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Contribution to the analysis of incremental innovation as a stimulator to improve the environmental performance: the case of industrial structures in Morocco

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Abstract
Between innovation and environment are several common aspects as the removed value, common stimulators, and their contribution to the overall performance of firms and sustainable development. In fact, if the environment is a broad scope of ameliorative innovation, it is the tool less engaging and most stimulating to the company to participate in environmental performance.
We intend through this paper present a synthesis of different stimulators for the development, emergence and dissemination of innovations for the environment and clarify the determinants of the ability to innovate "environmental" polluting industrial structures. The empirical investigation which focused on the five most polluting industrial activities in Morocco (Sous Massa Draa Region SMD), is to first, analyze the nature of pacemakers dynamism of environmental innovations, and to link incremental innovations involved with the components of the environmental performance and in the end to study the determinants of the ability to innovate green each specific activity observed, and this through the case method enriched by semi-structured interviews with management responsible the environment within the company.

Keywords: Environmental performance, continuous improvement, incremental innovation, innovation stimulator.

Introduction

Nowadays, global environmental problems (mercury air emissions, discharges of wastewater into streams and emissions of greenhouse gases.) are considered negative side effects of economic development countries, and more recently to enrich, develop and perfect their technologies, more their willingness and ability to address these problems also reinforce (OECD) [36]. Since the industrial revolution, the increasing rate of heavy innovations (radical, rupture or technological) has led to massive environmental degradation (Jaffe *et al*., 2005). But today, aware of the criticality of the problem, organizations recognize that stimulate innovation in environmental protection (Ambec, 2008) [2] especially that its incremental level (Achermann 2013) [1] often underestimated compared to radical. In reality, innovation is becoming essential point that the technologies and know-how current does not achieve environmental objectives at a reasonable cost at a time when market forces alone are not sufficient to solve the problem (Ugaglia *et al.*, 2012) [53].

Morocco (one of the emerging relocation of polluting industries), is considered a country where environmental policies are not mature enough or severe enough (almost pollution havens). Besides, if in emerging countries, environmental innovations are essentially incremental type, because environmental policies are insufficiently restrictive toward polluting and less incentive process in quantity and quality in research and development, and also because that environmental innovations are insufficiently integrated with environmental policies (Montalvo, 2008) [30]. Meet the needs of industrial firms' competitiveness and contributing to a significant improvement in environmental performance, incremental innovations introduced will be the scope of our study.

Relying primarily on the Porter hypothesis 1995 assumes that there is compatibility between overall performance and environmental investment, the adoption of environmental innovations incremental kind often generates among businesses of productivity gains believe with their experience (Yonkeu 2011) [55]. Thus, we assume that innovation actors (business and government) are able to create favorable conditions, have considerable economic potential, can create a more sustainable economic growth and the emergence, development and dissemination environmental innovations are realized in terms of technological maturity, scientific, institutional, and social sufficiently favorable (Ugaglia *et al.*, 2012) [53].

Problematic: At the time of research work (Hamdoun & *al.*, 2009) are interested specify why innovation is not reflected environmental concerns at the heart of decision-makers (due to lack of coordination between the two policies), we try to explain the links between the two policies are links stimulation and demonstrate the emergence of a dynamic incremental type of innovations, helping to improve the level of environmental performance (internally) as well as 'sustainable development in general. Our goal is to gather all the synthetic promoters for the establishment of environmental innovations and clarify the various determinants of innovative capacity of firms. Empirical side by use of data questionnaires and interview guides ducts with environmental leaders in the studied industrial structures, we aim to study and analyze the number of pacemakers environmental innovation, and among others, we are to meet this reciprocal relationship between innovation and pacemakers environment through case studies on the establishment (establishment of enterprises as required) and development of environmental innovations incrementally type.

So our paper will be organized as follows: at first we start with the definition of the conceptual framework, then we collect the different synthesis stimulators environmental innovation before defining the determinants of the ability to innovate green. The empirical investigation will analyze the different stimulators to environmental innovation and present the results of the implementation of these innovations in a case study approach five polluting industries in Morocco (Souss Massa Draa SMD).

