation).

5.2.10 Styria(A)

Under the name *Eco World Styria*¹⁵, this Austrian region is supporting a network of companies specialising in the fields of renewable energy and environmental technology.

Businesses can choose to join this network as "standard" or "premium" members.

Standard members have access to services including:

- Innovation: information, company visits and project development assistance;
- Know-how: development of new competences and access to the services of an *Eco Info Centre* (replies within 48 hours);
- New markets: information on foreign markets and attendance of specialist fairs;
- Marketing: mention of their business in guides and websites, right to use the network logo.

Premium member gain access to the extra services below:

- Premium business: three days of customised strategic development consultancy;
- Premium marketing: one day of consultancy and more visible presence in network promotion tools;
- Premium video: production of a 60-90" video in different languages advertising their company's qualities.

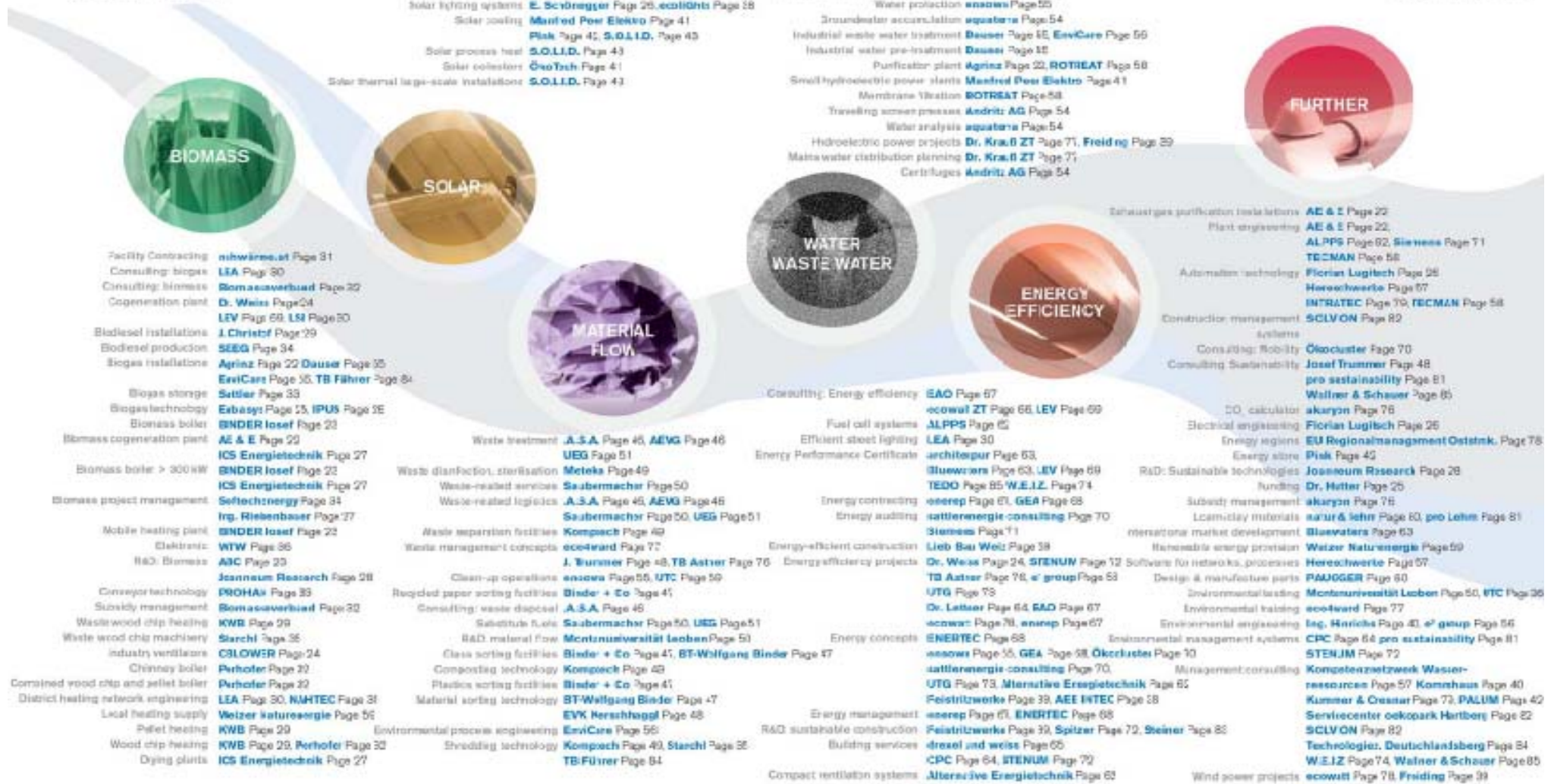
In 2009, the membership fee amounted to a basic €200+€4/employee (with a maximum of €1,500) for standard partners or €2,500+4€/employee (with a maximum of €4,900) for premium partners.

