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The Impact of the Cleaner Production Technologies in the Mining Productive Chain: The Case of Padua-RJ

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Academic Work

Introduction

- The exploitation of stones in the region of Santo Antônio de Pádua, in the northeast region of the state of Rio de Janeiro in Brazil, is currently the most important economic activity in the region.
- This sector, according to data from DRM/RJ, comprises about 168 companies (103 quarries, 54 sawmills, 10 sand mines, 1 mineral water source).
- These companies are responsible for about 5 thousand direct and indirect jobs in the region, which is considered the poorest region in the state of Rio de Janeiro.
- The extraction of ornamental stones in Santo Antônio de Pádua is the most relevant in terms of job generation and income in the local sphere, being very closely resembled to the definition of a Local Productive Arrangement

Introduction

- In spite of the economic strength of the sector, the mining and cutting operations make use, until this day, of simple, and even rudimentary techniques, causing uncountable environmental and competitiveness problems.
- Aware that, even nowadays, the main problems faced by the sector have been related to the lack of a policy framework specific to the mining sector, the use of cleaner production concepts and methodologies could be a feasible alternative for the sector.
- However, we have been observing a concentrated effort on cleaner production technology development for the mining sector, while other aspects are still missing such as cultural and mindset change and entrepreneurs and workers training.

Introduction

- From 1990 to the present day, there have been many coordinated and uncoordinated interventions from the institutions of the region and the state, in an attempt to develop technologies which could be implemented in the sector.
- Many of these technologies may be considered successful, because they were able to solve problems faced by the sector.
- However, the greatest challenge of the research, government and civil society institutions is to understand that only the development of cleaner production technologies is not enough to improve the sustainability performance of the mining productive chain.

Objectives

- Therefore, the main objective this research paper, given that many specific technologies have been developed and made available for the reduction of problems in the sector, is describe and assess the use and implementation of these technologies as an important contribution for cleaner production and more sustainable approaches and attest that these technologies can represent partial solution for the practice of cleaner production systems in its broader and modern conceptualization.
- With regards to the specific objectives, this research paper intends to:
  - describe the traditional processes of extraction and refining of ornamental stones in the region,
  - identify the main problems in all areas of the productive chain;
  - recognize and describe the main technological innovations and their impacts in the sector.