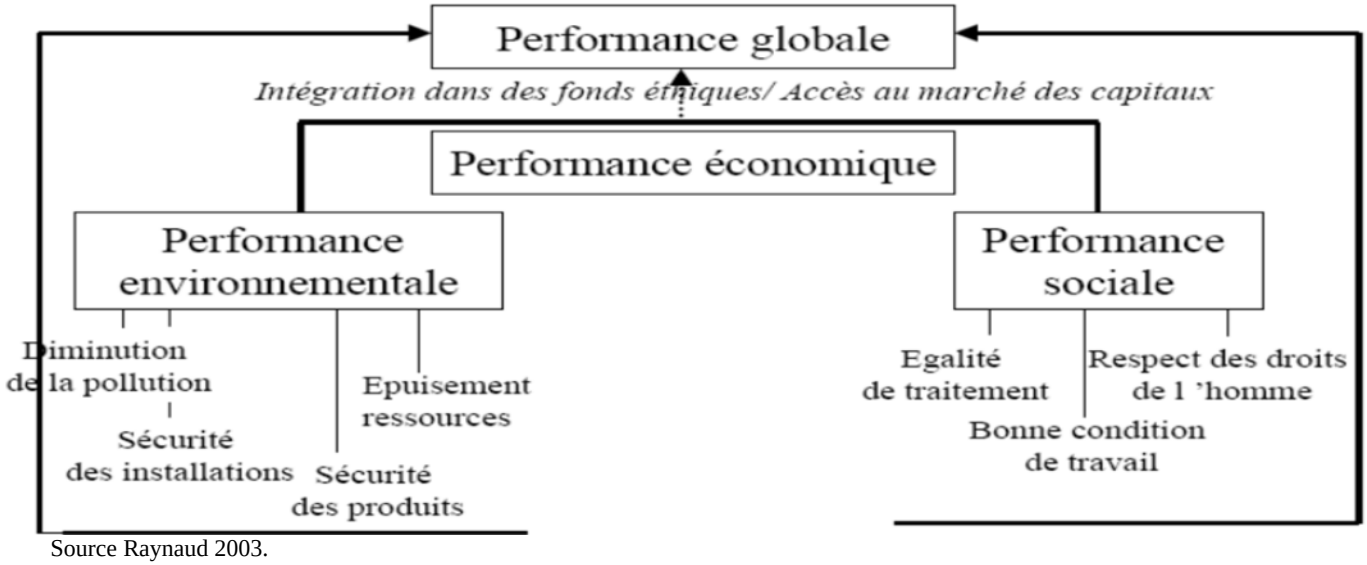
Conceptual framework of the search

This first part attempts to present a general framework of the terminology used in our work including sustainable development, environmental management system and environmental innovation incremental type.

Starting with sustainable development, he has been defined mainly by the World Commission on Environment and Development (Brundtland Commission 1987) [41] and the Earth Summit in Rio in 1992 as "development that meets the needs of the present without compromising the ability for future generations to meet their own needs". This is actually responsible development oriented towards the long term and focused on a multiplicity of dimensions ranging from economic, social, and environmental, to the political, cultural, and ethical. Moreover, in the context where only sustainable businesses will continue to grow unhindered (Demuynck 2000) [18], industrial companies are now seeking to adopt environmental management systems (EMS) to identify, measure and manage (Riedinger & *et al.,* 2008) [48] the effects of their activities on the environment (Yonkeu 2011) [55]. EMS and to define the quantitative objectives (such as compliance with environmental legislation, reducing risks to human health and the environment, the use of natural resources, as well as the prevention and reduction of pollution) in environmental performance and to develop a plan to achieve them.

Based on a PDCA approach (Plan, do, check and act), the EMS of the best known model is that of 14001 (Riedinger *et al*., 2008) [48] whose implementation certainly result in the creation of real value very concrete for the company (Mzoughi & *et al*., 2005) [31], translated by improving efficiency, increasing competitiveness and reducing transaction costs by reducing the use and waste of resources (Raynaud 2003), by facilitating compliance with regulatory requirements, employee involvement and improved relationships with customers (ISO 14031, 2004) [33].

