UNU-IAS Working Paper No. 163

Barriers to Environmental Management in Clusters of Small Enterprises in Brazil and Japan: From a Lack of Knowledge to a Decline in Traditional Knowledge

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April 2011
Abstract
This study aims to understand the main barriers to environmental management in two clusters of small businesses. For this, a comparative study of two clusters was performed, one in Brazil (in leather/shoes sector, considered the most complete cluster in Brazil, because it contains the entire supply chain) and the other in Japan (in the traditional Japanese products, considered one of the most relevant for Japanese culture and economy). The case studies involved approximately 20 interviews and an analysis of 12 small businesses located in the clusters. It was concluded that the Japanese cluster has more proactive environmental governance than the Brazilian cluster; both clusters could benefit from a governance standard that guarantees engagement of more environmentally conscious value chains; the main environmental practices that are adopted are operational, with the opportunity to adopt other environmental management practices, such as environmental seals on products; the main barrier to environmental improvement in the Brazilian cluster is the lack of information; and the main barrier to environmental management in the Japanese cluster is the constant decline of traditional and environmentally friendly knowledge applied to production. The originality of the research is linked to the scarcity of studies on environmental management among clusters and small businesses; the comparative approach of Brazilian and Japanese cases; and the discovery of a new barrier to environmental management among small businesses: the decline of traditional knowledge.

Keywords: Environmental management, Small businesses, Clusters, Brazil, Japan.
1. Introduction
In general, research on environmental management and, more recently, on global warming portrays the reality, challenges, and opportunities of large companies (Kolk and Pinkse, 2008; Boiral, 2006; Weinhofer and Hoffman, 2010). In general, the literature on environmental management of small businesses may be considered as growing, but still limited, when compared to the volume of research produced on environmental management among large businesses (Brío and Junquera, 2003). Thus, the environmental management of small businesses deserves more attention from researchers (Fresner, 2004; Heras and Arana, 2010).

Considered together, small businesses are thought to be the greatest contributors of environmental problems and global warming generated by the industrial sector (DiPeso, 2008). In this sense, (a) the smaller businesses are responsible for approximately 60% of the CO₂ emissions and 70% of the pollution generated by the industrial sector (Parker, Redmond and Simpson, 2009) and (b) the smaller businesses tend to adopt environmental management practices at a lower intensity than large businesses (Zhang, Bi and Liu, 2009).

However, various studies (Hillary, 2004; Zhang, Bi and Liu, 2009; Luken and Van Hompaey, 2008; Parker, Redmond and Simpson, 2009; Brío and Junquera, 2003; Perez-Sanchez, Barton and Bower, 2003; Van Hemel and Cramer, 2002; Roberts, Lawson and Nicholls, 2006) indicate that smaller companies face barriers and difficulties that inhibit the adoption of a more proactive environmental management positions.

One of the alternatives that can improve the environmental performance of small businesses is the making greener of the cluster or local production system to which they belong (Mbohwa, Rwakatiwana and Fore, 2010; Domingues and Paulino, 2009; Blackman and Kildegaard, 2010; Konstadakopulos, 2008; Carpinetti, Galdamez and Gerolamo, 2008). This is an emerging research area that has still not adequately discussed the role of clusters as vectors for the improvement of the environmental performance of small businesses.

Therefore, the main objective of this research is to understand the main barriers to environmental management in two clusters of smaller sized businesses: one in Brazil and another in Japan. As complementary objectives, the study has the following aims:

- To provide an overview of the relationship between the clusters and the environment;
- To identify the main barriers to environmentally friendly management in the clusters;
- To understand the environmental governance standard of the cluster, along with the associated opportunities and challenges;
• To analyse the environmental management practices directed at strategies for climatic change;
• To compare the case studies, examining both similarities and differences.

To meet the objectives, Section 2 presents the conceptual foundations of the research. The methodology is presented in Section 3. The results of the research are analysed in Section 4. Finally, the main conclusions of the research are recorded in Section 5.

2. Literature Review

2.1 Environmental management, global warming and small businesses

Environmental management deals with the incorporation of objectives and environmental strategies with the broader strategies of the organisation (Haden et al., 2009). The incorporation of environmental management among businesses implies the adoption of environmental management practices. González-Benito and González-Benito (2006) claim that environmental management practices may be classified into three types: (a) organisational and planning, involving the planning, organisation, direction, and control of the behavioural and business aspects of environmental management; (b) operational, involving environmental improvement of products and productive processes; and (c) communication, involving the practices aimed at internally and externally communicating the initiatives and results of the environmental improvement of the business.

One of the new branches of research in the environmental management of organisations is the area that has been called environmental strategies for climate change (Kolk and Pinkse, 2008; Weinhofer and Hoffmann, 2010), understood as a standard of business behaviour aimed at the management of greenhouse gas emissions (Weinhofer and Hoffmann, 2010).

The debate of this topic should necessarily involve small business (DiPeso, 2008, Brío and Junquera, 2003; Fresner, 2004; Heras and Arana, 2010), since their environmental impacts are significant (Perez-Sanches, Barton and Bower, 2003).

From a business perspective, this appears to be a topic of increasing interest. Revell, Stokes and Chen (2010) conducted research on 220 owner-managers. Of these, 95% were micro and small enterprises in the United Kingdom. The study points to a tendency of greater environmental responsibility among the respondents. For example, 75% of the respondents believe that, although they are small, their businesses can generate an impact on the environment. Approximately 53% of the respondents stated that they are worried about the CO₂ emissions of their business activity and are working to reduce emission levels.
2.2 Opportunities and barriers to environmental management among small businesses

One of the most important areas in the literature on environmental management is the understanding of barriers to environmental management (Chan, 2008; Luken and Van Rompaey, 2008; Van Hemel and Cramer, 2002; Roberts, Lawson and Nicholls, 2006) among smaller organisations. Smaller organisations (or small businesses) qualitatively comprise an independent property, which is personally managed by the owner-manager and which is active in a limited market share. Quantitatively, it is defined by economic, financial and demographic indicators (Filion, 1990).

Various studies are dedicated to understanding the barriers to environmental management among smaller businesses (Brío and Junquera, 2003; Perez-Sanches, Barton and Bower, 2003; Zhang, Bi and Liu, 2009), yet the research by Hilary (2004) stands out for grouping the barriers into two dimensions.