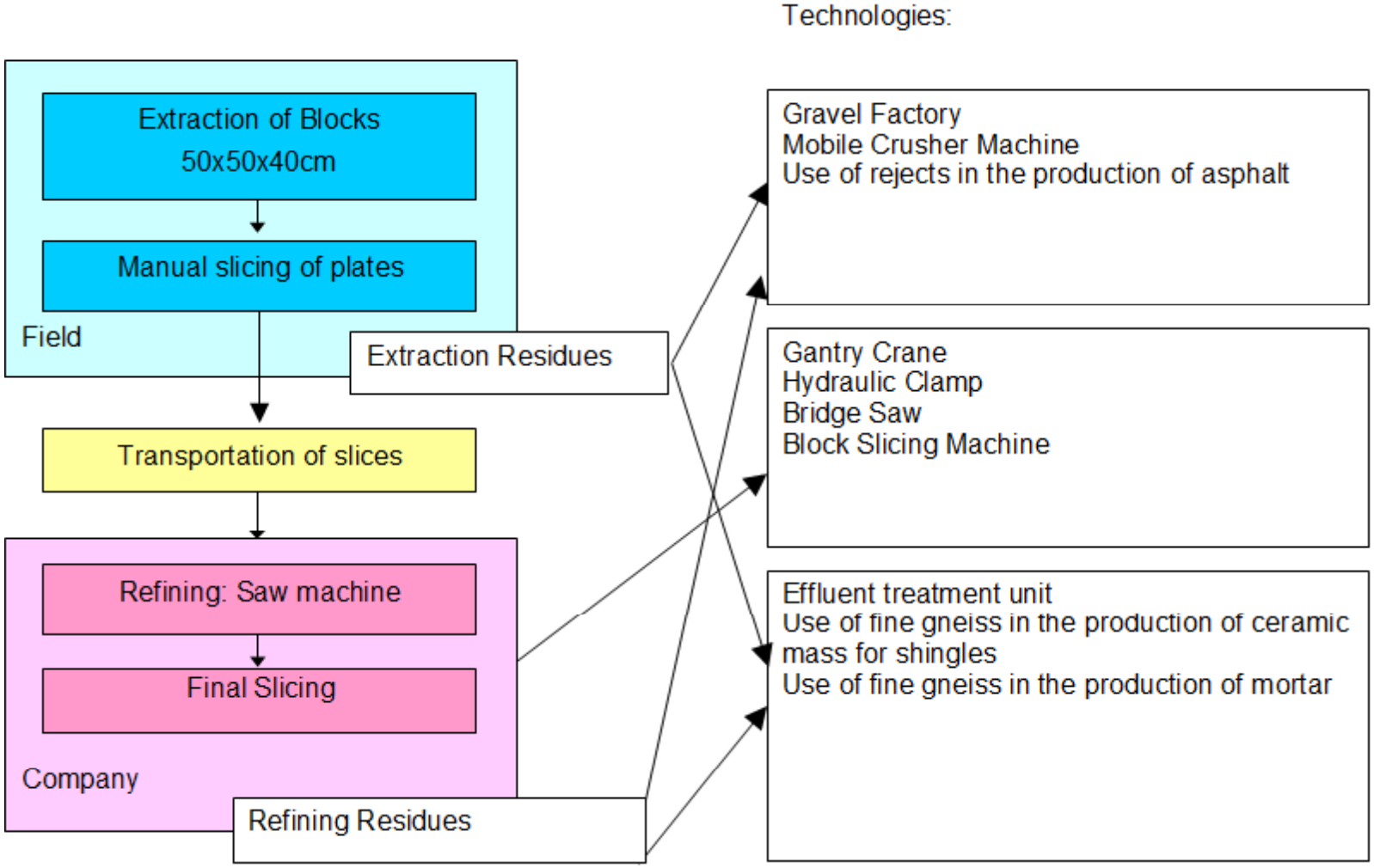
Methodology

- qualitative approach - subjective interpretations about the perspectives of individuals (entrepreneurs, policy makers and industry professionals);

- multiple sources of evidence:
  - bibliographical review,
  - semi-structured interviews with entrepreneurs and industry professionals
  - and the participation in various technical visits.
  - multiple case studies (20 small businesses, from a population of 54 legal sawmills)

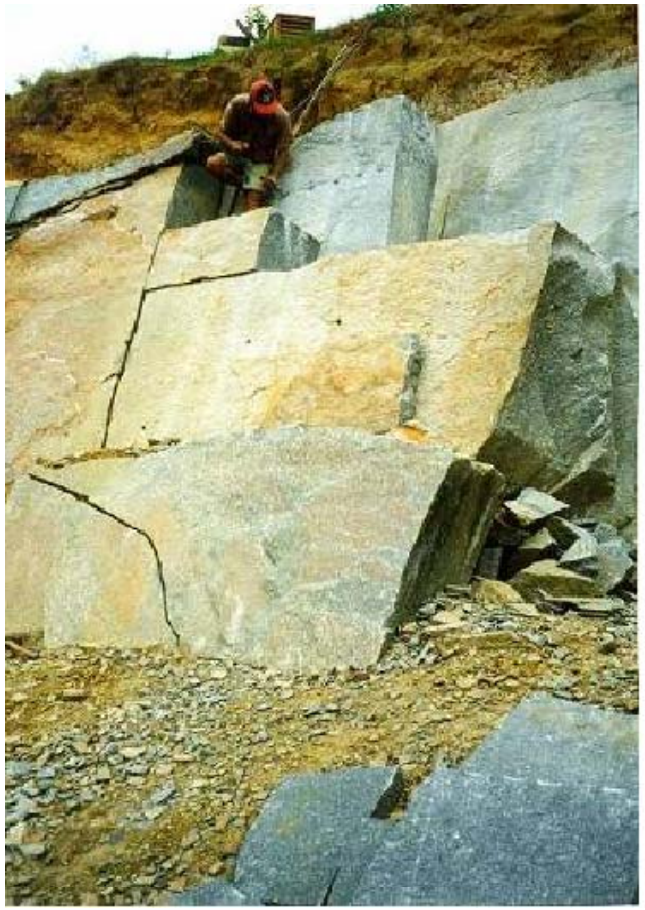
This multiplicity of sources of evidence turned out to be vital for the reliability of the results.

