Nº 28

AD-MINISTER

UNIVERSIDAD EAFIT · MEDELLÍN - COLOMBIA · ENERO - JUNIO DE 2016 · ISSN 1692-0279 · E-ISSN: 2256-4322

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JEL: I23, M14, Q54

DOI: 10.17230/ad-minister.28.10
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UNIVERSIDAD EAFIT®

AD-minister Nº. 28 enero-junio 2016 pp. 201 - 221 · ISSN 1692-0279 · eISSN 2256-4322

BUSINESS EDUCATION AND CREATION OF AWARENESS FOR DISASTER RISK MANAGEMENT IN CHILE

EDUCACIÓN EN NEGOCIOS Y GENERACIÓN DE CONSCIENCIA SOBRE LA GESTIÓN DEL RIESGO DE DESASTRES EN CHILE

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RECEIVED: 22/06/2016
MODIFIED: 28/06/2016
ACCEPTED: 29/06/2016

DOI: 10.17230/ad-minister.28.10
www.eafit.edu.co/ad-minister

ABSTRACT

This paper discusses the apparent disconnection between disaster risk management research and the lack of tools for business continuity after disastrous events in Chile. As disasters are a common occurrence in business development, local firms are becoming aware of the need for having tools for preparedness and mitigation of negative effects of disasters. Nevertheless, in Chile, this private awareness seems to be part of the business aptitude of large-sized firms rather SMEs. Some of the arguments presented here illustrate this gap between local firms and their need to integrate business continuity management into their business operations and their decision making to cope with disaster risks. In this vein, this document argues the need for innovative academic offerings in Chile and presents a proposal to advance in linking disaster risk management and business education at the University of Chile. This program is developed in the medium-term for each of its components, starting with undergraduate students and achieving major actions with public and private stakeholders in a progressive ladder of initiatives.

KEYWORDS

Business Education; Disaster Risk Management; Innovation and Business Continuity Planning.

RESUMEN

Este documento discute acerca de la aparente desconexión entre la agenda de investigación para la gestión de riesgos de desastres y la carencia de herramientas para la continuidad de negocios posterior a eventos de desastre en Chile. En tanto los desastres son una instancia común en el desarrollo de los negocios, las empresas locales son cada vez más conscientes de la necesidad de contar con herramientas para su preparación y para la mitigación de los efectos negativos de los desastres. Sin embargo, en Chile esta conciencia privada parece ser parte de la actitud de negocios de las empresas de mayor tamaño más que de las PYME. Algunos de los argumentos presentados evidencian este vacío entre las empresas locales y su necesidad de integrar la gestión para la continuidad de negocio en sus operaciones y toma de decisiones para sobreponerse a los riesgos de desastre. En este contexto, este documento argumenta sobre la necesidad de ofertas académicas innovadoras en Chile y presenta una propuesta para avanzar en la vinculación entre la gestión del riesgo de desastres y la educación en negocios en la Universidad de Chile. Este programa es desarrollado en el mediano plazo en cada uno de sus componentes, se inicia con los estudiantes de pregrado y desarrolla acciones de mayor envergadura con agentes públicos y privados en una secuencia progresiva de iniciativas.

PALABRAS CLAVE

Educación de Negocios; Gestión del Riesgo de Desastres; Innovación y Planeación de Continuidad de Negocio.

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INTRODUCTION

Latin America faces an increasing number of disasters related to anthropic, socio-natural and natural origins. In fact, since the 90's, these devastating events have been linked to a great amount of national loss, both human and economic. Some arguments that explain this situation are the process of continuing growth of cities in regions with a history of natural hazards, and the weakness of local planning tools to guide the appropriate location and organization of the economic activities, mainly in areas of exposure. A clear synthesis in terms of understanding the scope of this situation is stated by Wilches-Chaux (1992) and Chardon (2008) defining natural disasters as socially-constructed events rather than purely natural ones.

Economic activities are one of the dimensions strongly affected by the occurrence of an event of natural origin. However, the field is still open regarding the research of linkages between industrial location, private and public investments, and disaster risk in cities. That knowledge may be helpful in building resilient local businesses and regions (GAR, 2013). In recent years, authorities and investors have become more aware of the importance of taking into account extreme events as a real threat to business and the economy. This change in perspective consists of assuming that natural phenomena will cause structural and economic damage in both the short and long term.

In this context, considering the structure of Chilean economy and the performance of firms and entrepreneurs, one of the emerging questions is how to prevent, support and minimize the economic impact of natural and industrial disasters in affected regions, mainly in SMEs and the local labor market. Thus, risk management aims to organize and strengthen the joint work of different stakeholders located at regional level, such as social, political and business bodies. Then, the scope of work must be inter-agency and inter-sectoral, since collaborative and coordinated actions may help in developing effective risk management initiatives. In addition, as stated by Cardona (2008), a multi-tier governmental coordination is also important because the decentralization of initiatives benefit local government and communities in deploying context-specific actions oriented to manage risks, guarantee part of local investments and, ultimately, achieve effective results in the management of local risks.

The goal of this paper is to guide the higher education community toward improved understanding of disasters and the complex issues involved in disaster risk management. The Interdisciplinary Risk Disaster Reduction Program, the Vice-Presidency of Research and Development and the Department of Geography of the University support this initiative. The program is structured upon a seminar that will be grounded in a multidisciplinary perspective to be built in the medium term within the University. The key idea is to develop an innovative approach to mainstream disaster risk management content into undergraduate and graduate students, linked to risk management, geography and business, and other academic offerings within the University. As a result, we expect to generate a close relationship with public and

AD-minister Nº. 28 enero-junio 2016 pp. 201 - 221 · ISSN 1692-0279 · eISSN 2256-4322

private stakeholders located in affected or potentially affected areas in Chile in order to channel business continuity and risk prevention tools.

In the following, this paper argues about the need of linking business education and disaster risk reduction. Then it presents the methodology used to understand the importance of developing innovative curricula offerings that integrate disaster risk management and business continuity in Chile. The following sections develop a conceptual framework for understanding the role of disaster risk management in business education within the specific Chilean policy context. The next part tests the framework for the case studies. And the final section contains the conclusions and recommendations for an innovative academic offering in Disaster Risk Management and Business Education.