As for environmental performance (a concept largely unknown part, complex and contingent source of subjective interpretations (Renaud 2009) [45], it is defined by all the measurable results of the EMS, according to the control of environmental aspects (ISO 14031, 1999) [34] and environmental policy (mission, values, local and regional conditions and requirements of stakeholders) (Gendron, 2004) [20]. Thus, it relates to reduced pollution (Green Procurement), facility safety, product safety, and resource depletion as shown in the following figure.

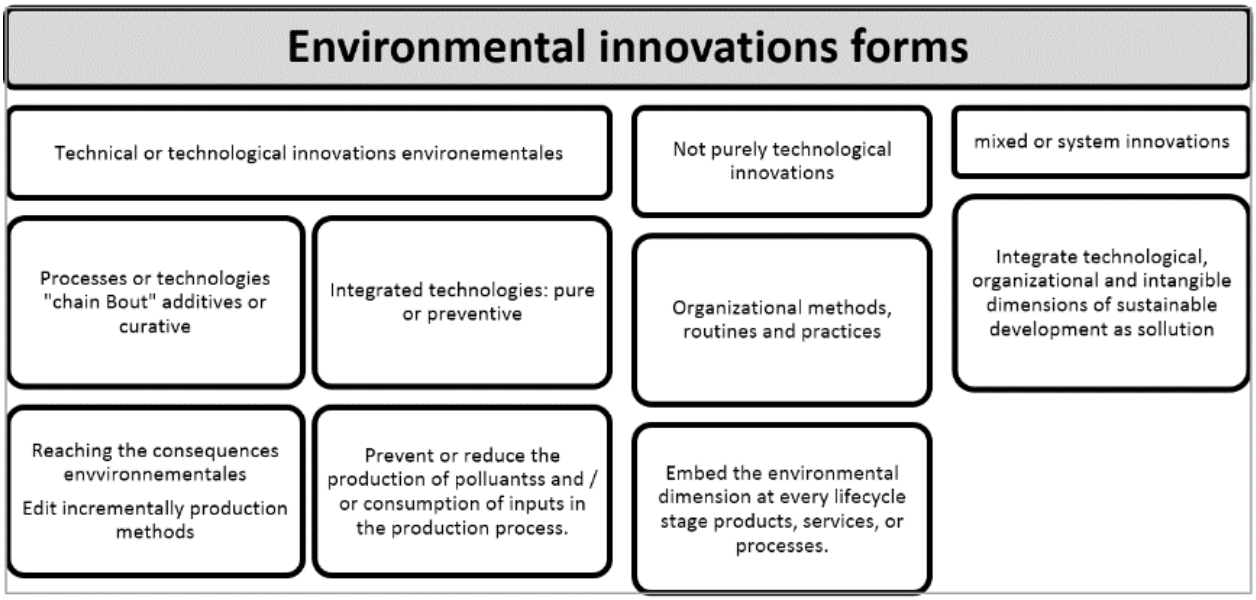


Source Raynaud 2003.

Fig 1: The overall performance

Interested by these four pillars of environmental performance, companies are continuously seeking development and emergence of innovations in this direction. They then adopt techniques, processes and products that eliminate or reduce emissions and / or the use of raw materials, natural resources and energy (Kemp *et al*., 1992) [27] as environmental innovations.

In reality, there are many types of environmental innovations which we will present in adopting the classification of Hamdouch and Depret (2008) based on the complexity of test technology from technological ones (at the chain end or integrated technologies) to those not purely technological (organizational structure) to those mixed or systemic (including technological innovations and intangible).



Source: Adapted from Hamdouch and Depret classification (2008).

Fig 2: Environmental innovations Forms

According to the OECD in 2010, the development of environmental innovations help prevent several environmental problems at lower cost (Withouse 2005) [54] does not require significant capital expenditures. Preventive or curative (Ugaglia *et al*, 2012) [53], they help to improve efficiency and lower costs, reduce the use and waste of resources to facilitate compliance with regulatory requirements, to encourage the contribution of employees in environmental performance and to improve relationships with customers (CEC 2005) [15].

