

# Chapter 1 Supporting sustainable regional innovation and ecodesign in small to medium enterprises

*a discussion on the issue with insights from Wales*

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## 1 Introduction

The paper aims at providing empirically-based insights into perceptions of ecodesign and sustainable development amongst design-led small to medium enterprises (SMEs) in Wales. The purpose is to inform methodological frameworks for ecodesign and sustainable innovation capacity building activities with SMEs. The investigation will include a characterisation of design-led growth businesses from a selection of manufacturing and service sectors, undertaking product development projects when environmental and social performance requirements could be considered.

The research was carried out in two phases. The initial phase involved a self-completion questionnaire which identified and ranked 250 businesses in terms of their growth potential and propensity to benefit from ecodesign. In the second phase of research over 30 companies, including key companies identified from Phase 1, were selected to attend three concurrent facilitated workshops where SME attitudes to environmental and social issues were explored.

The study shows that within design-led SMEs in Wales there is a concern at a managerial and operational level for sustainability issues in product and service development. The paper reflects upon the process, managerial and system barriers that prevent many of these SMEs from implementing ecodesign and sustainable innovation. The research identifies key action areas for intervention and highlights the need to reposition intervention strategies depending on institutional, organisational and operational capabilities.

## **2 Context**

Sustainable Consumption and Production (SCP) requires radically new perspectives on reducing the life cycle impacts of the production, distribution and consumption of products and services. The SCP agenda engages strongly with new perspectives on sustainable development policy, new understandings of innovation and new realities of business and communication.

Because the majority of the private sector is made up of SMEs it will be crucial to engage these businesses in SCP. It is increasingly understood that the cumulative environmental impact of SMEs is large, with some estimates suggesting that SMEs are responsible for as much as to 70% of industrial pollution (DG ENTR, 2004). In a recent study in the UK, only 15% of SMEs considered that their business activities could have an impact on the environment (NETREGS, 2007). This percentage rose significantly when the businesses were prompted on the potential environmental impact of specific activities. This low-awareness is coupled with weak market and policy incentives for improving environmental performance. The transitioning to more sustainable business models is also hindered by complex policy programmes, larger institutional bias, strategic, technical and financial weaknesses in SMEs and the perceived poor appropriability of investment in sustainable innovation.

As part of the Welsh Assembly Government's commitment to sustainable development (SD)<sup>1</sup>, funding was provided through the Materials Action Programme (MAP)<sup>2</sup>, to establish Ecodesign Centre Wales (EDC). EDC focuses on building capacity and capabilities in industry, public sector organisations and HE so that effective ecodesign can happen in Wales.

It is important to note that the perspectives within this paper reflect those of intermediary organisations working directly with businesses. Intervention strategies relating to central government are not discussed in detail.

## **3 Background issues impacting ecodesign in SMEs**

### **3.1 Ecodesign, SCP and SMEs**

For the purpose of clarity, we define ecodesign as a strategic design management process that is concerned with minimising full life-cycle impacts of products and services (e.g. energy, materials, distribution, packaging and end-of-life treatment). EDC see ecodesign is good design so this approach is relevant to mainstream design activities.

Although it is primarily focused on product and process improvements, ecodesign can act as a bridging link between the supply and demand sides of the SCP agenda. It can drive eco-efficiency improvements on the supply-side while enhancing sustainable consumption through effective design and business communications. There are numerous indirect or 'public good' benefits from ecodesign through positive externalities, such as low carbon products and services and improved environmental awareness.

<sup>1</sup> Wales has a statutory obligation, built into Section 121 of the government of Wales Act 1998, to promote Sustainable Development in the exercise of its functions.

<sup>2</sup> MAP funds are derived from the landfill tax scheme for businesses.

Ecodesign can be systematic, interactive and dependant on internal and external stakeholders. Therefore SMEs require new organisational and managerial capacities and face significant barriers when implementing ecodesign. From experience, through working with SMEs, and prior research (Millward and Lewis, 2005; OECD, 2005; Rennings et al., 2003; Tukker et al., 2000) the primary barriers can be classified on three levels (Table 1).