According to Hilary (2004), the environmental management initiatives of small businesses are threatened by eight types of barriers, both internal and external. The internal barriers refer to the inherent limitations for smaller businesses, such as (1) the lack of resources; (2) the lack of information of adequate knowledge; (3) poor implementation; and (4) attitudes and an organisational culture that discourage environmental management. On the other hand, the external barriers refer to: (5) the difficulty of obtaining certified environmental practices and systems; (6) economic uncertainty; (7) the lack of legal and institutional frameworks; and (8) the lack of specialised support and promotional associations among small businesses. The knowledge of and the ability to overcome these barriers may generate competitive advantages for smaller businesses (Morad, 2007; Zorpas, 2010).

2.3 Governance and environmental improvement among small business clusters

There is increasing recognition that clusters (Altenburg and Meyer-Stamer, 1999) and the firms located within these clusters play a key role in supporting the generation of innovations and wealth (Eisingerich, Bell and Tracey, 2010). Clusters can involve traditional knowledge, defined as practices transmitted from one generation to the next, which are generally related to a group of individuals of a specific region (WIPO, 2001). Clusters may also be a key piece to begin to incorporate environmental management and reflexions over climate change among smaller businesses. However, although the economic benefits of these clusters may be praised, it should be recognised that these clusters may generate significant environmental impacts (Konstadakopulos, 2008). Clusters were massively studied as a development instrument, yet there are few research results on their relationship with the environment (Domingues and Paulino, 2009).
Mbohwa, Rwakatiwana and Fore (2010), based on a case study in Zimbabwe, state that clusters may promote the spread and adoption of environmental management practices among the businesses that are involved. For example, the cluster may encourage the reduction of waste production, encouraging more efficient use of water and energy as well as socially responsible practices. Domingues and Paulino (2009) showed in a Brazilian study that it is possible to obtain environmental improvements concomitant on the reduction of production costs.

Blackman and Kildegaard (2010) performed research on 145 small- and medium-sized enterprises located in a cluster in Leon, Guanajuato (Mexico), to identify the determinant factors behind the adoption of cleaner technologies in the production process. According to the authors, the determinant factor in the adoption of clean technologies was the “spread of technical information.” A positive influence was detected in the supply chain and among associations for environmental improvements.

Konstadakopulos (2008) performed a survey of 56 small artisan enterprises in a cluster located in the Red River Delta of Northern Vietnam to examine the causes of increased environmental degradation caused by this cluster. The author identified that one of the main problems is the inefficiency of governmental action to combat environmental degradation.

However, to consider clusters as vectors for the environmental improvement of small businesses requires a discussion on the type of the environmental governance of the cluster. Understanding the governance of the cluster is of fundamental importance, as there exists evidence that this variable strongly influences the behaviour of the involved organisations (Bell, Tracey and Heide, 2009).

According to Puppim-de-Oliveira (2009), governance is the manner in which the various actors of the cluster integrate among themselves and also how this affects their behaviour and actions both among individuals and as a collective group. Thus, governance for environmental improvement and mitigation of climate change correspond to standards of behaviour and of interactions among the members of a cluster with the goal of reducing the environmental impacts generated by the organisational activity (Lemos and Agrawal, 2006). Three types of environmental governances may be predominant (Puppim-de-Oliveira, 2009):

- The effective application of an environmental legislation in the cluster.
- The voluntary adoption of an environmentally friendly position.
• The involvement of a more environmentally conscious supply chain, leading to environmentally sound products and processes.

3. Research Methods
This study involves qualitative research, with a strategy focused on two cases, with a comparative approach (Yin, 2009). In each of the case studies, the main unit of analysis is the cluster as a whole, at the macro level; the secondary units of analysis are the organisations that make up the cluster, mainly the support institutions and some small businesses. Figure 1 diagrams the flow of the research activities, which are coherent with the proposed investigation. The comparative case study involves two clusters, one located in Franca (a city belonging to the state of Sao Paulo, Brazil) and the other located in Kanazawa (a city belonging to Ishikawa Prefecture, Japan). The choice of these cases was intentional, based on the following criteria: (a) the comparison and contextualisation of the research object in a developing country and in a developed country; (b) both clusters’ specialisation in traditional products with a low level of incorporated technology; and (c) both clusters’ experiences of a loss of competitiveness in relation to new entrants in the active markets of these clusters, specifically involving new entrants that offered more accessible products for the consumers.

The field research related to the case studies occurred in 2010. The data related to the Brazilian case were collected during the first semester; the data related to the Japanese case were obtained during the second semester. The validity of the constructs used in the research was obtained by means of a conceptual definition and the operationalisation of relevant
variables (Table 1). These variables were adopted in the process of systematisation and the analysis of the cases, in an individual and comparative manner, with the goal of ensuring the internal validity of the study. The external validity was obtained in virtue of the international nature of the research and through the comparison of the practical results in light of the aforementioned theoretical framework.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Concept adopted</th>
<th>Main sources</th>
<th>Operationalisation</th>
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<tbody>
<tr>
<td>Environmental management</td>
<td>Environmental business management is the set of adjustments and planning in the structure, in the systems and in the activities of the company with the goal of establishing a certain type of position in relation to the environmental variable</td>
<td>McCloskey and Maddock (1994)</td>
<td>Identify whether environmental management is a concern of the cluster, whether it is incorporated into the structure of the organisations involved and whether the behaviour is reactive or proactive</td>
</tr>
<tr>
<td>Environmental management with a focus on climate change</td>
<td>This is understood as a standard of behaviour directed at the management of greenhouse gas emissions and involves a range of practices that may be chosen and implemented by the organisations</td>
<td>Weinhofer and Hoffmann (2010)</td>
<td>Examine whether some practice, product or process has undergone direct changes to reduce CO₂ emissions</td>
</tr>
<tr>
<td>Environmental management practices</td>
<td>The practices of environmental management can be classified into three groups: (a) organisational and planning; (b) operational, involving environmental improvement of products and production processes; and (c) communication</td>
<td>González-Benito and González-Benito (2006)</td>
<td>Interviews conducted with the business managers</td>
</tr>
<tr>
<td>Barriers to environmental management</td>
<td>Internal and/or external factors of the businesses that undertake environmental management initiatives</td>
<td>Hillary (2004)</td>
<td>Mainly through the interviews conducted with the business managers</td>
</tr>
<tr>
<td>Clusters</td>
<td>The existence of specialised businesses in a determined productive sector, with significant activity among firms</td>
<td>Altenburg and Meyer-Stamer (1999)</td>
<td>Convergence of historic data on the cluster and also from the support organisations and the businessmen</td>
</tr>
<tr>
<td>Small-size businesses</td>
<td>This should satisfy the qualitative criteria; and the quantitative criterion of up to 20 employees</td>
<td>Filion (1990)</td>
<td>Examination of the market in which the business is active, business profile and the amount of employees</td>
</tr>
<tr>
<td>Environmental governance in clusters</td>
<td>Deals with the relationship among members of a cluster, which influences individual and collective behaviour, on matters related to environmental management and the environment</td>
<td>Puppim-de-Oliveira (2009)</td>
<td>Interviews with the support organisations for the cluster and collection of secondary data on the environment and the cluster</td>
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</tbody>
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Table 1 – Conceptual profile of the main research variables