LINKING RISK REDUCTION AND BUSINESS EDUCATION

Natural hazards and risk management literature seem to concentrate a research agenda on understanding triggering factors of the geographical space that causes events with negative consequences for human beings. Several knowledge bodies from social sciences show important advances in their quest of to relate the scope and extent of risk management. One such field of potential enlargement is with regard to local businesses and disaster risks reduction. In this vein, a sustainable development perspective may help in clarifying what factors should be considered to strengthen the economic development of communities in balance with their environment. On the one hand, local economic development initiatives may be linked in order to define the extent of actions required to strengthen local firms, their productive and technological strategies, their ability to generate employment, and the infrastructure necessary to ensure that the local economy does not collapse against any natural and/or industrial event that can unexpectedly and negatively affect a region. Then again, from a more private perspective, activities could be tied to the development of more comprehensive management tools articulated with the usual dimensions of business risks assessment -such as financial, credits and operational. From this perspective, academia and policy makers can provide a set of tools that facilitate companies to contextualize and evaluate their investments plans, their plant and facility location alternatives, and the quantification of key resources that enable them to prevent negative effects on business productivity due to any disastrous event caused by natural or human action.

In Chile, there is evidence of a lack of risk management practices in economic activities. This weakness is both in the private and public sectors. The former, tend to locate and build productive infrastructure investments in areas that are prone to earthquake risks, landslides or tsunamis. The explanation for this situation is the structure of our endowment economy and the location of resources typically found in fault zones, in coastal areas, or high-altitude mountainous regions. On the other hand, the public sector has not taken an active role in designing preventive man-

agement tools regarding natural hazards. Usually, preventive actions are linked to signaling areas that have been previously affected by tsunamis. However, the population and the private sector do not have public tools to develop proper resilient skills against the outbreak of natural disasters.

In addition, the academic sector has mainly focused its research on the causes of disasters, but it is also necessary to advance initiatives for college students' education coupled with training strategies focused on entrepreneurs and workers, to develop management tools that combine and link the aspects of businesses and consequences derived from natural or industrial disasters. In this context, the main approach of this program presented by University of Chile is related to the theme of Business Continuity Planning: its importance and relevance and the need to include it into business management before and after shock events. In general terms, there are two key elements to take into account regarding the arguments of this proposal:

1. The difficulty of SMEs to incorporate tools for risk management and strengthen resilient business strategies within their geographical context. This situation contrasts with the position of medium and large businesses, that given their increasing returns to scale in their productive activities, may have enough surplus to incorporate risk, as a part of its board of business management indicators (KPI - Key Performance Indicators). This discussion is linked to the innovation theory and the actual capacity of SMEs to adopt new tools for managing and permanence of their business. Business innovation capability can constitute a significant factor in generating changes in the business strategies of local firms that are located in areas of risk. In this particular case, the example will focus on the Mining Industry in the Region of Tarapacá. Mining companies require security measures and international certifications of quality management and environmental standards to their suppliers. However, these investments are not translated into safer value chains and/or resilient activities to the effects of natural disasters. In fact, the 2014 earthquake exposed the disconnection between the different productive sectors established within the Region.
2. In a similar vein, it is interesting to discuss the need to institutionalize the management of natural risks from a long-term perspective, in contrast to the short-term view that dominates business management. Usually in Chile, when the population faces major natural events, that can mean the loss of human lives and infrastructure. Risk management mechanisms are activated from ONEMI[2]. However, a proactive society is aware of the ongoing risks they may be exposed to. This approach requires the development of preventive measures to reduce losses of any kind. In this context, the private sector can also generate their own tools to catalog the type and the level of exposure to risks while designing an appropriate strategy to guide investment and/or develop preventive infrastructure to avoid a total business disruption after a disaster

2 ONEMI: National Emergency Office of the Interior Ministry, for its acronym in Spanish

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occurs. Unfortunately, there are no recognized enterprises in Chile's SMEs that introduce this perspective, but rather many examples of investments located in risky areas. In this context, the second case study analyzes the situation of the Municipality of Caldera, in the Atacama region, which can potentially be affected by seismic risk and where firms are investing in risk-prone areas.

Finally, the proposal of disaster risk management in business education is a program that is developed in the medium-term for each of its components, starting with undergraduate students. The collaboration with the management school will be developed during the first year, since it is necessary to study the scope and coordination in academic curricula. Despite this fact, a first initiative will be the multidisciplinary course that will be recognized and credited by all the schools within the University. In the mid-to long-term, the plan is to develop a complete and multidisciplinary research agenda to take into account different dimensions of natural disasters. The first steps are outlined in the section related to the implementation of this initiative which is oriented to contribute to the understanding of how to build more resilient communities in those areas affected by natural and industrial shocks, and disturbances in several regions of Chile.

METHODOLOGY

Defining an academic offer oriented to Business Continuity and Disaster Risk Management

Research initiatives to achieve a better understanding of natural hazards and factors that trigger disasters in Chile are well established within different academic departments within the University of Chile. However, the social dimension of disasters is mostly related to housing and psychological effects, with few initiatives focused on economic aspects of natural or even industrial disasters. It seems to be an institutional matter rather an academic oversight. In fact, most of the public programs of reconstruction after recent seismic events in Chile, like the 27F earthquake (2010), Tarapacá Earthquake (2014), Valparaíso's fire (2014), Atacama´s landslides (2015), and Coquimbo's tsunami (2015), have had a strong focus on housing, infrastructure, fresh water accessibility, and infrastructure. The economic aspect of those public programs emphasizes investment in the rehabilitation of local firms, and re- capitalization and investment grants for new ventures at local level.

Several actions were conducted as a way of understanding this apparent gap and disconnection between the growing knowledge of natural disasters and the academic reflection that leads to the design of preventive economic public policies and/or business continuity.

The first action was the revision of the economic dimension in the reconstruction plans in affected regions. The issue was to answer if those events reshaped the location of economic activities or whether they gave way to the design of new public policies supported by negative experiences of local firms, so as to prevent future economic losses in similar situations.