Overleaf is a list of the products and services available from Eco World Styria member companies.

¹⁵ Cf. www.eco.at

Product map

Product | Service | Company name | Page xx
Copyright: ECO WORLD STYRIA



5.3 Component Links of the Eco-Industries Value Chain

Below is quite exhaustive a sample list of the different segments of the supply chain of the eco-industries sector.

<p>Air Pollution Control (APC) Dust and Fume Control NOx Control SO₂ and HCL Control VOC and Odour Control</p> <p>Cleaner Technologies and Processes (CTP)</p> <p>Contaminated Land Remediation (CLR) Containment Remediation – Biological Remediation – Chemical Remediation – Thermal Site Engineering / Contracting Site Investigations Site Flushing</p> <p>Energy Management (EM) Building / Facilities Management Systems Energy Audits Energy Consultancy Services Systems Integration</p> <p>Environmental Consultancy and Services (ECS) Air Dispersion Monitoring Environmental Audits Environmental Impact Assessment Environmental Information / Business Services Environmental Policy Research Environmental Risk Assessment Environmental Strategies and Systems Environmental Training Expert Witness Health and Safety Services ISO 14001 / EMAS Management Processes Regulatory Assistance Resource Efficiency</p> <p>Environmental Monitoring & Instrumentation (EMI) Air Monitoring Equipment (Ambient) Air Monitoring Equipment (Stack) Laboratory Analytical Services Monitoring Services Noise Monitoring Equipment Radiation and Radiological Assessment River / Marine Monitoring Equipment Soil Monitoring Equipment Water (effluent) and Water (potable)</p>	<p>Landscape Services</p> <p>Marine Pollution Control (MPC) Marine Pollution Control Equipment Marine Pollution Control Services</p> <p>Noise and Vibration Control (NVC) Noise and Vibration Control Products Noise and Vibration Control Services</p> <p>Recovery and Recycling Batteries Chemicals Electronics Energy Recovery Gases / CFCs Glass Liquids Machinery Metals (including cans) Paper and Board Plastics and Polymers Process Plant and Recovery Recycling Equipment Tyres / Rubber Vehicles White Goods / Furniture</p> <p>Renewable Energy (RE) Small-Scale Hydro Systems Solar Powered Systems Photovoltaic Tidal Flow Wind Power Systems</p> <p>Transport Pollution Control (TPC)</p> <p>Waste Management (WM) Composting Systems Hazardous Waste Disposal / Treatment Incineration Equipment Landfill Site Equipment Municipal Waste Disposal / Treatment Waste Handling / Processing Equipment Waste Minimization</p> <p>Water and Wastewater Treatment (WWT) Primary Wastewater Treatment Secondary Wastewater Treatment Sludge Handling / Treatment Tertiary Wastewater Treatment Water Treatment</p>
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Source : Envirolink (UK)

CHAPTER 6 ECO-INNOVATION ACCESS TO FUNDING SOURCES

6.1 Venture capital

The eco-innovation industry is attracting growing attention among investors. Below is some information regarding this most important aspect of market leader growth. In the UK between 2000 and 2004, the Carbon Trust¹⁶ identified the following operations:

Investment type	Number of deals	Amounts invested (in £M)
Seed	106	300
Start-up	81	486
Growth	8	25
Merger & Acquisition	23	375
IPO	7	112

In the US, investment by venture capitalists grew from \$263 million (32 deals) to \$ 2,188 million (144 deals) between 2002 and 2007¹⁷.