The originality of the incremental environmental innovation is its ability to generate for the company sustainable competitive advantages that can occur in any part of the complex world of business activity without that a process chain is necessary (Alidou Ouedraogo 2007) [42]. This type of integrated environmental innovation essentially based on competitiveness, efficiency, productivity, value for money and does not necessarily require a high level of technological complexity or risk (Clark *et al*., 1990) [44]. In Morocco, this is actually a learning techniques already used where the company is part of environmental innovation strategies more followers that triggers them (Tourabi & Bourma 2015) [51].

The diversity of forms of innovation (incremental, radical, technological, breaking, strategic, marketing or opportunist, modular architecture, etc.) (Clark *et al*., 1990, Blondel *et al*., 2006) [44, 4] fills in reality several main functions (facilitative functions, simplifying functions and improvement in quality functions) (Blondel *et al*. 2006) [4] and gives rise to several classification works that are based on marriage between a number of criteria such as consumption patterns, technological, classic or modern technological components, complexity and level of risks, etc. We stress here that the field of study of Moroccan structures focuses on environmental innovations incremental type having features that significantly improve the company's consumption habits, use of resources, and its technological level and conditions use, but do not necessarily undertake significant investments (intangible assets) or high risk.

Difference and modular architectural innovations which put together the components of the process to modify the links between components or replace techniques used for certain components, incremental innovation improves the design of components without affecting the links between them.

Classification of environmental innovation stimulators

Based on the theoretical literature on innovation in the environment, we want to understand and group motivations and stimulators that are pushing companies to register in the development, the emergence and dissemination of environmental innovations. In fact, pacemakers are many. In addition to the tax and regulatory stimulators (Mzoughi & *et al*., 2005) [31], despite their failure, polluting industrial structures, are found also motivated by internal economic factors (value for money, cost minimization, dynamic market...) and non-economic motivations (social cultural, historical and political geo....). The table below summarizes and class different stimulators environmental innovation as the source of the pacemaker (internal or external) with an explanation of its steering mechanism to the said environmental innovation.

Table 3: Summary of pacemaker's environmental innovation

Simulator	Type	Explication	Mecanism	Authors
Competitiveness and brand image (S1)	Internal	Competitive advantage Search Resource optimization Minimize transaction costs Differentiating means	The continuous search for competitiveness and sustainability is driving companies to acquire and preserve the benefits in terms of environmental innovation	Yonkeu 2011 (Ouedraogo 2007). Green *et al.* 1994).
Innovation at lower costs (S2)	Internal	The environment is a support to environmental innovation and other Cost effective approach	Set a depollution-line and look for the least expensive policy reach and generating more profits.	Depert & Hamdoun 2008 OCDE 2010