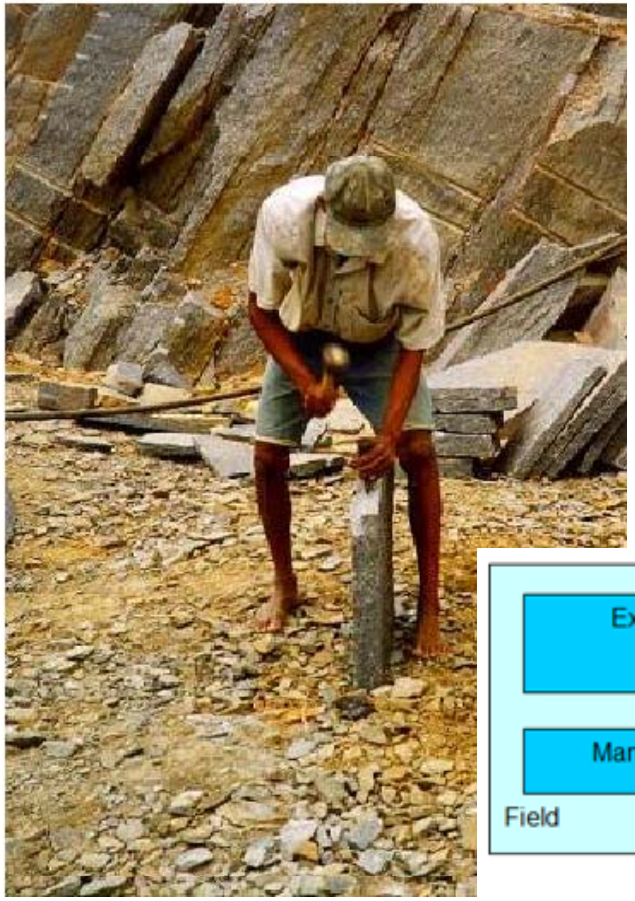
The Technological Innovations in the Sector and their Benefits for the Productive Activities and the Environment