Table 1: SME barriers to ecodesign

Level	Barrier
managerial	<ul style="list-style-type: none"> <li>• lack of managerial and operational resources (including time, cost, skills)</li> <li>• failure of SME managers to act strategically</li> <li>• lack of top management commitment.</li> </ul>
organisational	<ul style="list-style-type: none"> <li>• lack of awareness, training, and motivation of employees</li> <li>• systematic, interactive and strategic nature of ecodesign</li> <li>• fragmented product development processes in SMEs</li> </ul>
system	<ul style="list-style-type: none"> <li>• competing policy rationales (e.g. environment and innovation)</li> <li>• government information asymmetries (related to interventions)</li> <li>• uncertainty and poor appropriability of sustainable innovation</li> <li>• “public-good” nature of investment in ecodesign</li> </ul>

### 3.2 Innovation and SCP

Innovation (product, process, institutional and system) is a pervasive issue in policy making and is integral to the SCP debate. Much of the discussion and debate on innovation in the SCP context focuses on the role of radical and systems innovation, such as innovation in energy or mobility systems. While much of this debate is essential, the cumulative impact of incremental innovations on long term economic development and social change can be equal or greater than radical innovations (DG ENTR, 2002; Fagerberg, 2004; Kemp et al., 2004; Stabaek, 2006).

The development of coherent policy frameworks for innovation and SCP is often hindered by competing policy rationales, short-termism in resource allocation and fragmentation and segmentation of policy domains (OECD, 2005). For example policy strategies for innovation often contradict and discount strategies for the environment.

Innovation, both radical and incremental, is an interactive process where a company relies on information from and communication with different sources. These sources include market, suppliers, R&D institutions and networks. Experience has shown that there is great variance in how SMEs commercialise this information and knowledge. This is due to a number of factors including;

- Organisational capacity (especially in the case of start-ups)
- Internal communication and information systems
- Managerial culture
- Knowledge management systems
- Monitoring and evaluation systems
- Internal capacity to exploit external resources

### 3.3 Encouraging regional innovation and ecodesign

Although innovation policy is primarily concerned with stimulating regional and national competitiveness, it is increasingly concerned with

improving the environmental and social performance of the economy (EC, 2004). Many public sector initiatives that are not explicitly branded innovation policies are important for encouraging the diffusion of innovation. National and regional innovation systems are constantly changing in terms of their actors, policy instruments and challenges addressed.

There are many hard and soft mechanisms, outlined in Table 2, for encouraging regional innovation (Cooke, 2007; EC, 2006; Kivimaa, 2006; Morten Gabr, 2006).

Table 2: drivers and mechanisms for innovation

Driver	Mechanisms (hard and soft)
<b>finance</b>	
private & public sources for all company size, development stage and sector	tax law state aid structural funds
<b>knowledge</b>	
technology awareness	research funds
market intelligence	IPR system
management capacity	knowledge and technology transfer
design capacity	networks and clusters
<b>human capital</b>	
skills	education
creativity	labour law
entrepreneurialism	immigration
mobility	clusters
flexibility	
<b>demand</b>	
EU & global markets	market
consumers,	regulations
industry	procurement
public sector	

There have been numerous public sector interventions and initiatives to support ecodesign activities in SMEs. The majority of such initiatives ran throughout the mid-late 1990's and were primarily concentrated in Germany, the Netherlands and Scandinavia. Recently other European countries such as Ireland have begun to address the implementation of ecodesign in SMEs. While the initiatives took many forms (O'Connor and O'Rafferty, 2005; Tukker et al., 2000), the primary mechanisms of intervention included;

- information services
- demonstration projects
- R&D financing
- grants
- establishing co-ordination bodies
- 'brokering' services

It is understood that many publicly funded initiatives on innovation and environmental best practice in SMEs do not produce long-term impacts in the SMEs or sectors involved. The reasons for this include limited project scope, restrictive budget cycles, fragmented support mechanisms and lack of consideration of broader institutional contexts. It is also true to say that impacts and outcomes of these initiatives are difficult to measure. More

often than not the success of an intervention is only based on narrow quantitative measures and output additionality. Other difficulties in measurement include attribution of intervention to additionality and spill-over effects, time-lag between commercialisation and intervention, the quantification of qualitative effects, improved absorptive capacity, competencies of SMEs and improved networks (Boekholt and Larosse, 2002).

## 4 Methodology

The research was carried out in two phases and occurred during the development stages of Ecodesign Centre Wales.

The initial phase involved a self-completion questionnaire which, from a sample of 2056 SMEs, identified and ranked 250 businesses in terms of their business growth potential and attitudes to environmental issues. Each of the businesses selected has a self-specifying design capacity. These companies predominantly operate in the following sectors: electronic and electrical equipment, general manufacturing, food and drink, automotive and building. Half of the highest ranked companies employ between 10 and 49 staff.