The interviews and informal conversations, conducted with 13 key respondents in Brazil and 10 key respondents in Japan, are the main sources of evidence of this research. The
interviews with the support organisations were performed mainly with the directors of the associations and representatives of the local governments, and lasted two hours on average. The interviews performed with the business leaders lasted, on average, one hour. The main instruments of the data collection were: (a) two guidelines of interviews, one for the support organisations and the other for the business leaders; and (b) the use of a notebook to record the comments and information. Interpreters mediated the interviews performed in Japan.

In addition to the interviews, direct observations were made as well as technical visits to the support organisations and some small businesses in both clusters. These were in addition to the collection and analysis of the documents, mainly those that deal with the history of the clusters or other relevant data. Table 2 systematically presents the data collection procedures for the analysed cases.

<table>
<thead>
<tr>
<th>Case</th>
<th>Data collection procedures</th>
<th>Documents</th>
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<tbody>
<tr>
<td></td>
<td>Interviews</td>
<td>Observation/Visits</td>
</tr>
<tr>
<td></td>
<td>• Two interviewees from the Union Association</td>
<td>• Visit to the city of Franca</td>
</tr>
<tr>
<td></td>
<td>• Two interviewees from the Business Prefecture/Incubator</td>
<td>• Visit to the Union Association</td>
</tr>
<tr>
<td></td>
<td>• Nine managers-owners of micro/small enterprises</td>
<td>• Visit to the Business Incubator</td>
</tr>
<tr>
<td>Franca, Brazil</td>
<td>• Visit to the Industrial District</td>
<td>• Visit to nine small-size businesses</td>
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<td></td>
<td>• Visit to nine small-size businesses</td>
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<td></td>
<td>• Visit to the city of Franca</td>
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<td></td>
<td>• Visit to the Union Association</td>
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<tr>
<td></td>
<td>• Visit to the Business Incubator</td>
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<tr>
<td>Kanazawa, Japan</td>
<td>• Visit to the tourism centre of traditional products of the region</td>
<td></td>
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<td></td>
<td>• Visit to the City of Kanazawa</td>
<td>• Visit to the facilities of Ishikawa Prefecture</td>
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<td></td>
<td>• Visit to the facilities of Ishikawa Prefecture</td>
<td>• Visit to the facilities of Kanazawa City, Crafts Production Division</td>
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<tr>
<td></td>
<td>• Visit to the tourism centre of traditional products of the region</td>
<td>• Visit to the tourism centre of traditional products of the region</td>
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<td></td>
<td>• Visit to three small-size businesses</td>
<td>• Visit to three small-size businesses</td>
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<td></td>
<td>• Visit to the studio of an artist and professor</td>
<td>• Visit to the studio of an artist and professor</td>
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<tr>
<td></td>
<td>• Informal conversations with two members of a regional research institute</td>
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<tr>
<td></td>
<td>• Two interviewees from the Ishikawa Prefecture, Traditional Industries Promotion Division</td>
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<tr>
<td></td>
<td>• Interviewee from Kanazawa City, Crafts Production Division</td>
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<tr>
<td></td>
<td>• Four managers-owners (from three different businesses)</td>
<td></td>
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<td></td>
<td>• Professor and artist of traditional Japanese culture</td>
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</table>

Table 2 – Details of the data collection process

The data analysis was performed in three stages. In the first, the information was individually systematised, by cluster, based on the main variables of the research. In the second stage, the information of the clusters was transversally compared and analysed according to the most relevant research variables. Finally, the main evidence of the research was discussed based on the literature reviews. The case of the cluster in Franca, Brazil, was codified as “BRA,” and the sub-cases that were analysed, related to the small businesses, were codified as “BRA1 [...]
The case of the cluster in Kanazawa was codified as “JAP” and its sub-cases as “JAP1, JAP2 and JAP3.”

4. Results

4.1 Clusters’ profiles

4.1.1 The cluster of footwear and leather accessories of Franca, Sao Paulo, Brazil (BRA)

Brazil is the third major producer of footwear in the world, behind only China and India. The city of Franca is located in an area of intense livestock production, which was a resting point for merchants from the interior of Sao Paulo en route to the state of Minas Gerais for centuries. These factors created the conditions for the emergence of a leather and footwear cluster: the production of leather and the demand for products such as boots and leather items to meet the local and travellers’ demands (Suzigan et al., 2001). Franca is a city located in the interior of the State of Sao Paulo, Brazil (Figure 2). It has approximately 319,000 inhabitants; around 80% of the economically active population of Franca is involved in the city’s leather and footwear industries.