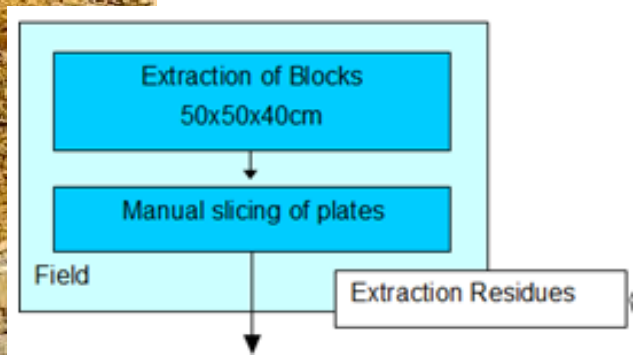


The Mining Productive Chain in Pádua and its Environmental Impacts

The traditional processes of extraction and refining







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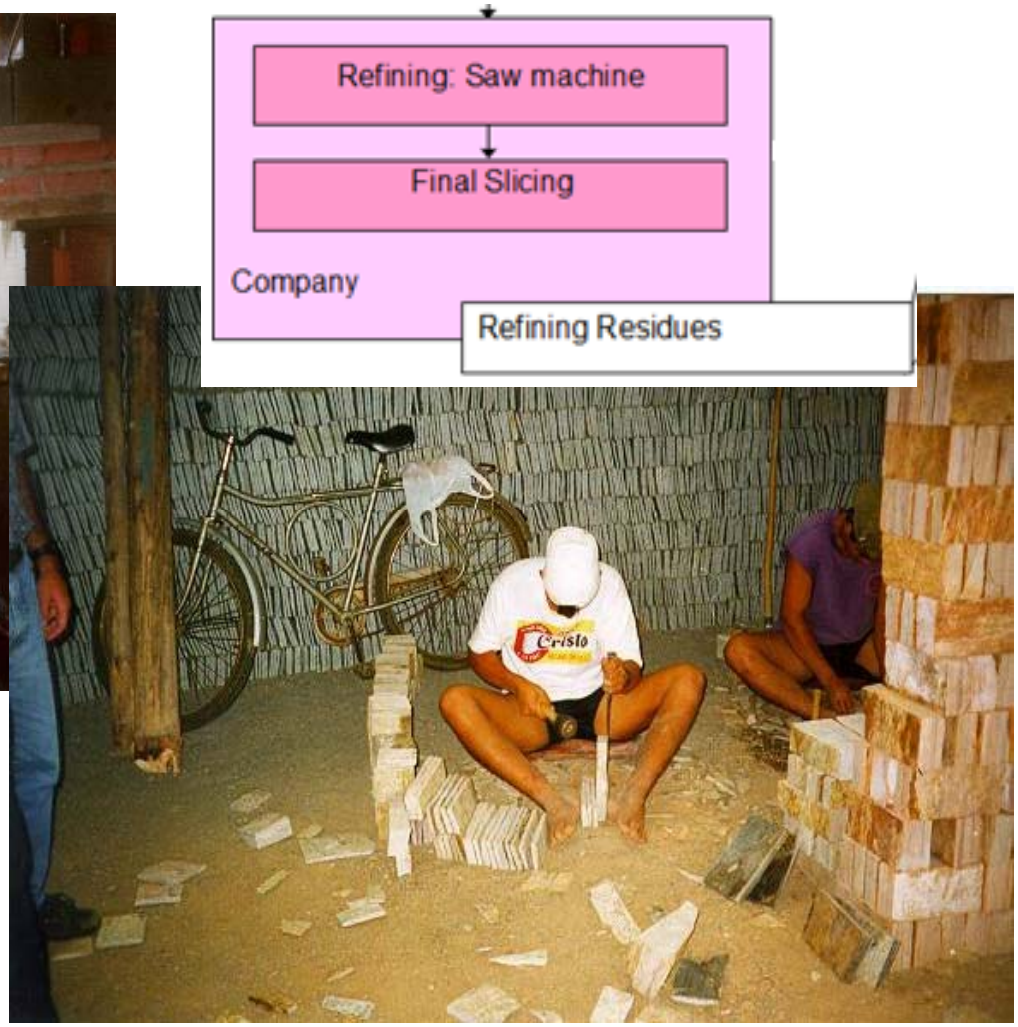