Secondly, the development of case studies with the previous information focusing on specific topics considering, as a background, the link between disasters and the development of economic activity in the affected areas. Those cases are set out below:

- **Tarapacá Region:** In April 2014, the region was affected by several earthquakes in conjunction with large-scale shock waves that hit the coast. In economic terms, the destruction of physical assets and lost markets -at least temporarily- mainly affected fishing, trade and agriculture activities, with consequences in employment, particularly low income families who suffered the most severe damage to their homes (Ministerio del Interior, 2014). In this context, mining is one of the key activities in the region, but it seems not to translate into actions or experiences from natural disasters to an upgrade along the value chain. Given this, it is interesting to review the demands of the mining industry to local suppliers of goods and services that result in the incorporation of innovations to improve the economic performance of the sector and discover which, if any, are related to prevention and/or mitigation of risk reduction.
- **Atacama Region:** In March 2015, the region faced an unexpected hydrometeorological event: the intensity of the rainfall caused floods and the overflow of Copiapo and El Salado rivers. Flooding in surrounding areas of lower slopes gave rise to an unprecedented disaster that killed 31 people, left 16 missing and more than 35,000 homeless, over 2.000 homes destroyed, as well as the destruction of public and private infrastructure (Ministerio del Interior, 2015). In this regional context, the review of Caldera, a coastal county within the region, is interesting since it may shed light on the diffusion of experiences related to the socioeconomic consequences of a natural disaster from an affected city to another potentially affected by an earthquake. Therefore, this case analyzes the role of investment in the social construction of risk, related to the four main industries developed in the area -aquaculture, fishery, mining and sanitary- according to the exposure to natural hazards and the vulnerability levels of each company associated with risk management. Underlying factors and their local and regional consequences are also determined.

After the revision of case studies and findings, semi-structured interviews were conducted with the Head of the Department of Business Management at the Universidad de Chile, the Head of the Strategic Programs at the National Agency for the Economic Development (CORFO)[3], and the Manager of Programs at the Technical Cooperation Service (SERCOTEC)[4]. Those interviews were aimed at determining the scope of academic offerings related to risk management and business continuity planning at the

3 The National Agency for the Economic Development (CORFO) is a public body oriented to supporting and promoting the economic performance of SMEs. Its mission is to improve the competitiveness and the productive diversification of the country by encouraging investment, innovation and entrepreneurship, strengthening in addition the human capital and technological capabilities to achieve a sustainable and territorially balanced development.

4 The Technical Cooperation Service (SERCOTEC) is a public service aimed at supporting Micro and Small Enterprises and Entrepreneurs of Chile. One of its key goals is to develop and be a source of growth for Chile and Chileans.

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graduate level. In addition, interviews were oriented to detect if the public sector, that is specialized in promoting economic activities and entrepreneurship, take into account natural disasters as a way to strengthen public tools and measures to assure the economic continuity of firms, and maintaining employment in affected areas.

With this background, a strategy was designed to introduce the importance of linking risk management initiatives and economic stability within the academic offerings at the University. The scope of work is of a progressive nature in the medium term and with actions suited for undergraduate and graduate levels supported by a research agenda that aims to be a permanent academic initiative.

LITERATURE REVIEW

Interestingly, the increasing volume of research on global warming, natural disasters and related issues has not been taken into account by the private sector and public services to the same extent and in terms of the design of context-specific tools to prevent, mitigate and/or rehabilitate economic activities in a resilient manner against disastrous events, both natural or industrial. In fact, several studies highlight aspects of private investments and its risks minimization, such as regulatory and institutional frameworks, business climate and financial facilities, among others (Coller Capital, 2013; The Economist, 2014). Similarly, some research emphasize the role of the insurance sector to avoid economic losses due to the negative effects of natural and industrial disasters (Joein & Luo, 2015; Carvallo, 2012; Pissera, 1997). While others focus on the sustainable development in Latin America regarding investment stability (PwC, 2014) and the impact that natural disasters have on firms, mainly on SMEs (Keipi et al, 2005; UNDP-GAR, 2013; Sarmiento et al, 2013; GAR, 2013). One of the key lessons derived from this work is to determine to what extend the private sector is prepared to keep economic activities in risky areas and display resilience assets, in order to maintain employment rates and recover production rates as quickly as possible after a disaster occur. This argument is even more relevant when executives from companies recognize that global warming and seismic events generate negative effects on firms' performance, as these risks are not part the overall business analysis.

In its economic strategy, Chile has promoted the formula where the private sector is the key agent to conduct the development of productive activities, while the public sector preserves that economy and operates under conditions of free competition. This strategy has meant that the role of government has focused mainly on promoting economic activities and innovation, so environmental issues and risk management -as opposed financial, credit and financial issues- are seen as delayed. One of the implications of that situation is a private sector that culturally has few skills and assets in overcoming their vulnerability in regions affected by earthquake, tsunamis, landslides and bush-fires, among others hazards.

Thus, improper handling of disasters has created a vicious cycle, because after a disaster has occurred, the reconstruction process does not take into account those factors that cause it in the first place. Furthermore, housing and facilities are main-

tained in a condition of vulnerable physical infrastructure. This creates the conditions for another disaster with perhaps even worse consequences (GTZ, 2006). In fact, according to the final report of the reconstruction process in Chile after the 27F earthquake (Ministerio del Interior, 2014), only a few settlements were relocated to safer places, but economic measures related to rebuild the previous economic infrastructure missed the opportunity to visualize new entrepreneurships or productive activities, with innovative processes and technics, so to embed a resilient local economy.

Impacts of disasters on development are significant because they result in high costs of rehabilitation and reconstruction, in lieu of effects in economic terms like lower production and retraction of activities, reduction of exports, increased imports, unemployment and migration. In this context, endowment economies, like Chile, show a propensity for investment projects located close to their sources of raw materials. For instance, an investment in fishing builds their processing facilities next to the coast, the same as ports and shipyards for the manufacture and maintenance of vessels. Similarly, mining operations locate their facility close to the pit or ore production, to reduce the cost of transport of materials, raw minerals and employees.