![Figure 2 – Location of Franca, Sao Paulo State, Brazil](image)

The city of Franca is the second region for the production of footwear in Brazil. In this region, production destined for the male footwear market is predominant, although this production is experiencing a phase of diversification by also offering footwear for women and children. The Franca cluster lags, in terms of the volume of production, only behind the footwear cluster of Vale dos Sinos located in South Brazil; the latter region is ranked first in Brazil for the production and exportation of footwear. In 2010, the Franca footwear cluster produced around 36 million pairs of shoes. The Leather and Footwear Cluster is considered by some researchers (Suzigan et al., 2001) as a practically perfect example of an industrial cluster in Brazil, as it presents all the tiers of the leather-footwear chain in geographically close proximity. Figure 3 systematically presents the links of the leather-footwear chain (Corrêa, 2001).
4.1. 2 Cluster of traditional products of Kanazawa, Ishikawa, Japan (JAP)

The region circumscribed by the Prefecture of Ishikawa is one of the main producers of traditional products that are typical of Japan. Among these products, the following stand out: artisan coal and salt in typical regions of Japan; products used in the traditional tea ceremony; and Kutani porcelain Buddhist altars, lacquer ware and kimonos.

Within the Prefecture of Ishikawa, the role of Kanazawa’s artisan products stands out (Figure 4). The city is recognised for maintaining Japanese culture applied to handicraft, food production and architecture. For example, in the city it is possible to find the Higashi Chaya District, which still maintains the appearance of the Japanese feudal period. In this city, the Kenrokuen Garden is also found, which was created during the Edo period and is considered one of the three most beautiful and famous gardens in Japan. The city has 55 water canals that stretch for 150 km (CBD, 2010). The intention of the local government of Kanazawa is to maintain and strengthen the characteristics of the city: “Kanazawa is blessed with pure water and abundant nature [...] it is rich in history and traditions [...] our objective is to continue to improve these characteristics” (CKAR, 2010).
The city of Kanazawa was the first in Japan to be recognised by UNESCO as a “Creative City of Crafts and Folk Art”, since 2009 (CKAR, 2010). According to one of the interviewees, “[...] this recognition is proof that Kanazawa is an essential city to maintain and rescue Japanese culture [...] we want the city to be recognised worldwide for this reason.” There are around 800 establishments in Kanazawa that are dedicated to the production of more than 26 traditional types of products, generating more than 3,000 jobs (Sasaki, 2003).

Within the main environmental problems of Kanazawa, the following can be cited (CBD, 2010):

- Accelerated urbanisation. The city’s population doubled between 1920 and 1980, going from 200 thousand to 400 thousand inhabitants, reaching 450 thousand according to the most recent estimates;
- Challenges for the “Satoyama” forest management model. Satoyama deals with a particular and sustainable forest management system that guarantees, at the same time, environmental preservation with the sustainable generation of income for the residents. The accelerated urbanisation and competition with cheaper products obtained without sustainable forest management led to the deterioration of the forest areas.

Finding these problems led the local government to create, in a proactive and pioneering manner, the Ordinance on Preservation of the Traditional Environment (1968). This decree was followed by others, published between 1989 and 2003 with the intent to maintain the environmental quality of the city and to promote initiatives appropriate for the expansion of urbanisation, such as the Ordinance on the Promotion of Green City Building (2001) and the Ordinance on Forest Development (2003) (CBD, 2010).

4.2 Clusters and the environment: a macro analysis
4.2.1 The cluster of footwear and leather accessories of Franca, Sao Paulo, Brazil (BRA)
The majority of the environmental problems in the leather-footwear sector are generated in the leather tanning phase, which, as can be observed in Figure 3, is exposed to a number of chemicals, including chromium (Cr). The use of chemical products in the preparation of leather propagates the environmental problem into other stages of the productive chain. The main environmental problem of the sector is the generation of leather residue with the chemical load received during the beginning of the chain. The environmental problem with the greatest repercussions is initiated in the leather tanning phase, where the product receives chromium (Cr) salts and, consequently, the residue of this process ends up containing...
chromium, considered a “class I” residue, which is dangerous and requires treatment (Alves, Barbosa and Renofio, 2009).

The process of adding chromium to leather occurs as follows: after being tanned, the leather is standardised for the purpose of adjusting the input for the production process. The leather is then trimmed and the leather shavings are tanned with chromium, which becomes a voluminous and toxic residue. The estimations indicate that each piece of tanned leather generates between 3 and 4 kilograms of shavings that are contaminated with chromium. Thus, taking the 2000 data on leather production in Brazil, it can be concluded that 125 tons of shavings contaminated with chromium were produced (Alves, Barbosa and Renofio, 2009).

Chromium can contaminate human beings via ingestion or inhalation (in the form of hexavalent chromium). From the point of view of the production of leather footwear, it is estimated that each manufactured shoe generates approximately 220 grams of residue, the majority of which consists of leftovers and scraps of leather tanned with chromium (Corrêa, 2001). Figure 5 shows that leather is not used with 100% efficiency in the productive process of footwear, thereby generating residue.

Figure 5 – Shavings and areas generating waste in the chromium treatment of leather
Source: CETESB (2010)

Corrêa (2001) points out that another environmental problem of the sector is the use of solvent-based adhesives and glues in the shoe manufacturing process, specifically with soles and heels.

The analysis developed here is mainly restricted to the manufacturing stage of footwear, since during this stage the two aforementioned environmental problems – leather residue with chromium and solvent-based adhesives – are significant. In general, a reactive behaviour has been observed among the managing entities of the cluster – Unions and the City – in relation
to the environmental improvement of the businesses located in the cluster. This reactive behaviour is predominantly based on a slow reaction to the increased stringency of environmental legislation, mainly of the State of Sao Paulo, by means of The Environmental Company of the State of Sao Paulo (CETESB).

For example, the tanneries for chromium-based leather tanning were only moved to an industrial district with the appropriate infrastructure and with adequate treatment of effluents after warnings and fines delivered by CETESB. CETESB also requires that the leather residue subjected to chromium be sent to an appropriate location, with control of the soil and water contamination, since chromed leather is hazardous waste that is costly to members of the cluster.

The interviews with the coordinating institutions of the cluster indicate that the main motivation for larger scale environmental changes among footwear enterprises is the need to adapt to the evolution of the legislation, the avoidance of fines, warnings and negative exposure in the media. An example of this reactive position is related to the search for the treatment and decontamination of leather wastes exposed to chromium. The alternatives to managing this problem emerged with the evident exhaustion of the area that was the historical destination for the businesses of the cluster for the burial of the hazardous wastes from the city of Franca. According to the testimony of one of the interviewees, “we are very close to the maximum capacity for dumping leather scraps and clippings [...] if we don’t find a solution [... some businesses] will have to be closed.” The responsibility of waste collection lies with a business association of the cluster.