The breakdown between 5 major market segments was as follows:

	2003	2004	2005	2006	2007
Solar	2	4	6	19	39
Energy supplies (incl. batteries)	10	17	25	26	29
Pollution and recycling	15	14	17	17	29
Wind	0	1	1	3	9
Other alternative energy sources	5	6	6	22	34
Total	32	42	45	87	140

Worth noting is that in Q3 2008 alone, 11 deals were closed by venture capitalists in green industries in the Silicon Valley for a total of \$188.8 million. Six transactions were concluded at seed stage. Six companies are operating in the solar energy sector. By comparison, only six deals were closed in New England – representing a total of \$50.8 million –, three of which in the air industry.

According to a Cleantech Group LLC report¹⁸, activity in the venture capital industry looked like this in 2008:

Worth highlighting is that a number of successful business developers from the Silicon Valley's ICT era are now investing into eco-innovation. Examples include Bill Gates (Microsoft) in biofuels and Elon Musk (Pay Pal) in electric vehicles.

"2008 saw solar take a 40% share of clean technology venture investment dollars, led by mega-investment rounds in thin-film solar, concentrated solar thermal and solar service provider companies" said Brian Fan, Senior Director of Research, Cleantech Group. "Investors also continued to migrate from first-generation ethanol and biodiesel technologies to next-generation biofuels technologies, led by algae and synthetic biology companies. Other sectors with healthy investor interest included

¹⁶ See Clean Technology Investment Trends 2000-2004.

¹⁷ See PWC Moneytree.

¹⁸ <http://cleantech.com/about/pressreleases/010609.cfm>.

smart grid companies, small-scale wind turbines, plastics recycling, green buildings and agriculture technologies."

Top Venture Capital Clean Technology Sectors in 2008		
Technology Sector	Amount invested	% of total
Solar	\$3.billion3	40 %
Biofuels (including ethanol, biodiesel, synthetic biology, algae)	\$904 million	11 %
Transportation (including electric vehicles, advanced batteries, fuel cells)	\$795 million	9.5 %
Wind	\$502 million	6.0 %
Smart Grid	\$345 million	4.1 %
Agriculture	\$166 million	2.0 %
Water	\$148 million	1.8 %

Top clean technology funding rounds in 2008 were dominated by US-based solar companies :

Five Largest Clean Technology Rounds in 2008		
Company	Description	Amount Raised
NanoSolar (USA)	Thin-film solar (GIGS)	\$300 million
Solyndra (USA)	Thin-film solar (GIGS)	\$219 million
SoloPower (USA)	Thin-film solar (GIGS)	\$200 million
WinWind Oy (FIN)	Wind turbines	\$177 million
Solar Reserve (USA)	Concentrated solar thermal	\$140 million

By world region :

Europe and Israel

European and Israeli companies raised \$1.8 billion in 146 disclosed rounds, up to 43% from 2007. Europe and Israel accounted for 21% of the global total. The traditionally strong energy generation sector increased its share of total investment to 71% (\$1.279 billion) from 56% (\$703 million) in 2007, with a strong increase in investments in wind (\$322.6 million, an increase of 294% from 2007) and solar (\$589.3 million, an increase of 64% from 2007) leading the way. Outside of the energy generation sectors, energy efficiency investing led the way, representing 8% (\$137.6 million) of the total invested.