Ecodesign Centre Wales worked in partnership with the Leadership, Enterprise and Economic Development Unit (LEED) of Cardiff Business School to design and develop the questionnaire. The LEED Unit have developed an informal index, the potential growth index (PGI), that aggregates the responses of firms using a combination of quantitative and qualitative data.

The next phase of the research involved three concurrent facilitated workshops with over 30 SMEs. These workshops ran during an industry event and involved businesses identified through the growth study alongside other design-led businesses from Wales, recycling companies, policy makers and knowledge transfer practitioners.

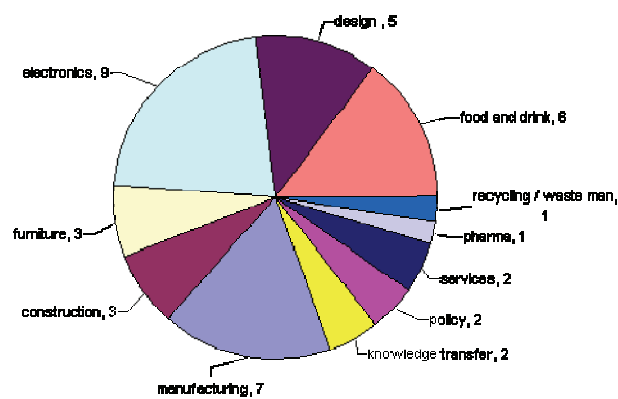


Figure 1: Breakdown of workshop companies by sector

## 5 Overview of findings

### 5.1 Phase 1 of the research

Through Phase 1 of the research, some key operational and managerial indicators of business growth that are relevant to ecodesign and innovation

were identified. These indicators have contributed to a characterisation of design-led growth businesses. These primary indicators included;

- Self-specifying design capacity
- Turnover and profitability
- Export potential
- Management prioritisation of environmental issues
- Business obstacles/barriers
- Innovative capacity
- Networking
- Environmental management capacity
- Skills development and training
- Investment in new products and processes
- Investment in research and development

In terms of design activities, about three-quarters of respondents<sup>3</sup> indicated that they use an in-house design department, over one-third use external design consultants and 6% indicated that they use 'other' sources to conduct design, e.g. Knowledge Transfer Partnerships<sup>4</sup>.

Three quarters of respondents have a business plan, and just over half have marketing and training plans. 20% of respondents reported that they have other strategic documents including a vision document, cost reduction plan, investors in people and quality assurance documents.

#### 5.1.1 *Management prioritisation of environmental issues*

In terms of short to medium term business priorities, better targeting of customers, developing staff and increasing innovation are the most important. Other priorities cited include developing social responsibility and improving environmental performance. 38% of respondents considered improving the environmental performance as a main source of competitive advantage.

While 14% consider environmental performance as a very high priority for their business, just over a quarter do not consider it to be a priority. 22% and 27% of respondents respectively are looking to grow their business through improving the environmental performance of their company and developing social responsibility. 37% of respondents suggest they are accredited with one or a combination of the ISO14001, EMAS, and Green Dragon<sup>5</sup> environmental standards.

#### 5.1.2 *Business obstacles and barriers*

The majority of those businesses surveyed showed ambitions to growing their business with increases in turnover, profitability and staff being cited by at least three quarters of respondents. When it comes to how they plan to

<sup>3</sup> The survey was completed by a senior representative from the company i.e. owner, director or financial director. The engagement from the outset of senior management was a key criterion for inclusion in the study.

<sup>4</sup> Knowledge Transfer Partnerships (KTP) is Europe's leading programme helping businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK knowledge base. See <http://www.ktponline.org.uk/>

<sup>5</sup> Green Dragon is a Welsh five-stage environmental management system relevant to the specific needs of SMEs. Participating organisations gain recognition for effective environmental management without necessarily adopting a formal management system. <http://www.greendragonems.com/>

do this approximately 60% plan to expand their premises, increase their product range and move into new markets.

Surprisingly, respondents on average did not perceive any major obstacles to the growth of their business. This may relate to the perspective taken that SMEs in general do not have strategic capacity. The largest priority related to the training and recruiting of good staff. This would correlate with the intention to grow their business.