In this context, consideration should be given to both the assessment of and investment in location alternatives and business continuity planning for firms, from the perspective of innovation linked to the local development of economic activities. This is because risk management is a new tool for firms that imply new processes and new behaviors to cope with, in the event where future occurrence is unknown. However, despite the importance to link risk management and firms' innovation, this is not an easy task, since SMEs show evidence of weakness to adopt to and rapidly set up new means to operate.

Scholars studying the competency of firms to innovate, draw attention to weak absorptive capacity that characterize SMEs and their scale of production, business models and actual level of acquired knowledge. Those features are arguments that reveal SMEs limitations for effective integration in the value chain (Acs & Audretsch, 1988; Cohen &Levinthal, 1990; Malerba & Orsenigo, 1997; Shefer & Frenkel, 2005). Furthermore, it is necessary to understand how local conditions impact in the economic performance of firms, since they develop their activities in specific regions, with specific social and geographic settings. Thus, these firms' core market base have definite institutional situations, factor endowments and environmental challenges that can influence their economic linkages, investment in innovation and knowledge creation (Storper & Venables, 2004; Boschma, 2005; Huber, 2012; Zuñiga & Crespi, 2013). For instance, in the case of large firms, damages caused by an event can be absorbed by the firm, since they have been covering them with insurance or resources for emergencies or have developed storage facilities located elsewhere allowing them to keep their production. By contrast, for small and medium enterprises, it is less likely to have invested in protection plans and risk reduction.

Countries like U.S, Japan, Australia, have developed tools to support private sector preparedness and reaction after a seismic event (FEMA, 2011; Texas Department of

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Information Resources, 2004; Ono, 2015; Queensland Government, 2011). What these experiences all have in common is the implementation of action programs aimed at making business resilient to events –natural or anthropic- stressing economic activity at the local level. These experiences are the basis that motivates the proposal of this document that seeks to incorporate a simple methodology to train students and SMEs in identifying potential hazards, their scope and impact within the firm, the design of a disaster plan, and the preparation of the necessary elements before the outbreak of risks and the identification of adverse events following actions.

POLICY OPTION OR POLICY CONTEXT

Due to economic and human losses suffered by the various regions in recent decades, institutions such as the Inter-American Development Bank (IDB), the Organization for Economic Co-operation and Development (OECD) and the United Nations Office for Disaster Risk Reduction (UNISDR) have conducted studies and developed strategies and methodologies for the awareness and sensitization of public and private investment agents.

These institutions recognize, as a common factor, that through the process of project planning no exposure to hazards is ever properly analyzed. It is therefore necessary to establish measures to provide for greater strength and resilience and that this investment is taken into account (Keipi et al, 2005; PwC, 2014). However, companies have made progress in terms of financial, legal and market backups (Deloitte, 2012; GAR, 2013). As a result, firms do not properly internalize their propensity to suffer from disaster risk and therefore must take measures to develop internal policies which are designed considering these issues.

The ISO 31.000:2009 is an international standard for risk management that can be adopted by both the private and the public sectors. However, it is not certifiable in Chile, since is not part of the verifiable standards by the National Institute of Standardization. Although it provides the basis for proper management (context, identification, analysis, evaluation and treatment of risk), it is not specific on the issue of disasters associated to natural events.

From a public perspective, at the regional and community level, the Constitutional Organic Law on Government and Regional Administration, according to Law No. 19,175, expressly assigns functions to the Intendant and Governors, to take all necessary measures to prevent and deal with emergencies or disasters, without prejudice to the relevant national authorities. The Organic Constitutional Law on Municipalities, Law No. 18,695, provides that Municipalities have the power to directly develop, or in collaboration with other organs of the state administration, carry out functions related to risk prevention and assistance provision in emergency situations.

At the municipal level, the design of planning instruments such as Intercommunal and communal regulator plans have the power to define restrictions to urban development areas that constitute a potential danger for human settlements. These are defined as “non-building zones” allowing only transitional activities, and pro-

tection to zones at risk of exposure to dangerous infrastructure. These "risk areas", meanwhile, are seen as areas of exposure to natural and anthropogenic hazards, and activities that pose a risk to the community.

Regarding those requirements related to industry risks, the Environmental Assessment System determines those who are required to submit an Environmental Impact Assessment, as well as indicating what should be included in the base line of physical hazards presents in the sector where they are located or want to locate. Any project that is submitted to the Environmental Assessment Service must have a Contingency Plan for Prevention and Emergency associated with any risk.

The Law No 16.744 requires companies to implement strategies for the safety of workers in relation to risk of accidents at work and occupational diseases; however, this law exempts certain accidents due to "force majeure strange" not having any relation to the work.

In Chilean legislation, there are many public agencies charged with aspects related to emergency management. There are none, however, specifically related to firms' resilience and/or risk preparedness. There is no doubt that this matter may be an area of future discussion, to the extent that companies are made aware of their priorities as related to the development of their economic activities. Some policy implications related to the review development for this paper take into account:

1. The need to institutionalize enterprise level risk management. This means that it is necessary to consider a broader notion of risk management that goes beyond the sway of economic cycles, commodity prices, or production goals. Nevertheless, there is a need to introduce comprehensive tools that facilitate the economic recovery of production units located in territories affected by disaster.
2. The need to differentiate policy instruments aimed at boosting productive development, in order to encourage the deployment of risk management tools, mainly in SMEs (SMEs).

It is key to become more sensitive to the need of advancing a research agenda and professional training in business continuity related to a whole set of tools for risk management –such as financial, credits, operational, natural and industrial hazards. Nowadays, the main focus of business schools is on economic areas of profit maximization, finance, and management to achieve productivity goals. However, a partial understanding of the sustainability of economic activity is related to a lack of consideration of the geographical environment, which could lead to negative effects on local employment and long-term investments.

CASE STUDIES AND FINDINGS

Case studies presented in this section show how the private sector has not yet become fully aware of the dimension of natural hazards in places where production

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processes are located. In this regard, the case of the mining sector in Tarapacá region shows how large mining companies require that their service supplier achieve international certifications in management models. While the case of Caldera in the Atacama region shows how investments in certain productive sectors are materialized despite the level of exposure to natural hazards.