The crew of one of the support institutions for the cluster entrepreneurs stated that it is developing a technology, here called Technology A (to preserve the confidentiality of the data presented) in cooperation with a university of the region, to make the leather exposed to chromium less toxic and harmful for the environment. According to one of the interviewees, “we are going to recycle the leather [...] the leather leftovers can have another destination [...] they can go to a landfill for non-hazardous waste. This is going greatly reduce the warnings from CETESB and we are also going to be more economical.”

However, the environmental improvement of the cluster through the development of Technology A may lose force due to pressure from the regional businessmen to soften the law regarding waste from their businesses. In a recent publication (CETESB, 2010), the businessmen of the Franca cluster obtained authorisation from CETESB to place the
chromium waste in landfills for non-hazardous waste, because the analysis of leather samples showed tolerable levels of chromium.

The involvement of the cluster is weak in a more environmentally conscious and productive chain. Because the majority of footwear produced in Franca is destined for internal consumption, the interviewees of the supporting institutions of the cluster reported that international buyers do not exert strong pressures for a lower environmental impact of the footwear. As one of the interviewees commented, “only some of them ask us, yet the greatest interest is related to whether our price is low and whether the product is good.”

When asked about concerns of global warming and the role of the Franca leather-footwear cluster in mitigating CO₂ emissions, those responsible for the support institutions exhibited lack of knowledge of the cause. They stated that they do not have data on the topic and therefore believe that the leather-footwear sector is irrelevant for the development of actions to reduce greenhouse gas emissions. Through the interviews that were performed, it can be seen that environmental problems are ignored, mainly as they relate to emerging topics such as global warming, as well as the raising of the bovine stock, its slaughter, the production of leather, the manufacture of footwear and the equivalent CO₂ emissions from the transportation used to make the Franca leather-footwear cluster feasible.

There are indications, therefore, that the Franca leather-footwear cluster has a standard of environmental governance based on complying with the environmental legislation.

4.2.2 Cluster of traditional products of Kanazawa, Ishikawa, Japan (JAP)

There is relatively little material available on the relationship between the cluster of traditional products of Kanazawa and environmental questions and climate change. However, there appears to be a consensus that the artisan production of the cluster is environmentally friendly. For example, there are researchers (Sasaki, 2003) who state that Kanazawa is not interested in large businesses and therefore appears to have few significant environmental liabilities. On the other hand, its economy is based on micro, small- and medium-sized enterprises, with production influenced by traditional and cultural values of Japan (Sasaki, 2003).

In general, the support organisations for the cluster of traditional products believe that the traditional products have a low environmental impact and, therefore, are environmentally-friendly. According to one of the interviewees, “the traditional products are made according
to technique developed many centuries ago, and were more environmentally-friendly and based on natural products [...] without the use of toxic substances.”

Another interviewee stressed that regarding many aspects that justify the perception of a low environmental impact associated with traditional products, “[...] the products are made with great care and dedication, and nothing is wasted [...] as these products are more durable and can even be restored [...] this is different from what occurs with mass produced products.”

However, all of the interviewees were unanimous in indicating the main barrier to the continuation of a standard of environmentally-friendly production is the continuous decline of traditional knowledge, which is knowledge that is a custom and is inherited, generation to generation, for the development of the products. Data allow for the conclusion that economic activity linked to traditional knowledge has declined; the volume of sales of artisan products decreased by 30% between 1990 and 2009, whereas the quantity of jobs in the sector decreased by 45% between 1992 and 2009.

The decline of activities that are intensive in traditional knowledge and that are more environmentally-friendly is caused by three main conditioning factors, according to an interviewee from a support organisation: “(1) the difficulty in making traditional knowledge circular and of keeping it alive, respecting nature; (2) the difficulty in maintaining of the of the links of the traditional production chain, including that of inputs and primary materials; and (3) obtaining natural resources and primary materials in an environmentally sound manner.”

The entrance into the market for alternative and cheaper traditional products, mainly from other countries in Asia, is the main concern of the interviewees, not only from an environmental point of view, but also from an economic point of view. “The plastic products are very similar to the originals and have the same function [...] and cost 10% of the value of the original product,” according to one of the owners who was interviewed. Another interviewee asked, “[...] is it possible that these products respect the environment as we do? [...] is it possible that they have a relationship of respect for the environment as we do in this city?”

When asked about the relationship between the cluster of traditional products and the topic of climate change, the interviewees of the support organisations reported that they did not have detailed data on this relationship. Despite not having data, there is a perception that “the
businesses of this sector do not cause much environmental impact in terms of CO₂ emissions,” according to one of the interviewees.

There is evidence that the cluster of artisan products accompanies the pro-activeness of the city of Kanazawa in relation to the quality of the environment. The city is recognised for having promulgated innovative laws for the conservation of natural resources. Thus, there is evidence that the environmental governance in the cluster follows a standard of voluntary adherence to a traditional type of environmentally friendly production.