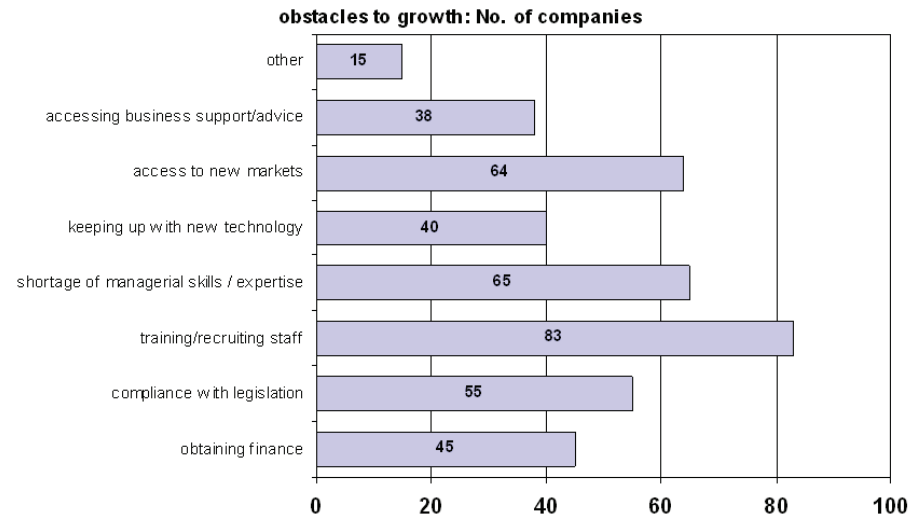


Figure 2: What would you say are the main obstacles to the growth of your business? (LEED, 2007)

### 5.1.3 Innovative capacity

Innovation was highly valued to companies that predicted rapid growth. The companies that value innovation seem to be more ambitious and had performed better in recent years. The companies that considered themselves innovative in relation to their industry sector had also been more active in implementing change through the introduction of new and/or improved processes within the last 12 months. Respondents identified a number of constraints to innovation including a lack of tax incentives, finance and skilled personnel.

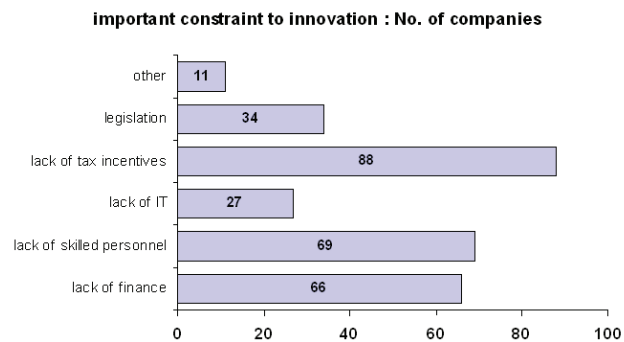


Figure 3: What are the main constraints on innovation? (LEED, 2007)

### 5.1.4 Networking

Over half of respondents consider networking to be important for the success of their company. 55% of respondents are members of a trade association, over one quarter are members of a business club, and 12% belong to a supplier association. The benefits obtained from networking included improved skills and training, accessing new markets and environmental compliance.

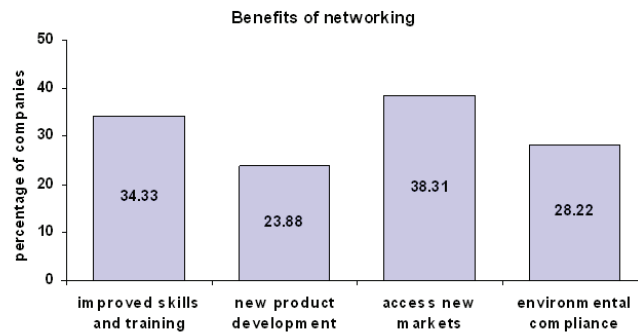


Figure 4: What are the benefits of networking? (LEED, 2007)

### 5.1.5 Skills Development

Of those surveyed, larger companies value training far more than smaller ones. These results are borne out in practice as well as attitudes. Those companies with more employees tended to invest in training and have a set training budget. It is important to note that training in the smaller and micro-sized businesses tends to be ad-hoc and more informal. It is important to consider how SMEs value training that is either context specific or accredited. There is a conflict in how service providers can tailor training programmes to specific needs while maintaining reliable and certifiable training. The systems of learning within SMEs have an important bearing on how strategies for external support are developed.