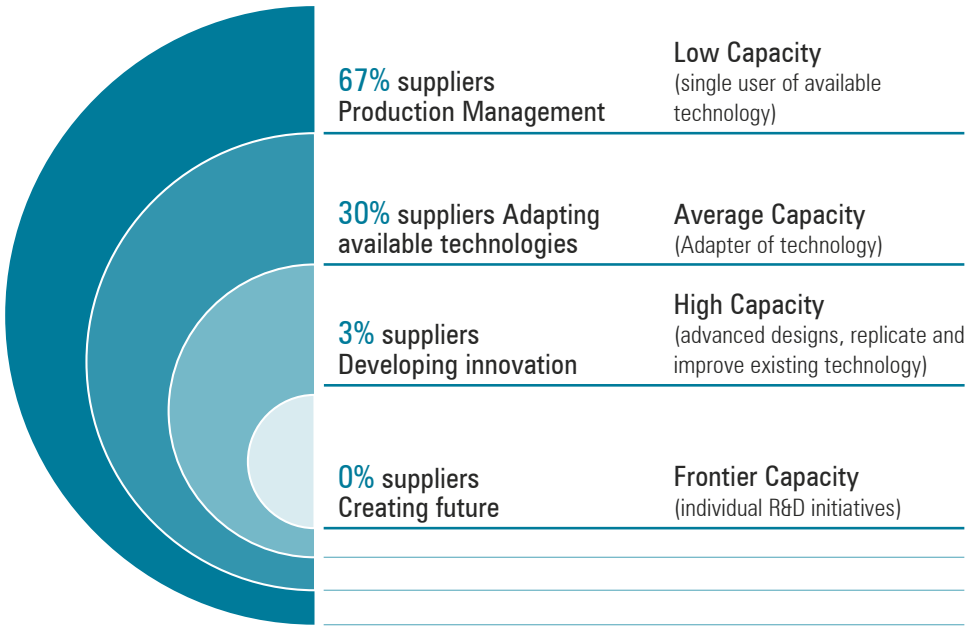
Tarapacá Region: Mining suppliers of services.

The mining industry is one of the major sectors in Chile, and accounts for an important economic source of production both locally and globally. Indeed, Chile represents one third of the global production of copper. The mining industry accounts for 12% of the national GDP, nearly 60% of the total exports of Chile are explained by mining, and about 50% of the mining suppliers sold more than US$ 1 million, in 2012 (Salas, 2014; FCh, 2014). Nevertheless, this general picture of the sector does not represent the internal composition of the suppliers of services, as key agents of the mining industry's growth. The number of mining suppliers has been increasing from 3.443 firms in 2007 up to 5.998 firms in 2012.

Accordingly, the internal composition shows that medium-sized and large firms are increasingly relevant, with a participation of 27% and 34% of mining suppliers, in 2010 and 2012, respectively. On the other hand, micro-enterprises and small-sized firms group around 65% of mining suppliers. Geographical distribution shows that 23% of firms are located in the mining regions -known as Tarapacá, Antofagasta and Atacama. Antofagasta, comprises 12% of total mining suppliers. (FCh, 2012; 2014). In this context, the effective productive integration within the mining sector requires a greater participation in the areas of technology and knowledge management to strengthen its competitive advantages. However, local suppliers are not able to meet these challenges, especially in light of their limited learning and innovation capabilities (Urzua, 2007; Urzúa, 2013a). Indeed, 97% of mining suppliers can be classified as average or low capacity in the use of technology.

Thus, as depicted in figure N°1, most local suppliers operate in a context of production management and adaptation of available technologies. While only 3% of firms show advanced conditions that facilitate the development of innovation processing and/or the advanced design to improve existing technology. Nevertheless, there are no local suppliers whose activity is focused on expanding the knowledge frontier in mining, as seen in the figure below. In sum, the vast majority of Chilean mining suppliers tend to be less capable of developing new knowledge or innovations in their overall sector that will have positive effects on the mining industry and its value chain.

Figure 1. Innovative capabilities of mining suppliers in Chile.



Source: Adapted from Urzúa (2007)

In particular, mining companies of the Tarapacá Region have been implementing suppliers' development programs since 2012, in order to upgrade their collective service firms' innovation capabilities. There are two industrial experiences related this task. One of them is the training program "Más Proveedores Tarapacá" (More Suppliers Tarapacá) conducted by the Industrial Association of Iquique. The other experience is developed by BHP-Billiton in Chile, and their scope is to upgrade technological competencies and innovation capabilities of local firms throughout its "World Class Supplier" program.

In Chile, BHP-Billiton defined two key challenges: (1) to develop 250 Chilean-based resource-industry suppliers into 'world-class' global resource-industry suppliers by 2020, and (2) to foster the technical and managerial upgrading of the company's suppliers, by developing innovative solutions to address challenges identified as critical by BHP, for its operations in Chile (Bravo-Ortega & Muñoz, 2015). The program engages local suppliers to develop innovative solutions to manage at least one aspect of mining identified as critical, such as water, energy, human capital, maintenance, dust control, acid mist control or leaching. The program of world class suppliers is structured through a systematic process that takes into account challenges associated with identification, selection process, portfolio management, and the commercial escalation of mining solutions developed by suppliers (Urzúa, 2013b).

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Those suppliers' development programs are similar in their scope and the requirements to those of local firms, like quality certifications –ISO 9.000 and 14.000-; Health; Safety; Environment and Community certification (HSEC). The key requirement from mining companies is to get credited suppliers of services in their availability of an integrated management model that establishes the necessary balance between production processes, health and safety of both workers and the community, and the constant interaction with the environment. However, local suppliers of services perceive it to be of extreme difficulty to raise the level of transactions with mining companies despite the various actions that have been made and the different programs that have taken place. This has increased their frustration, and has fostered a negative attitude among mining companies.

In 2015, several earthquakes in conjunction with large-scale waves hit the coast of the Tarapacá Region. There is no exhaustive cadaster of firms exposed to this natural disaster in different economic sectors within the region. Nevertheless, something interesting to highlight is that of the apparent disarticulation of economic sectors in the region and how this aspect determines the diffusion of innovation adopted by firms. Particularly, with the focus of improving their Key Performance Indicators (KPIs) and to reduce their operational risks, mining companies invest in initiatives where suppliers upgrade their competencies. Those training programs enable suppliers to achieve certifications of international standards, but this acquired knowledge does not flow to the whole range of local suppliers linked to construction, trade and transport, which are common services required by mining companies and who were also affected in its assets and economic solvency after the earthquake.