The most significant country growth was seen in Germany (\$383 million invested, an increase of 217% from 2007) and Israel (\$247 million invested, an increase of 224% from 2007), both led by very large solar deals. Germany overtook the UK as the country receiving the most venture capital in 2008, helped significantly by the region's largest solar deal of 2008, the \$137.1 million investment in Berlin-based solar thin-film manufacturer Sulfurcell Solartechnik. The UK's decline in total investment (\$337.8 million, down 11% from 2007) left its second in the country league table, with Israel moving into third place from sixth in 2007.

China

In 2008, Chinese cleantech companies raised \$430 million in 18 disclosed rounds, up 22% from 2007. China accounted for 5% of the global total.

India

Indian companies raised \$277 million in 14 disclosed rounds, down 20% from 2007. India accounted for 3% of the global total. Although 2008 was down from 2007, new

investors including Kleiner Perkins and Garage Technology Ventures, as well as corporate investors such as Applied Materials, entered the India clean technology market.

North America

In 2008, US companies raised \$5.8 billion in 241 disclosed rounds, up 56% from 2007. US companies accounted for 68% of the global total. Canadian companies raised \$159 million in 14 undisclosed rounds, down 58% from 2007.

Top investors

Leading clean technology investors in 2008, as measured by the number of disclosed financing rounds the fund participated in, were :

Full-Year 2008 Top Five Most Active Clean Technology Venture Funds	
Venture Capital Firm	# of rounds
Khosla Ventures	21
Kleiner Perkins Caufield & Byers	18
Quercus Trust	16
Rock Port Capital Partners	13
Draper Fisher Jurvetson	13

Source: CLeantech Group (cleantech.com)

IPOs

In 2008, clean technology public offerings totalled an estimated \$5.1 billion in 16 IPOs.

Top 5 Clean Technology IPOs in 2008			
Company	IPO Date	Amount raised	Exchange
EDP Renovaveis S.A.	6/4/2008	\$2.4 billion	NYSE Euronext Lisbon
American Water Works Company Inc.	4/23/2008	\$1.2 billion	NYSE
SMA Solar Technology	6/26/2008	\$570 million	Frankfurt
GT Solar Inc.	7/24/2008	\$500 million	NASDAQ
Energy Recovery Inc.	7/2/2008	\$69 million	NASDAQ

6.2 Rabobank Green Finance (NL)

Green financing enables investors to finance green projects less expensively, by offering a lower interest rate for environmentally-friendly investments.

Green financing opportunities are based on the so-called Green Funds Scheme. This is a tax incentive scheme of the Dutch government, which only applies to the Netherlands and non-OECD countries. Green retail investors have a tax advantage if they invest in green funds or bonds. Part of the tax advantage is passed on to companies which invest in sustainable activities.

Rabobank allocates at least 70% of the proceeds of Rabo Green Bonds to provide loans to companies that invest in green projects like :

- Organic farming
- Sustainable construction
- Sustainable innovations such as agrification
- Sustainable energy from wind, water, sun and biomass
- Projects relating to the forest and nature.

The first project financed with green finance was completed in December 1995. Since then, the amount of green financing provided by Rabobank Group has risen sharply. Rabobank accounts for 50% of the total number of green-financed projects in the Netherlands. At the end of 2006 Rabobank contributed in excess of €2.4 billion to green investments.

Between 1995 and 2005, the importance of investment by project nature has been as follows :

- Nature, Forests and Landscape	14.20 %
- Organic farming	24.90 %
- Renewable energy	20.60 %
- Sustainable construction	10.30 %
- Sustainable innovations	25.90 %
- Other projects	7.10 %
TOTAL	100.00 %

6.3 Nord-Pas-de-Calais Loan Issues (F)

Toward the end of 2008, The French region of Nord-Pas-de-Calais issued a 15-year, €50 million bonded loan (against an all-in cost of 4.41%) to finance sustainable development projects in fields including waterways and rail transport development as well as brown-field reclamation and the development of a vast green belt¹⁹.