Search environmental performance (S3)	Internal	Search facility safety, product safety, resource depletion, production or emission of pollution.	These four pillars are wide fields of development of environmental innovations.	Whitehouse Tim 2005 Raynaud 2003
Implementation of an environmental management system EMS (S4)	Internal	Norme ISO 14001 (Certification)	The standard drives the company to innovate to better manage waste, waste, dangerous, polluting substances, in parallel with the industrial hygiene, safety, transportation, energy and water...	ISO 14001 ISO 14035 ISO14031 CCE 2000 CCE 2005 Renaud 2009
Social responsibility CSR (S5)	Internal	Refers to the integration of voluntary, social and environmental concerns in the current affairs of the company and in its interaction with stakeholders.	CSR encourages the company to take initiatives for greater environmental responsibility. Through the development and diffusion of environmentally friendly technologies.	(Mzoughi, Grolleau 2005) Commission européenne 2002 Benabou & Benabdilah 2008
General corporate culture (S6)	Internal	Sociocultural aspects, Geopolitics, profile of manager. Sustainable innovation is a matter culture, understood as an implicit or explicit set of values, rites, practices and methods common to all members of an enterprise and explains the basics of how an organization.	Inspired and borrowed from the general culture of the company, the strategy may advocate the involvement of the latter in innovative actions for the environment based on sustainable development as a key success factor for innovation.	Mzoughi Grolleau, 2005 Jaruzelski B., J. Loehr, R. Holman. (2011)
Perception of environmental innovation (S7)	Internal	Cognitive approach which describes the positive perception of the company environmental innovation and added value.	The positive perception of the profitability of green investment, is a major mobilizing development and the emergence of environmental innovations.	Benabou & Benabdilah 2008. Porter 1995
Fiscal stimulation or environnemental taxation S8)	External	Restrictive: pricing of pollution, environmental taxes, fines or fiscal and environmental penalties.	In principle, it should reduce the competitiveness of polluting firms and promote those innovative companies for the environment.	OCDE 2010 Rennings 2000, Oltra & Saint-Jean 2011
Protection of innovative rights. Intellectual property.(S9)	External	Rights to the "first movers" tax benefits, subsidies and others.	The reward of "first's movers" stimulate further boost green innovation.	OCDE 2010 Depret & Hamdoun 2009
State subsidies (S10)	External	Government aid as part of sustainable development programs Tax incentives: trading license, tax benefits, privileges to public procurement, access to bank loans.	The financial means put at the disposal of companies the means to develop their environmental innovations followed by an implementation monitoring.	OCDE 2010
Competitive nature of the markets (S11)	External	Research continues to keep his hand on her and get real market share in other potential markets.	The competitive nature of the market (requires business engagement in innovative activities for the environment. Especially if our direct and indirect competitors adopt these innovations.	Claire Lelarge 2009 Jean-luc gaffard
Regulatory compliance (S12)	External	Get an eco-label, getting an abatement rate, a level of waste recycling rate, utilization of renewable energies required by the authorities.	The search for regulatory performance, pushing the company to improve its environmental performance through engagement in green innovations.	YONKEU 2011 OCDE 2010
Improved relations with local residents and stakeholders. (S13)	External	Requirements of contractors, banks, insurance companies, associations of environmental NGOs, Press / Media, scientific institutions.	In a direct or indirect way the local environment or stakeholders influences the decision of the company to invest in favor of the environment.	Henri Martre AFNOR 1994

Source: By the author, 2015.

S1-competitiveness and brand image: The continuous search for competitiveness and sustainability are important economic stimulators that motivate companies to innovate in favor of the environment, especially if incremental innovation gives them control costs and allows them to convey a good image as a contributor to sustainable development (Yonekeu 2000). In Morocco, the concerns of businesses focus on broadening actual and potential markets by seeking cost competitiveness (control of production costs, saving on production costs, efficiency of production processes, efficiency and managerial practices organizational) competitiveness originality of the offer (offers adequate environmental protection). It is clear that in Morocco, opportunities to improve both the environmental and economic performance of companies are numerous.

S2-Innovation at lower costs: The ongoing concern of the business dynamism of innovation stimulates him to exploit the various fields including environment and sustainable development (Depert & *al*., 2008). Green innovation is perceived as a lower-cost innovation based on the principle of continuous improvement since it does not require large investments and not outstanding critical risks. In Morocco, enterprises are setting sustainable goals (a pollution threshold) and then seek the least costly environmental policies to achieve them.

S3-Search environmental performance: Combined with the economic performance, environmental performance is important part of the overall performance of the company

(Raynaud 2003), as it seeks to establish security installations (high level of sustainability of the environment and resources), product safety, get to the depletion of resources (increasing energy efficiency, optimizing energy consumption), and act on production or emission of pollution (reduction of pollutants and nuisances) while developing the dissemination of environmental innovations.

S4-implementation of an environmental management system EMS: In seeking economic efficiency through continuous improvement principles (Bendiabdellah A. 2008), the company's environmental behavior is based on the implementation of the EMS as a direct stimulator of environmental innovations and as an innovative approach, which led him to begin more detailed environmental analysis, to control the impact of its activities on the environment, giving preference to preventive rather innovations as corrective, and commit to achieve regulatory compliance, auditing, certification, and periodic follow-up audits. According to Renaud, 2009, so that more efficient production becomes more important the implementation of an EMS under ISO 14000 approach facilitates the reduction of inputs in the production process and make operations faster and cheaper by that before.