Atacama Region: Caldera city.

The case of the Caldera consolidated urban port area is known for the arrival of national and international investors during the 80s, and the local activities related to the exploitation of maritime resources. It has been established that 63% of investments are in exposed areas, mainly tsunami risk, due to the historical configuration of the city. As it relates to risk management, SMEs associated with the aquaculture and fishery industries are those with a higher level of vulnerability; medium-sized and large firms associated with mining and sanitary industries have generally a medium to low level of risk vulnerability. In addition, the fragility of investments varies according to each company's resources invested in the security of their business. There do not appear to be integrated strategies for reducing the risk that strengthen the value chain.

Highlighting this problem, the case focuses on assessing how risk is constructed in the urban area of Caldera, from the point of view of economic activities taking place and its role in the increasing or decreasing risk. As a regional context, the wealth of natural resources in the Atacama region has allowed the arrival of private investments in four major industries: aquaculture, fisheries, mining and sanitary industry. Those investments provide for a greater contribution to the local GDP, which

in turn, has influenced the growth of the city's exposure to risky sectors, where complementary facilities to these industries (fuel supply, ports, etc.) and minor manufacturing industries are located. The mining activities have spread so quickly in the last decade, that is has led to the arrival of workers to the commune area, and therefore, a greater demand for services such as those in equipment and construction (I.M. Caldera, 2010).

The coastal area of Atacama region has geomorphological, climatic and meteorological characteristics typical of a desert environment (Soto et al., 2012). This creates conditions for the presence of four major natural hazards as described in table number 1.

Table 1. Type of natural hazards in Caldera City

Type of Natural Hazard		Factors base	Triggering factors
Geophysical	Seismic	Active faults, Subduction of tectonic plates	Quakes
Hidrological	Flood overflow channels	Basin types, hierarchy and density of drains, soil permeability, channelization and flow	Rainfall
Oceanographic	Tsunami	Depth, shape and slope of the platform	Tsunamigenic quakes
Geomorphological	Landslides	Slope and slope orientation	Rainfall

Source: Orellana, 2015

Local production activities are linked to investment in the primary sector, such as extraction and cultivation of aquaculture resources. The rest of investment projects are related to the export of mining products and activities to process fisheries and aquaculture products. The majority of these projects are located in the urban area of Caldera, as shown in table number 2.

Table 2. Investment projects in urban area of Caldera

Type of industry	Number	Percentage
Aquaculture	27	47.37%
Mining	14	24.56%
Fishery	8	14.03%
Sanitary	3	5.26%
Others	5	8.77%
Total	**57**	**100%**

Source: Orellana, 2015

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Overall, 36 of the 57 investments that are in operation and run related to aquaculture, fisheries, mining and sanitary industry present in the urban area of Caldera are located in areas of exposure, as shown in table number 3.

Table 3. Exposition to natural hazards in Caldera City

Projects exposed		
Hazards	Number	Percentage
Tsunami	33	57,89%
Landslides and tsunami	1	1,75%
Flood overflow channels and tsunami	2	3,51%
Without exposition	21	36,84%
Total	**57**	**100%**

Source: Orellana, 2015

On one hand, more than a half of investment projects are only located in areas prone to the risk of tsunami, 1.75% are in areas prone to the threat of landslides and tsunami and 3.51% in areas with potential flood threat by overflow channels and tsunami. On the other hand, as shown in table number 3, taking into account investment projects located in areas of exposure, productive activities of the aquaculture industry are more common as potentially affected, with 63.88%, followed by mining reaching 16.66%. Fisheries and sanitary industries represent a small percentage.

Table 4. Investment projects in urban area of Caldera

Type of industry	Number	Percentage
Aquaculture	23	63.88%
Mining	6	16.66%
Fishery	4	11.11%
Sanitary	3	8.33%
Total	**36**	**100%**

Source: Orellana, 2015

Regarding the size of investing firms, 71.05% are micro and small-sized firms, as shown in table number 5. This is a key factor, as small and micro enterprises in this area generally do not have continuity plans or insurance covering damage due to disasters, or characterized as a seismic event, indicating a possible that they cannot return to work.

Table 5. Projects exposed to natural hazards by firm size

Firm size	Number	Percentage
Large	6	15.79%
Medium	5	13.16%
Small	12	34.21%
Micro	13	36.84%
Total	**36**	**100%**

Source: Orellana, 2015

Economic activities in the Caldera urban area show a high level of vulnerability and potential fragility of investments. In fact, almost one half of the investments show a high level of exposure to natural hazards, while only 7% of investments show low levels of exposure. In terms of business preparedness, 90% of them would not find themselves sufficiently prepared for an emergency and/or disaster (Orellana, 2015). The possibility of facing optimal and efficient post-disaster recovery is hampered because skills are not suitable, augmented by the lack of public sector preparation tools. In this sense, investors have not considered the exposure to threats as critical to the security of their business and productive units. This case has been endorsed by the various local governments that have driven the investment allocation without clear policies of land use aimed at strengthening greater resilience of investment in the firms and employees established there.

CONCLUSION

As previously discussed, the University of Chile is particularly interested and committed in addressing: Business Continuity Planning, especially after the evidence found in case studies in mining and Caldera city. Our intention is to mainstream Disaster Risk Management content into a seminar with a focus on training, research and SMEs engagement at different academic levels, within regular undergraduate and graduate programs.

This program is threefold, oriented to cover different aspects of local understanding of risks' events and their effects on local business performance. Thus, the seminar is divided into specific initiatives listed below, in order to distinguish the scope and extend of each:

1. **Undergraduate initiatives:** The scope of this initiative will be the local preparedness of small businesses exposure –their assets, employees and operations to natural and industrial hazards.
   - Within the course of Regional Analysis of the undergraduate curricula of Geography, a specific module will be considered and developed to achieve a better understanding of the systemic aspects of risks at regional level.