4.3 Clusters and the environment: a micro analysis
4.3.1 The cluster of footwear and leather accessories of Franca, Sao Paulo, Brazil (BRA)
To confirm this perception, a study of nine cases was performed with the businessmen of the micro and small enterprises of the footwear production sector of Franca. Table 3 systematically presents the main information for each case that was analysed.
<table>
<thead>
<tr>
<th>Case</th>
<th>Size/Products/Data Collection</th>
<th>Environmental Management Practices</th>
<th>Strategy for mitigating climate change</th>
<th>Main barrier to environmental management</th>
<th>Main motivation for environmental management</th>
<th>Was there environmental improvement for being part of the cluster?</th>
<th>Comments on the initiative supplied by the coordinating elements of the cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRA1</td>
<td>Micro-enterprise&lt;br&gt;Men’s footwear&lt;br&gt;Interview with owner</td>
<td>Separation of office waste for recycling (paper)</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation&lt;br&gt;Environmentally conscious consumers</td>
<td>No</td>
<td>“People may even say that the environment is important, but they’ve never told me anything about how to apply this to my business”</td>
</tr>
<tr>
<td>BRA2</td>
<td>Micro-enterprise&lt;br&gt;Men’s and women’s footwear&lt;br&gt;Interview with owner&lt;br&gt;Access to the site of the business</td>
<td>No evidence</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation&lt;br&gt;Cost reduction</td>
<td>No</td>
<td>“I don’t know exactly what environmental management is”&lt;br&gt;“I don’t know whether environmental management could reduce my costs”&lt;br&gt;“I think they could provide more information on this”</td>
</tr>
<tr>
<td>BRA3</td>
<td>Small enterprise&lt;br&gt;Women’s footwear&lt;br&gt;Interview with the owner&lt;br&gt;Access to the business site</td>
<td>Separation of office waste for recycling (paper and plastic)&lt;br&gt;Selection of leather suppliers (tanneries) that have not had environmental problems&lt;br&gt;Use of recycled components in shoes (sole and other components)&lt;br&gt;Use of certified wood for the shoe soles&lt;br&gt;Use of water-based glue for shoe production</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation&lt;br&gt;Environmentally conscious consumers</td>
<td>No</td>
<td>“All that I do for environmental management I learned alone”&lt;br&gt;“They never told me how I could improve my business with environmental management”&lt;br&gt;“I believe that only when the law takes hold will they become involved”&lt;br&gt;“They will only think about the environment when it impedes our production”</td>
</tr>
<tr>
<td>BRA4</td>
<td>Micro-enterprise&lt;br&gt;Men’s shoes&lt;br&gt;Interview with one of the partners</td>
<td>Donation of leather waste for artisan production process</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation&lt;br&gt;Cost reduction</td>
<td>No</td>
<td>“What is most lacking is information on environmental management”&lt;br&gt;“If awareness doesn’t come from above then we won’t change”</td>
</tr>
<tr>
<td>BRA5</td>
<td>Micro-enterprise</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation</td>
<td>No</td>
<td>“I think they should talk about environmental management practices” “I think environmental management increases costs and therefore they don’t talk about it”</td>
<td></td>
</tr>
<tr>
<td>BRA6</td>
<td>Micro-enterprise</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation</td>
<td>No</td>
<td>“Honestly I don’t know and they never explained to me the relationship between my products and the environment” “If they don’t say anything it is because my business and my product don’t pollute”</td>
<td></td>
</tr>
<tr>
<td>BRA7</td>
<td>Small enterprise</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation</td>
<td>No</td>
<td>“Many of my employees don’t think the environment is a priority and those responsible for the cluster don’t do anything to change this behaviour” “When they give lectures on quality, I think that they should consider environmental aspects as part of the quality of our products”</td>
<td></td>
</tr>
<tr>
<td>BRA8</td>
<td>Micro-enterprise</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation</td>
<td>No</td>
<td>“Environmental management is not a problem of my business […] I think it’s for this reason that they’ve never talked about this” “They only say that the landfill is reaching its maximum capacity, but I don’t know how this is going to affect my business”</td>
<td></td>
</tr>
<tr>
<td>BRA9</td>
<td>Small enterprise</td>
<td>No evidence</td>
<td>Lack of information/knowledge on environmental management</td>
<td>More stringent legislation</td>
<td>No</td>
<td>“These organisations provide use with very important support on other matters, such as entrepreneurship” “If they provide more information on the environment it would be easier to perform environmental management”</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3 – Systematisation of the environmental management of selected businesses of the Franca Cluster – SP, Brazil**
Of the nine businesses that were analysed, four evidently did not adopt environmental management practices (BRA2, BRA5, BRA6 and BRA8). In this group, it was possible to identify a certain disbelief in the transition of the leather-footwear sector towards an environmentally proactive position. As was reported by one of these businessmen: “[...] I’m going to tell the truth [on the relationship between the business and the environment]: we are only going to do something different and better if someone makes us, if there is a law [...] that’s how it works [...]”

Only five businesses exhibited the adoption of some environmental management practice. In three of these (BRA1, BRA4, and BRA9), only the adoption of a practice to appropriately dispose of office waste is evident (paper, in the cases of BRA1 and BRA9) and can serve as scraps of the productive process, such as leather waste (which, in the case of BRA4, is given to artisans who use the leather scraps in the production of key chains and other items).

A larger amount of environmental management practices has been adopted by businesses BRA3 and BRA7. In an interview with the managers of these two companies, it was clear that the adoption of a broader range of environmental practices is an individual initiative of the businessmen, merging environmental awareness and the pursuit of future business opportunities with more environmentally conscious consumers. In both cases, there is a search for the correct destination for office waste, the identification of leather suppliers (tanneries) with a history of complying with the environmental legislation and the use of water-based glue in the production of the footwear.

The most innovative case of environmental management is, without a doubt, BRA3. The manager revealed a great interest in environmental improvements in both the process and product of his company. According to this manager, “[...] I was always interested in the environment and therefore I read, searching for new ideas on the internet and with suppliers.” The manager began a process of substituting shoe parts, such as the sole and the details, for recycled materials. In one of the lines of shoes and women’s boots, he began to use certified wood for the composition of the heel. However, the manager stated that “[...] I am only using water-based glue because the supplier came up here to present the product [...] it is even more expensive, but I believe that one day I’ll receive a return and that this is the correct thing to do.”

The entrance of cheaper products, mainly from China, has led to a pressure to reduce costs and achieve mass production, with implications for environmental management. As one of the
interviewees reported, “there is a rush just to fill requests and to not shut any doors [...] if I think about the environment then I won’t do anything else.”

When asked about the main barrier (difficulty) against the improvement of environmental management practices, the managers were unanimous in pointing to the lack of information and knowledge on the topic. Only with BRA3 and BRA9 did the lack of knowledge prove to be less relevant, though even in those cases it is the most significantly noted barrier, mainly because the managers of these businesses would like to know more about how to reduce costs through environmental management.

The lack of knowledge of the topic becomes evident in some of the comments made by the interviewees: “environmental management?” As a broader consequence of the lack of knowledge on environmental management, the managers also reported ignorance on the relationship between climate change and the leather-footwear sector and on how the leather-footwear chain could reduce its global warming potential. All of the interviewees believe that the main reason for which cluster companies exhibit improvements in environmental management is due to the existence of more effective environmental legislation for the sector or market incentives.