S5-societal Responsibility CSR company: (Capron *et al*, 2007) referring to companies a voluntary integration (power and no duty) of environmental concerns, it leads managers to address environmental issues such as the fight against climate change, preservation of biodiversity, the preservation of the energy transition, societal innovation etc..., which stimulates their environmental commitment and improves their social legitimacy.

S6: The culture and values of the company are in fact a source of legitimacy of corporate behavior and its environmental commitments and thus a pacemaker to integrate the environmental dimension into the logic of the strategies adopted.

S7 Perception of environmental innovation: As long as the company sees the profitability of its investment and ecological added value of the implementation of environmental innovation positively, it remains interested in the development and dissemination and the emergence of the latter.

S8: Stimulator tax or environmental tax: According to the OECD (2010) [36] environmental taxes make economic sense to invest in innovative research and development activities in the ecological sense, "*the studies on the impact of climate change tax... adopted by the United Kingdom, on innovation have shown that companies subject to the full rate of the tax deposited more patents than those enjoying reduced rate*". The taxation is therefore a pacemaker for companies to reduce its tax obligations. In Morocco, the polluter pays principle has been operational since 2013 ((imports of plastics) from green taxes to the waste management. These environmental taxes are used to make the practices that respect the environment economically viable to change the behavior of producers and consumers in favor of a more 'eco-efficient' use of resources, as a result, they allow to charge the damaging behaviors the environment (the cost of environmental degradation in Morocco is 20 billion dirhams a year) by making support by polluters the costs of pollution and allow thus "internalize externalities" by the environmental costs in the prices of goods and services (Rennings 2000) [46]. The specificity of the Moroccan case pushes the authorities to find a balance between restriction of polluting activities and the emergence of the industrial sector as industries relocation of countries (example automobile) while seeking environmental efficiency through the use of resources and cleaner processes.

S9- Innovative protection rights or intellectual property: To stimulate the development and the emergence of innovative approaches in terms of environment, public authorities with their institutional structures must protect and support innovative especially the first movers who engage in significant investments offering their experience, expertise and capitalization of knowledge to innovate followers. Depret & *et al*., 2009 argue that rewards first movers always incite boost their innovations in the ecological sense.

S10- State subsidy: Companies belonging to polluting sectors with high potential for development, can be found in public subsidies to develop a strong stimulator of environmental approaches in quantitative and qualitative terms above that the state carries out audits of their green commitments (OCDE 2010) [36].

S11- Competitive nature of the markets: Some forms of markets are more attractive in environmental innovation than others. Thus, market competition (unlike the monopolistic and oligopolistic markets) where coexist several direct and indirect competitors, national and international push companies to engage in the environmental. The monopsony also requires with a single buyer imposing its ecological conditions for companies. (Claire Lelarge 2009) [17].

S12- Respect of regulations: From the moment the authorities require to comply with environmental laws, economic agents especially polluters are found in the obligation to comply with regulations recognized national and international level. The authors highlighted two main effects of environmental regulations: the Regulatory push effect materialized by technology push effect in a context where the market failure justifies government intervention (Porter and Van der Linde, 1995) [40] and the effect materialized pull Regulatory by an effect demand pull (Rennings, 2000) [46] by participating in the demand for environmental quality, creating a societal pressure that stimulates innovation firms. Regulations require moving towards an economy of resources and preservation of natural capital and the environment.

S13- Improve relations with local residents and stakeholders: Contrary to the quality, the customer suffers no direct disadvantage if the supplier does not meet the environmental requirements. By cons, local residents are the first to suffer the nuisance and damage caused by failure to respect the environment, their repetitive claims associated with stakeholder requirements are a relational risk and at the same time (to avoid) stimulator to innovate in favor of respect for the environment and also to keep good relations with partners. As for the stakeholders (or environmental stakeholders), their influence is very important and can be classified into four groups as quoted by Marquet-Pondeville (2003) [29]. Indeed, he

distinguished between regulatory stakeholders (laws and directives); environmental advocates stakeholders (environmental protection such as: local communities, media, associations etc.); market stakeholders (market players such as customers, competitors and professional associations) and finally the organizational stakeholders (management, shareholders, employees). Note also that the real motivations for environmental innovation are much more oriented "market driven" than "regulation driven" (Yonkeu 2011) [55].