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- The design and implementation of a multidisciplinary course "Curso de Formación General (CFG)" imparted by the Interdisciplinary Risk Disaster Reduction Program, open for students of all undergraduate programs at the University, hosted at the Faculty of Architecture and Urbanism, in order to develop specific topics of research on the theme of Risk Management, including Business Continuity Planning, during a semester.

2. **Graduate initiatives**: The scope of this initiative will be based on topics proposed for the undergraduate level, but with an emphasis on the concept of business continuity planning, risk reduction actions and the design of risk management measures focused on SMEs preparation and for the mitigation of negative consequences of disruptive events. Initially, these topics will be considered within the structure of the Diploma in Management for Disaster Risk Reduction offered by the University.
3. **Public Sector Initiatives**: The scope of this initiative will be based on topics proposed for at the graduate level, engaging participants who are professionals of regional or local public organizations. Topics are linked to methodologies aimed at developing the economic analysis of risks and preventive mechanisms, within the training program of ONEMI.
4. **Research Agenda**: The scope of this initiative is to incorporate local business strategies in order to tackle natural and industrial risks and to evaluate how those actions are effective in terms of SMEs' resilience and continuity, according to their context.
   - To design and implement a Business Continuity Planning Observatory, that takes into account, on a regular basis, the development of a georeferenced local business cadaster of affected areas; the monitoring of risk management tools' implementation; the identification of best practices and lessons learned derived from unsuccessful experiences. Initially, Caldera and Iquique will be the two localities considered to pioneer this initiative, through case studies centered on:
     d. SMEs current business situation and the kind of management tools developed,
     e. the distinction of local hazards affecting local business,
     f. the existing institutional atmosphere to enhance risk management tools aimed at contributing to local business continuity, and
     g. the detection of best practices related to this content.

- To design and develop workshops and seminars to achieve private sector awareness as to the link between local risks and Business Continuity, and to develop training opportunities related to risk management tools, and to the importance in developing a shared value perspective along the value chain and the diffusion of best practices.
- To develop regular opportunities to transfer knowledge and tools aimed at SMEs' risks management and mitigation strategies, in tandem with local authorities, municipalities, and industry associations.

Ultimately, the deployment of each of these initiatives will contribute to the achievement of a more resilient local economic development strategy for localities affected by natural and industrial shocks and disturbances in several regions of Chile. In implementing this program, the University of Chile seeks to achieve a leading position in an unexplored field of work in Chile. Each initiative defined above will favor academic and social learning, providing for the interaction of varied stakeholders interested in implementing or designing context-specific disaster risks management tools.

In a proactive perspective, one of the major tasks for the University is finding the appropriate coordination environment where academic work is invigorated with the practical knowledge of practitioners who have the acquired background knowledge, skills and qualifications to execute the implementation of quality and risk management tools in the private sector. Thus, the integration and cross-fertilization of formal and practical (tacit) knowledge is vital to the achievement of strong results in both students' training and business continuity after disastrous events.

ACKNOWLEDGEMENTS

The author wishes to thank to the "Interdisciplinary Risk Disaster Reduction Program" hosted by the Vice-presidency of Investigation and Development (VID) of the University of Chile for providing support for this research, and the two anonymous referees for their helpful comments on earlier versions of this paper.

REFERENCES

Acs, Z. & Audretsch, D. (1988). Innovation in large and small firms: an empirical analysis. *The American Economic Review*, *78*(4), 678-690.

Boschma, R. (2005). Editorial: Role of Proximity in Interaction and Performance: Conceptual and Empirical Challenges. *Regional Studies*, *39*(1), 41-45.

Bravo-Ortega, C. & Muñoz, L. (2015). "Knowledge Intensive Mining Services in Chile". Working paper IDB- DP-418. Inter-American Development Bank. DOI: 10.18235/0000187.

Cardona, O.D. (2008). Medición de la gestión del riesgo en América Latina. *Revista Sostenibilidad, tecnología y humanismo,* (3), 1-20.

Carvallo, J. (2012) El sismo y la industria aseguradora: balance final, lecciones y tareas pendientes. En: Brain, I. y Mora, P. (2012) *Emergencia y reconstrucción. El antes y después del terremoto y tsunami del 27f en Chile*. Santiago: Fundación MAPFRE-Centro Políticas Públicas UC.

Chardon, A. (2008). Amenaza, vulnerabilidad y sociedades urbanas: una visión desde la dimensión institucional. *Revista Gestión y Ambiente, 11*(2), 123-135.

AD-minister Nº. 28 enero-junio 2016 pp. 201 - 221 · ISSN 1692-0279 · eISSN 2256-4322

Cohen, W.M. & Levinthal, D.A. (1990). Absorptive capacity: New perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128-152.

Coller Capital. (2013). Encuesta de Inversores en Private Equity en América Latina. LACA Retrieved from: http://www.collercapital.com/uploaded/documents/Publications/2013/Coller_Capital_-_LAVCA_LP_Survey_-_Spanish_-_FINAL.pdf

Deloitte. (2012). Disaster *Recovery: 10 Lessons from Hurricane Sandy*. Retrieved from http://deloitte.wsj.com/cio/2012/11/29/disaster-recovery-planning-10-lessons-learned-from- hurricane-sandy/

FEMA. (2011). Business Continuity and Disaster Preparedness Planning Patterns and Findings from Current Research. Issue 7: Winter 2011. U.S. Washington: Department of Homeland Security.

Fundación Chile. (2012). *Proveedores de la Minería Chilena. Estudio de Caracterización 2012*. Santiago: Fundación Chile.

Fundación Chile. (2014). *Proveedores de la Minería Chilena. Estudio de Caracterización 2014*. Santiago: Fundación Chile.

GAR. (2013). *Global Assessment Report on Disaster Risk Reduction*. Geneva: UNISDR.

GTZ. (2006). *Conceptos asociados a la gestión del riesgo de desastres en la planificación e inversión para el desarrollo, serie*. Lima: Sistema Nacional de inversión pública y la gestión del riesgo de desastres.