The interviewees believe that belonging to a cluster, as is the case of the leather-footwear cluster in Franca, does not positively influence the environmental management of the firms. Various interviewees recognise that the support institutions for the cluster should lead this process and provide information and examples on how to integrate environmental management with business opportunities. In this sense, one of the interviewees argued, “[...] what is most lacking is information on environmental management [...] if awareness doesn’t come from top down then we won’t change.”

Thus, there is evidence that the cluster and its participants share a culture of environmental management based on compliance with the legislation, with few cases (BRA3 and BRA7) of businesses presenting the adoption of more advanced environmental management practices. It was found that the main barrier to environmental management in the cluster is the lack of information and knowledge on the topic, which impedes the search for environmental improvements by the firms and the consideration of recent environmental topics such as climate change. It is believed that, in the case of Franca, the environmental governance of the cluster is based on a more effective environmental legislation.
4.3.2 Cluster of traditional products of Kanazawa, Ishikawa, Japan (JAP)

To complement this trend, three case studies were performed with businesses in the cluster, in addition to an interview with a renowned artisan of the city (Table 4). The three businesses that were analysed (JAP1, JAP2, and JAP3) exhibit the adoption of environmental management practices. These practices are related to the search for a sustainable use of biodiversity resources and traditional basic materials, such as natural dyes, as opposed to solvent-based dyes. While conducting the case studies, a perception became evident that traditional production is environmentally sound. One of the interviewees reported, “[...] here everything is made on a small scale [...] we are careful not to waste resources [...] here a chemical product is used only to clean the bushes used in the production of parts.”

Thus, the existing environmental management practices deal with the most efficient use of resources and the appropriate destination for wastes. The interviewees demonstrated a deep understanding of the relationship between the productive activity in which they are active and the environment. This knowledge is evident in a statement made by one producer of gold-leaf, “the production has low environmental impact, yet the technique used to obtain the gold leaf generates a type of environmental impact that is little known [...] it is noise pollution [...] I identified this problem and I solved it.” The interviewee refers to the production process of gold leaf, in which the metal is constantly beaten until forming a leaf that is thinner than a human hair.

The three businesses presented similar environmental management standards, with minimally observed impact and practices aimed at eco-efficiency and on the reduction, reuse and recycling of the materials. When asked about the main barriers to environmental management, the decline of traditional and environmentally sound knowledge was indicated unanimously. Competition with cheaper products and with alternative materials was noted as a main factor that causes the decline of traditional knowledge. One of the interviewees stated “[...] the consumer looks at my product, which is more expensive, and the other, made of plastic, which is much cheaper [...] they are products with the same function and the same appearance [...] so the consumer buys the alternative product [...] without knowing the environmental damage that this product causes.”
<table>
<thead>
<tr>
<th>Case</th>
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<th>Environmental Management Practices</th>
<th>Strategy for mitigating climate change</th>
<th>Main barrier to environmental management</th>
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<th>Was there environmental improvement for being part of the cluster?</th>
<th>Comments on the initiative supplied by the coordinating elements of the cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAP1</td>
<td>• Small enterprise&lt;br&gt;• Gold-leaf&lt;br&gt;• Interview with owner</td>
<td>• Separation of office waste for recycling (paper)&lt;br&gt;• Artisan production techniques&lt;br&gt;• Reduction of environmental pollution</td>
<td>• No evidence</td>
<td>• Decline of traditional knowledge</td>
<td>• Voluntary environmental soundness</td>
<td>• Yes, yet indirectly</td>
<td>• “There is a large effort to maintain the traditions of the city and a good relationship with the environment”</td>
</tr>
<tr>
<td>JAP2</td>
<td>• Small enterprise&lt;br&gt;• Kutani Porcelain&lt;br&gt;• Interview with owner</td>
<td>• Separation of office waste for recycling (paper)&lt;br&gt;• Artisan production techniques&lt;br&gt;• Re-use of waste products</td>
<td>• No evidence</td>
<td>• Decline of traditional knowledge</td>
<td>• Voluntary environmental soundness</td>
<td>• Yes, yet indirectly</td>
<td>• “The current focus is on strengthening our sector [...] and this is positive for the environment [...] our production with respect to the environment”</td>
</tr>
<tr>
<td>JAP3</td>
<td>• Small enterprise&lt;br&gt;• Lacquerware&lt;br&gt;• Interview with the manager&lt;br&gt;• Interview with partner</td>
<td>• Separation of office waste for recycling (paper)&lt;br&gt;• Artisan production techniques&lt;br&gt;• Re-use of waste products</td>
<td>• No evidence</td>
<td>• Decline of traditional knowledge</td>
<td>• Voluntary environmental soundness</td>
<td>• Yes, yet indirectly</td>
<td>• “There is enough support in every sense [...], for example, the consumers of countries such as Germany value products that respect the environment [...] and we have the chance to export the products in fairs and other events”</td>
</tr>
</tbody>
</table>

Table 4 – Systematisation of the environmental management of selected businesses of the Kanazawa Cluster – Ishikawa, Japan
When asked whether belonging to a cluster led to improvements in their relationship with the environment, the interviewees indicated that their businesses are still active due to the help received from the support organisations, which strive to promote Japanese culture. As stated by one of the interviewees “[...] there is an effort to promote our products abroad and to form new generations of young people who work in the traditional sector, respecting the environment.”

Thus, there is evidence that the cluster promotes a proactive environmental stance, based on a traditional search for compatibility between productive and economic performance and the environment. It appears that the main barrier to environmental management in the cluster is the decline of traditional knowledge, which is somewhat unexpected. The standard of governance identified in the cluster is the voluntary adoption of social responsibility practices, as there is a perception that traditional products are voluntarily environmentally friendly.

4.4 Discussion

4.4.1 Barriers to environmental management

The main barriers to environmental management are different for each cluster. In the Brazilian case, the main barrier is the lack of knowledge and information – in some cases even elementary knowledge – on business environmental management, which is considered an internal barrier (Hillary, 2004).

In the Japanese case, a barrier was identified that had not been previously cited in the specialised literature (Hillary, 2004), namely the “decline of traditional and environmentally friendly knowledge”. It is believed that the identification of this barrier indicates the need for inclusion of sectors based on traditional culture in studies on environmental management, in addition to the need for contingency analysis of this topic.