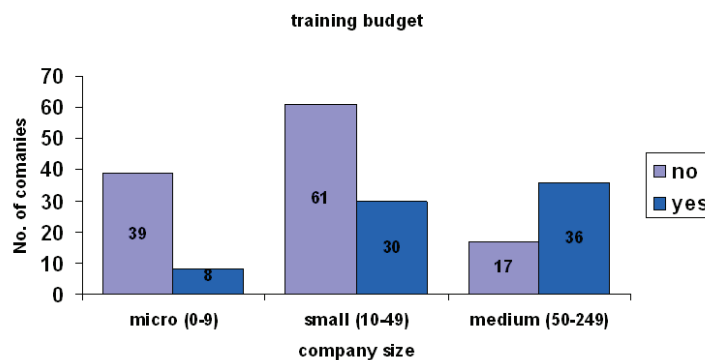


Figure 5: do you have a training budget? (LEED 2007)

## 5.2 Phase 2 of the research

Through the second phase of the research it was possible to explore in more detail some of the existing perceptions on ecodesign and sustainable business practices in Welsh SMEs. In general the perceptions were positive and reflect much of what has been previously discussed in the literature on ecodesign.

It is important to highlight that the company perception may have been influenced by the event and the facilitation of the workshops by EDC staff.

### 5.2.1 Perceptions of ecodesign

During the workshop the attendees were initially asked to discuss the potential benefits that ecodesign and social responsibility could bring to their business. Many of the responses were broad and largely general but they can be classified under three headings (Table 3).

Table 3: benefits of ecodesign as identified by companies

Level	Benefit
strategic	<b>innovation</b>
	<ul style="list-style-type: none"> <li>• new product/service ideas</li> <li>• new ways of looking at existing products/services</li> <li>• long term gains arising from short term investments</li> </ul>
	<b>internal</b>
internal	<b>costs</b>
	<ul style="list-style-type: none"> <li>• reduced production cost – e.g. bill of materials, energy bills, more efficient distribution</li> <li>• compliance costs – e.g. landfill tax</li> <li>• end-of-life treatment costs</li> </ul>
	<b>communications</b>
	<ul style="list-style-type: none"> <li>• better supplier/customer communications</li> <li>• improved brand perception</li> <li>• product differentiation</li> <li>• enhanced brand equity</li> </ul>
	<b>commercial</b>
	<ul style="list-style-type: none"> <li>• “added value”</li> <li>• increased sales</li> <li>• compliance</li> <li>• associated quality indicators</li> </ul>
	<b>social</b>
	<ul style="list-style-type: none"> <li>• motivated staff</li> <li>• healthy environmentally aware staff</li> </ul>
	<b>external</b>
	<b>resource efficiency</b>
<ul style="list-style-type: none"> <li>• waste minimisation / avoidance</li> <li>• on-site recycling</li> <li>• reduced packaging</li> <li>• transit packaging (in/out) and point of sale</li> <li>• potential for material re-use</li> </ul>	

### 5.2.2 Competencies for ecodesign implementation

After the companies discussed the potential benefits ecodesign could bring to their businesses they were asked to identify the primary competencies and support required to allow them to implement ecodesign. Again the discussions ranged broadly depending on the sector, scale and previous experiences of the companies in question (Table 4).

Table 4: required competencies as identified by businesses

Internal competencies	External competencies
<ul style="list-style-type: none"> <li>• environmental impact measurement – e.g. LCA, carbon/eco footprint, energy accounting tools</li> <li>• upskilled staff</li> <li>• environmental management systems</li> <li>• materials knowledge</li> <li>• energy, packaging auditing</li> <li>• supplier communications</li> <li>• understanding of design trade-offs – e.g. product durability /longevity</li> <li>• understanding cost implications</li> <li>• improved planning - reducing business risk – e.g. investment</li> </ul>	<ul style="list-style-type: none"> <li>• more/better information from public sector organisations</li> <li>• ecodesign support through existing business support organisations               <ul style="list-style-type: none"> <li>○ – e.g. trade bodies</li> <li>○ Intermediaries</li> <li>○ Funding bodies</li> </ul> </li> <li>• ecodesign support through existing business networks</li> <li>• improved graduate skills/training</li> </ul>

## 6 Developing interventions for SMEs

Key success factors of previous capacity building and demonstration initiatives included top management commitment and integration with existing management systems, a clear business case communicated to companies, appointed environmental champions (within SMEs), involvement of wider design community, inter-agency and business support service endorsement and a project team with the right skills and commitment (O'Connor and O'Rafferty, 2005).