Huber, F. (2012). Do clusters really matter for innovation practices in Information Technology? Questioning the significance of technological knowledge spillovers. *Journal of Economic Geography*, *12*(1), 107-126. DOI: 10.1093/jeg/lbq058

I.M. Caldera (2010) Plan Regulador Comunal de Caldera, Memoria Explicativa. Ilustre Municipalidad de Caldera. Retrieved from: http://www.plataformacaldera.cl/biblioteca/589/w3-article-67490.html

Joein, J. and Luo, Y. (2015) Experiences of Private Sector Involvement in DRR in Europe: Focus on Insurance. In: Izumi, T. and Shaw, R. *Disaster Management and Private Sectors. Challenges and Potentials.* Heidelberg: Springer.

Keipi, K., Mora, S. y Bastidas, P. (2005). Gestión de riesgo de amenazas naturales en proyectos de desarrollo: Lista de preguntas de verificación ("checklist"). *Serie de informes de buenas prácticas del Departamento de Desarrollo Sostenible*. Washington: Banco Interamericano de Desarrollo (BID).

Law No 16.744 *Establece Normas sobre Accidentes del Trabajo y Enfermedades Profesionales*. Santiago: Gobierno de Chile.

Law No. 18.695 Ley Orgánica Constitucional de Municipalidades. Santiago: Gobierno de Chile.

Law No. 19.175 Ley Orgánica Constitucional sobre Gobierno y Administración Regional. Santiago: Gobierno de Chile.

Malerba, F. & Orsenigo, L. (1997) Technological Regimes and Sectoral Patterns of Innovative Activities. *Industrial and Corporate Change*, 6(1), 83-118. DOI: 10.1093/icc/6.1.83

Ministerio del Interior (2014a) *Plan de Reconstrucción de Tarapacá*. *Ministerio del Interior*. Santiago: Gobierno de Chile.

Ministerio del Interior (2014b) *Plan de Cierre Reconstrucción Terremoto y Tsunami 27F, 2010*. *Ministerio del Interior de Chile*. Santiago: Gobierno de Chile.

Ministerio del Interior (2015) *Plan de Reconstrucción Atacama*. *Ministerio del Interior*. Santiago: Gobierno de Chile.

Ono, T. (2015). Role of Private Sectors and BCP in Japan. In: Izumi, T. and Shaw, R. *Disaster Management and Private Sectors. Challenges and Potentials*. Heidelberg: Springer.

Orellana, P. (2015). *Actividades económicas y su rol en la construcción social del riesgo. Caso de la Comuna de Caldera, Región de Atacama. Memoria para optar al título de Geógrafa.* Santiago: Universidad de Chile.

Pissera, M. (1997). La cobertura de los peligros naturales. Papel del seguro y el reaseguro. Mapfre Análisis N°57:29-42.

PwC. (2014). Encuesta PwC sobre Desarrollo Sostenible en América Latina. Retrieved from: https://www.pwc.com/bo/es/publicaciones/assets/pwc-encuesta-desarrollo-sostenible.pdf

Queensland Government. (2011). *Rebuilding a stronger, more resilient Queensland*. Brisbane: Queensland Government.

Salas, A. (2014). Minería: proyecciones, competitividad y desafíos. Presentation to the National Society of Mining. Santiago. Retrieved from: http://www.cpc.cl/wp-content/uploads/2015/11/35_Presentacion_SONAMI_en_seminario_Escenario_Economico_y_Proyecciones_Sectoriales.pdf

Sarmiento, J., Hoberman, G., Ilcheva, M., Asgari, A., Majano, A. Poggione, A. &Duran, L. (2013) Private Sector and Disaster Risk Reduction: The Cases of Bogota, Miami, Kingston, San Jose, Santiago and Vancouver. Florida UNISDR-FIU-USAID.

Shefer, D. & Frenkel, A. (2005) R&D, firm size and innovation: an empirical analysis. *Technovation*, *25*(1), 25-32. DOI:10.1016/S0166-4972(03)00152-4

AD-minister Nº. 28 enero-junio 2016 pp. 201 - 221 · ISSN 1692-0279 · eISSN 2256-4322

Soto, M.V., Marker, M., Castro, C.P. & Rodolfi, G. (2012). Dinámica actual de micro cuencas del desierto costero de Atacama (Caldera, Chile) y su influencia en la generación de amenazas. *Geografía Fisica e Dinámica Quaternaria*, *35*(2012), 79-89.

Storper, M. & Venables, A. (2004). Buzz: face-to-face contact and the urban economy. *Journal of Economic Geography*, *4*(4), 351-370. DOI: 10.1093/jnlecg/lbh027

Texas Department of Information Resources. (2004). Business Continuity Planning Guidelines. Rev. December 2004: Austin.

The Economist. (2014). *Evaluando el entorno para las asociaciones público-privadas en América Latina y el Caribe. Infrascopio*. New York: The Economist Intelligence Unit.

UNDP-GAR. (2013). Small Businesses: Impact of Disasters and Building Resilience. Analysing the vulnerability of Micro, Small, and Medium Enterprises to natural hazards and their capacity to act as drivers of community recovery. Geneva: UNDP.

Urzúa, O. (2007). Elementos para estimar los esfuerzos de innovación y aprendizaje necesarios para el desarrollo del Cluster Minero. Documento de trabajo Consejo Nacional de Innovación para la Competitividad. Santiago: Gobierno de Chile.

Urzúa, O. (2013a). Emergence and Development of Knowledge-Intensive Mining Services (KIMS). Working Papers in Technology Governance and Economic Dynamics no. 41. Tallinn: Technology Governance. Tallinn University of Technology.

Urzúa, O. (2013b). World-Class suppliers to the global mining industry. BHP-Billiton. Retrieved from: http://www.slideserve.com/reilly/world-class-supp-lie-rs-to-the-global-mining-industry.

Wilches-Chaux, G. (1992). La Vulnerabilidad. En Maskrey, A. *Los desastres no son naturales.* Colombia. La Red. Tercer Mundo Editores. Retrieved from: http://www.desenredando.org/public/libros/1993/ldnsn/LosDesastresNoSonNaturales-1.0.0.pdf

Zuñiga, P. & Crespi, G. (2013). Innovation strategies and employment in Latin American firms. Structural Change and Economic Dynamics, *24*(2013), 1–17.