In both cases, the focus of the productive chain as a whole proved to be necessary to understand the relationship between clusters of small businesses and the Environment. For example, in the Brazilian case, it was shown that the more advanced companies in relation to environmental management (mainly BRA 3) were strongly influenced by more environmentally sound suppliers of the raw materials. In the Japanese case, the chain of traditional products as a whole deserves attention, since disruptions in some tiers, such as the suppliers of traditional tools (e.g., brushes and spatulas) may weaken the entire cluster, promoting a decline in traditional and environmentally friendly practices. The importance is thus stressed of suppliers and of the supply chain for the process of improving environmental management (Unnikrishnan and Hedge, 2007).
4.4.2 The role of traditional knowledge in environmental governance

In general, it can be considered that the Japanese cluster has a proactive standard in relationship to environmental management, whereas the Brazilian cluster has a reactive standard. The proactive standard of environmental management in the Japanese cluster can be considered to be due to the type of environmental governance that has been adopted, based on the voluntary adoption of a more harmonious relationship with the environment. Traditional knowledge helps the greening of Japanese cluster because:

- There is a relationship between the traditional Japanese culture in city of Kanazawa and the respect to the Environment;
- The traditional products from the Japanese cluster are developed with rational use of resources, adequate use of resources from biodiversity and a lower use of chemical products than mass-production products;
- The traditional Japanese products are made to be used in the long-term, they are not disposable.

The reactive standard of the Brazilian cluster can be seen from an environmental governance standard based on the laws, which are not always applied or considered relevant. For example, various interviewed owner-managers (BRA2, BRA5, BRA6 and BRA8) did not adopt environmental management practices. Other example is the relative lower level of awareness on environmental issues showed both by support organizations and by entrepreneurs.

4.4.3 The role of chains end the set of environmental management practices in shaping environmental governance

Both clusters did not benefit from an environmental management standard guided by the engagement of environmentally sound international chains (Puppim-de-Oliveira, 2009), though more so for the Brazilian case. Although the consumers tend to be cited as drivers for environmental improvements in both products and processes in both cases, neither of the clusters is exploring this opportunity. For example, in the Brazilian cluster, an interviewee said: “a foreign customer asked me about the relationship between the shoes I sell and the environment […] I will start to think about this relationship”. It shows that the chains could be more and more relevant for the greening of the Brazilian clusters. But so far, both clusters did not use environmental marketing instruments, such as seals and labels, to gain competitive advantages guided by environmental management (Zorpas, 2010).

According the testimony of one leader in Franca’s footwear sector, the creation of a seal of origin will be important for footwear in the future, where this is “linked to commitments that
businesses will have to make in relation to the environment, to child labour and the
destination of industrial waste, which are problems in the footwear industry” (Sindifranca,
2010). In the clusters, a greater focus was found in the operational focus of environmental
management and a weaker focus on organisational and communication environmental
management practices (González-Benito and González-Benito, 2006). Thus, there are
opportunities for the clusters to become more environmentally friendly.

4.4.4 Competition as driver affecting environmental management upgrades
In addition, it was shown that even though they are located in different countries on different
continents, both clusters are affected by a similar problem: competition with cheaper products,
mainly those produced in China, that have the same functionality as traditional products. For
example, a piece made with plastic could cost only 10% of the cost of an original traditional
Japanese handcraft with the same appearance.

The entrance of these products in the market has led both clusters, but mainly the Brazilian
one, to search for production patterns associated with decreasing costs, in which the quality of
the environment and the social implications tend to be considered non-core variables. As a
Brazilian owner-manager related, “I have time only to think about how decrease my
production costs and how maintain my enterprise open”.

4.4.5 Lack of Climate Change concerns in the governance agenda
Common to both cases is the relative lack of actions regarding small business and climate
change (DiPeso, 2008), although this lack of information may be more significant in the
Brazilian case. This finding is alarming, though it simultaneously constitutes an opportunity,
as these clusters could become pioneers in the investigation of their impact regarding climate
change in terms of CO$_2$ emissions. This pioneering activity could lead to outstanding roles for
these two cases, sparking the debate on clusters and climate change. In both cases, and mainly
in the Brazilian case, there is an opportunity for the support organisations to definitively
include environmental topics in the governance standards of the clusters, assuming pioneering
effort in the debate on clusters and climate change. It is believed that the co-benefits of
various types, local-global and economic-environmental, could be earned with this position.

4.4.6 Mix of traditional and modern environmental knowledge
Generally, new green technologies are considered relevant for the improvements of
environmental quality. But the Japanese case study shows that the traditional knowledge and
production practices could offer a relative harmony between the activities of the cluster and
the Environment. On the other hand, modern knowledge and new green technologies are
considered relevant for the environmental upgrade of Brazilian clusters. These analyses call for a contextual and deeper understanding of each cluster as unique in its relationship with environmental issues.

5. Conclusions

In this research, a comparative study was proposed for Brazilian and Japanese cases for the analysis of how clusters of small businesses have incorporated the theme of environmental management and other more recent topics such as climate change and the governance standards, and how these elements are related to the barriers against environmental management. A case study was performed of the leather-footwear cluster in Franca (Brazil) and of the traditional Japanese product cluster in Kanazawa (Japan).

The main results indicate that the clusters possess both differences and similarities. In relation to the differences, it was found that the Japanese cluster has a more environmentally proactive position, with governance guided by voluntary environmentally sound practices and the search for harmony between economic activities and the environment. In the Brazilian cluster, a generally reactive standard of environmental management was identified, with environmental management guided by the response to (or the impediment of) the advancements in environmental legislation. Both clusters could benefit from an environmental governance standard guided by engagement with more environmentally conscious value chains.

The main barrier to environmental management in the Brazilian case is the lack of information on the environment. In the Japanese case, a new barrier to environmental management was identified: the decline of traditional knowledge, which constitutes a contribution to the state of the art of the topic.

In both cases, a strong emphasis on operational environmental management practices aimed at the production process was identified. It is believed that the clusters could obtain competitive advantages if they were to use other environmental management practices, such as environmental marketing and green seals. This type of initiative could provide competitive differences for the products of these clusters, avoiding one of the main challenges that exist: competition with low-cost products from other countries. These clusters could engage in a pioneering movement in the debate on the relationship between local production and climate change, as part of the search for co-benefits.
References


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ISSN 1564-8427
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