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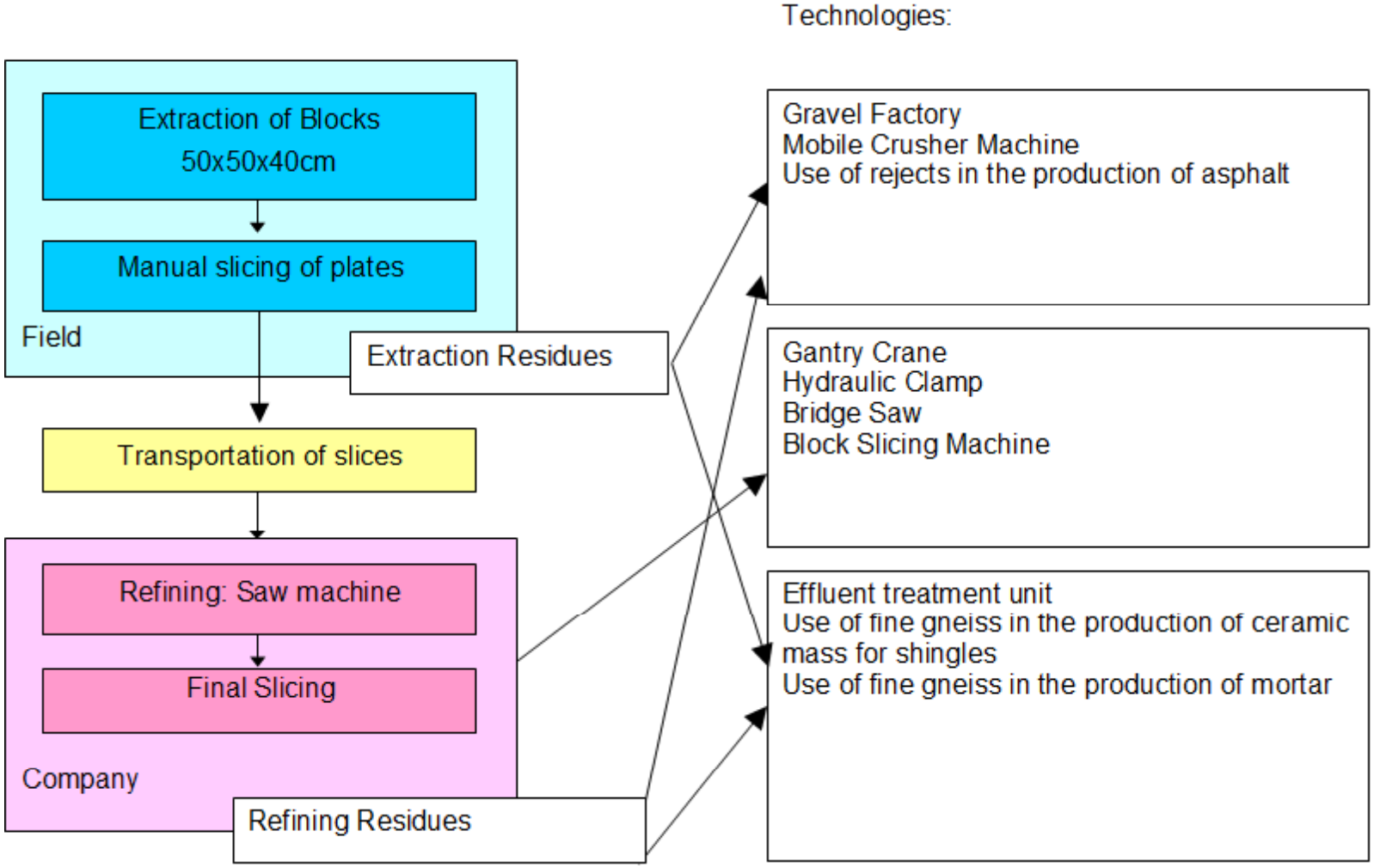

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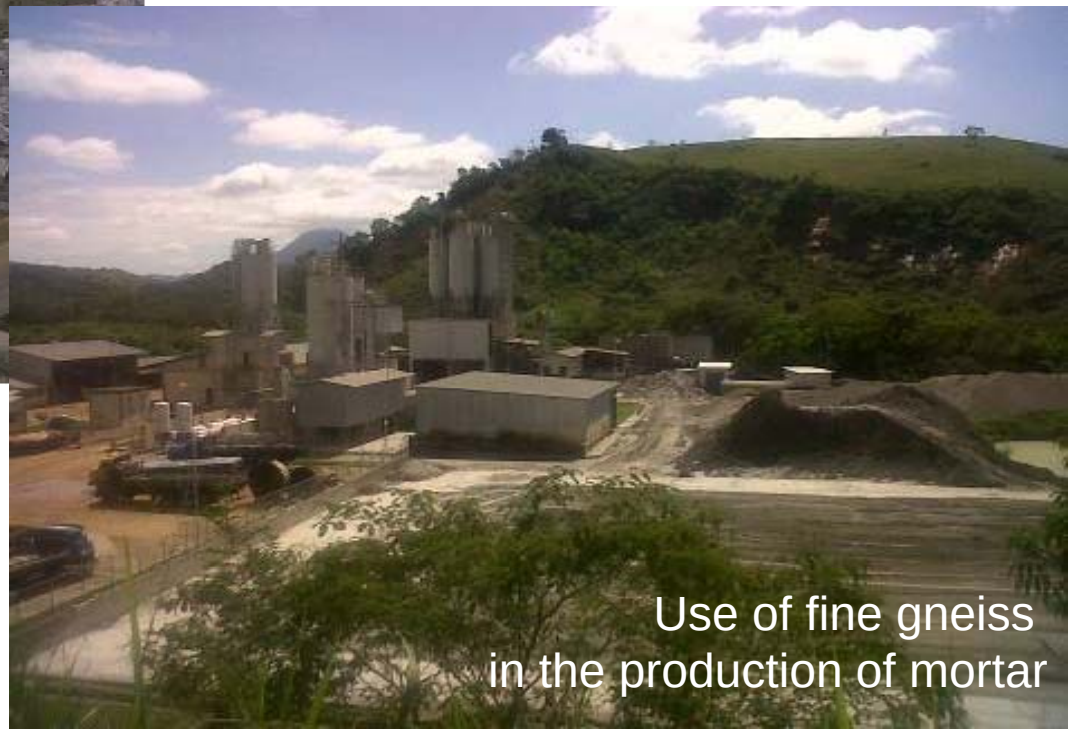
Effluent treatment unit