¹⁹ *Les Echos*, 19-20 December 2008.

CHAPTER 7 FOREIGN DIRECT INVESTMENT (FDI)

Between 2003 and 2007, the number of FDI operations which the Financial Times²⁰ considered to be related with environmental technology evolved as follows:

2003	83
2004	89
2005	139
2006	276
2007	428

The countries that attracted these technologies between 2003 and 2008 included:

China	85 projects
USA	76 projects
UK	68 projects
Spain	67 projects
France	64 projects
Germany	42 projects

The countries of origin of these investments were:

Germany	165 projects
USA	141 projects
Spain	89 projects
UK	72 projects
France	60 projects
Japan	50 projects
Canada	45 projects
Austria	44 projects
Denmark	41 projects

Worth underscoring is that some US States are attempting to attract EU businesses. Illinois for instance, can claim to have attracted 7 European companies operating in the wind energy segment in recent months: Acciona (Madrid, E), EON Climate & Renewable (Düsseldorf, D), Horizon Wind Energy (Lisboa, P), Nardex (Hamburg, D), Siemens Energy & Automation (Berlin, D), Vestas (Randers, DK) and Winergy (Voerde-Friedrichsfeld, D)²¹.

²⁰ FDI Intelligence, August-September 2008.

²¹ Office of Trade and Investment, State of Illinois, Western Europe Office, Newsletter 13, January 2009.

CHAPTER 8 FUTURE GAZELLES²²

In 2008, a UK newspaper (*The Guardian*) published a ranking of the top 100 EU start-ups operating in the eco-innovation industry.

An abstract from this list is presented below for a double purpose:

- a) an opportunity to benchmark regions ("How many of my regional SMEs are on the list? If none, why?");
- b) a concentration of businesses to canvass as part of an eco-innovation-driven FDI attraction campaign.

Worth highlighting is the geographical distribution (13 different countries) of this list.

UK	52	FIN	2
D	17	CH	2
DK	6	N	2
S	6	B	1
NL	4	I	1
F	3	IRL	1
Israel	3		

Top 20 of Young European Companies active in the eco-innovation industry (2008)				
Rank	Company	Sector	Based	Founded
1	Odersun	Solar power	Frankfurt (D)	2002
2	Deep Stream Technologies	Distribution & management	Bangor (UK)	2003
3	CamSemi	Electricals	Cambridge (UK)	2000
4	SiC Processing	Industry	Hirschau (D)	2000
5	Marine Current Turbines	Marine power	Bristol (UK)	1989
6	Sulfurcell Solartech	Solar power	Berlin (D)	2001
7	Pelamis Wave Power	Marine power	Edinburgh (UK)	1998
8	Solarcentury	Solar power	London (UK)	1998
9	Nujira	Electricals	Cambridge (UK)	2002
10	Atraverda	Electricals	Abertilly (UK)	1991
11	Biogasol	Biofuels	Kgs Lyngby (DK)	2005
12	Choren Industries	Biofuels	Freiburg (D)	1997
13	KIOR	Biofuels	Hoevelaken (NL)	2007
14	Green Biologics	Biofuels	Abingdon (UK)	2002
15	Inetec	Biofuels	Brigend (UK)	1997
16	Orchid Environmental	Biofuels	Lancashire (UK)	2003
17	Regenastar	Biofuels	Oxford (UK)	2008
18	TMO Renewables	Biofuels	Guildford (UK)	2002
19	SweTree Technologies	Biofuels	Umea (S)	1999
20	Microtherm	Building technology	Sint-Niklaas (B)	1970

Regions that cannot incubate gazelles specialising in eco-innovation may steer the growth of existing local businesses, advising them to mainstream eco-innovative technology into traditional regional industries.

²² Guardian, 18.9.08 <http://www.guardian.co.uk/environment/table/2008/sep/18/cleantech100fullist>