From our analysis of the two phases of research we can see that several additional intervention implications emerge. There is a clear need to for intermediary organisations to;

- diagnose
  - existing awareness of sustainability and competencies for ecodesign in companies
  - level of training and skills development required on ecodesign tools and strategies
- establish appropriate KPIs using hard and soft metrics
- improve access to and composition of finance
- provide practical support on compliance

These factors can be used to inform strategies and key action areas on intervention for ecodesign in SMEs (Table 5). These activities should drive processes of network and skills development through shared learning. It is also important to create the platforms on which this shared learning can occur.

Table 5: key action areas for intervention

Activity	Actions
identify focus areas for intervention	<ul style="list-style-type: none"> <li>• in a region, identify external stakeholders include design consultancies, business support organisations, research agencies, financiers (public and private), business networks, other SMEs and suppliers.</li> <li>• evaluate role, competencies and input relevancy to product development in SMEs</li> </ul>
market analysis	<ul style="list-style-type: none"> <li>• identify businesses that are likely to succeed and benefit from intervention.</li> <li>• identify products and services with large environmental impact</li> <li>• identify products and services that will provide transferable knowledge</li> </ul>
build capacity in	<ul style="list-style-type: none"> <li>• build capacity in existing business support organisations</li> </ul>

Activity	Actions
business support organisations	<ul style="list-style-type: none"> <li>• create platforms for communication and collaboration</li> </ul>
embed in education	<ul style="list-style-type: none"> <li>• embed sustainability and ecodesign in mainstream design education. Many SMEs require graduate to be proficient designers while managing broader issues such as legislation</li> </ul>
create platforms for networking	<ul style="list-style-type: none"> <li>• commercial mentors</li> <li>• help SMEs share experience and knowledge</li> </ul>
build capacity in the design sector	<ul style="list-style-type: none"> <li>• build capacities in design sector. Many SMEs do not have internal design capacity. Design consultancies require skills, knowledge, resources and capacity for ecodesign</li> </ul>
establish policy learning processes	<ul style="list-style-type: none"> <li>• monitoring and evaluation of activities to establish an evidence base (using hard and soft metrics)</li> </ul>

## 7 Conclusion and discussion

This paper provides empirically based insights into perceptions of ecodesign and sustainable development amongst design-led SMEs in Wales. These insights will be used to inform methodological frameworks for ecodesign and sustainable innovation capacity building activities.

Crucially the investigation highlighted that within design-led SMEs in Wales there is a concern at a managerial and operational level for sustainability issues in product and service development. Through reflecting upon the barriers that prevent many of these SMEs from implementing ecodesign and sustainable innovation this paper identifies key action areas for intervention.

Experience and prior research (DEFRA, 2006; Andersen, 2004) has shown that a number of key factors can greatly influence when and how SMEs engage with intermediary organisations. These include:

- **Local knowledge of business support organisations:** SMEs respond positively to support organisations that have local knowledge, including other business support organisations, suppliers, sector organisations and competitors.
- **Partnerships:** Ecodesign in SMEs requires a team approach and this is fundamental for engagement. Partnership development is essential and can be facilitated through supply-chain initiatives, commercial mentoring programmes and informal business networks.
- **Long-term relationships:** SMEs benefit from established relationships with intermediary organisations and business support organisations. It can take time to establish rapport and trust. This needs to be accounted for when developing intervention initiatives for SMEs.
- **Inspiration:** SMEs need to be inspired to engage with ecodesign and then facilitated to apply the various ecodesign tools, techniques and resources. The knowledge and skills need to be appropriate to the needs of SMEs.
- **Appropriate language:** It is widely understood that communication needs to be appropriate for small businesses. This includes using simple jargon-free messages and balancing ecodesign and sustainability in business terms.
- **Suitable finance:** Access to finance is a key factor in encouraging innovation, growth and entrepreneurship. There is a need to simplify and improve the accessing of finance by SMEs.

This paper highlighted the rationale, through seeking to understand the business perspective, for supporting ecodesign activities in SMEs. It has also highlighted the need to reposition intervention strategies depending on institutional, organisational and operational capabilities. Supporting incremental innovations such as ecodesign in SMEs can lead to longer-term regional innovative capacities for sustainable development.

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