Use of fine gneiss
in the production of mortar

The Technological Innovations in the Sector and their Benefits for the Productive Activities and the Environment

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Gravel Factory


Mobile Crusher Machine

The Technological Innovations in the Sector and their Benefits for the Productive Activities and the Environment

Block Slicing Machine

Innovation and Technological Diffusion – Challenges for the Padua Mining Productive Chain

Based on the technical visits and the interviews with entrepreneurs of the sector and with professionals of the supporting institutions, it became evident that despite all of the efforts of the institutions to raise funds and to develop technologies to minimize the problems of the sector, these are not widely widespread. Factor such the lack of qualified workforce, lack of market information and the resistance to changes in the company, were the main obstacles to the technological diffusion in the sector. In some cases, the economic factor, 'too expensive', was a barrier to diffusion.

This paper argues that development and availability of cleaner production technologies is not enough to improve the sustainability performance of the mining productive chain. It is also important to make a deliberate effort to implement cultural and entrepreneurial mindset changes to incorporate sustainable practices into firms' operations, which can only be achieved with education and training as well as a set of policies to back up the initiative.

Cleaner Production in the mining industry

According to Hilson (2003), mining Cleaner Production practices can effectively be divided into three separate categories:

- the first group, "managerial changes", refers to environmental management-related initiatives that improve the overall efficiency of operations, and which require the participation of staff;
  - One important "managerial change" – and inevitably, a tool for achieving Cleaner Production – is the implementation of an environmental management system (EMS), which is the component of the overall management system that includes organizational procedures, environmental responsibilities, and processes
  - Furthermore, regarding "managerial changes" we should also add education and training for employees and managers and organizational commitment to provide direction to employees operating on all levels.

Cleaner Production in the mining industry

- The second group of elements, ‘‘policy changes’’, emphasizes the environmental decision-making aspect of operations. Principal examples include corporate environmental policies, voluntary impact assessments, environmental audits, and reviews.
- The third, and final, group of elements, ‘‘physical changes’’, include technological modifications, implementation of state-of-the-art equipment, and process - related initiatives.

Cleaner Production in the mining industry

Based on the discussion above regarding the mining productive chain in Padua, we observed that:

- the efforts made by the institutions targeted basically “physical changes”, with the focus on the development of cleaner production technologies.
- However, significant difficulties were encountered to diffuse these technologies.
- This fact was observed while no initiative regarding “managerial changes” or “policy changes” was identified during the field studies.

We argue that the lack of knowledge of firms and institutions about the cleaner production concepts and methodologies hindered the synergies and the positive effects these technologies could have in the mining productive chain.

Conclusions

The concept and methodologies of Cleaner Production have evolved significantly in the last few decades, yet their application in the mining context still remain under the radar for firms and institutions in developing countries. It is not rare institutions, firms and government undertaking an articulated effort with the focus almost entirely on the technological aspects. In Padua, the same thing happened: localized efforts to solve punctual problems in the productive chain, yet no initiative regarding “managerial changes” or “policy changes” were identified. This was in part the result of the lack of knowledge from the actors involved about concepts and methodologies associated with Cleaner Production. We argue that the development of cleaner production technologies is important, but the missing aspects of the approach adopted brought significant drawbacks for the whole initiative. We suggest that a workshop with all actors involved could be a milestone to change the course of the mining productive chain in Padua toward cleaner production and sustainable practices.