In general, it is certainly accepted that incremental environmental innovations are able to bring real added value to the company, resulted in increased efficiency, reduced costs and value for money, which positively influences its actual market value in transactions (sale of assets, value image goodwill of the business, merger and acquisitions etc...).

Distinguishing between stimulator environmental innovation (which means especially the set of excitatory and mixers) and determining the ability to innovate green (all the characteristics that powers its ability to innovate through the gathering of appropriate modalities to innovation), we will presented in the following different factors that define this capacity.

Ability of companies to innovate in favor of the environment

Since the 90s, a large set of authors (Hollenstein (1996) [23], Blundell *et al*. (1995) [9], Mayor, *et al*. (2010), Raymond *et al*. (2007), etc.) have developed analysis determinants of companies' ability to innovate, considered a major factor in their competitiveness (Roux 2001) [47].

Analysis of economic and organizational determinants of innovation distinguishes two groups of factors namely those affecting the technological capacity of businesses and affect the anticipated profits (Blanchard *et al*., 2011) [7] and to address the other side, other determinants (Autant-Bernard *et al*., 2008) [3] as the market structure, opportunities and the degree of appropriability and financing. Other work (Belderbos & *et al*., 2004) [8] and more integrated cooperation and the role of governmentsubsidiesinthedynamicdevelopmentofinnovations. Thus, the factors explaining the innovation capacity (Pisano 1990) [39] are summarized in the quantities of inputs (expenditure from internal R & D and / or external cooperation with public and private research centers, ongoing need external knowledge, technological monitoring, etc.), and the variable characteristics of the firm (size, membership in a group) and the environment (sectoral affiliation, geographic location) (Blanchard *et al*., 2011) [7].

The work of Le Masson and Weil 2006 Hatchuel explain that it is the design activities that can generate innovation. They innovation is a non-systematic output of the activity design, and they consider the different traditions of design (architectural, artistic, ingénierique, manager) with reasoning, organization of modeling and performance criteria to be responsible for defining the innovative capacity of firms.

Overall, and despite the complexity of the phenomenon, we can conclude that the innovative capacity of firms may take the form of a probability depends primarily of the company's turnover, headcount of its employees, its degree of international openness, membership to a group, the investment rate, the rate of return on the part of engineers and technicians, the degree of its ownership in its sector, the home region.

Regarding the ability to innovate green, it is strongly influenced by three types of complementary factors (Rennings, 2000) [46] and explaining the propensity to innovate green businesses namely institutional, regulatory and social (logiqque Regulatory push / pull), scientific and technological factors (technology push logic) and economic and financial factors (market pull logic) (Rennings, 2000) [46].

Naturally, we cannot speak of an ability to innovate green not to mention a successful implementation of an SME guarantee both a regulatory performance (compliance) and environmental performance.

If environmental commitment depends on the degree of pollution from industrial activities, locations and operating sites, environmental taxes and partner requirements etc... (Whitehouse 2005) [54], their ability to innovate green in reality reflects its ability to find new ways and new technical processes to reduce pollution and its effects, and develop policy instruments that guarantee immediate environmental progress (OECD 2010) [36].

In the end we present a table in the main determinants of the ability to innovate green businesses ranging from the level of investment in research and development dedicated to the environment, the level of learning and ability to accumulate skills, environmental awareness leaders inspired by their culture of social responsibility, the part of the responsible environmental engineers on the total number of engineers at the company's involvement in environmental issues, organizational form (interactive or transverse), the public incentive measures, the market structure, the nature of environmental management tools, to the consideration of pressure groups (stakeholders).

Table 5: Determinants of the ability to innovate green businesses

Determinants of environmental innovation	Nature of factor	Measurement indicator	Abbreviations
Investment in research and development in favor of the environment	Quantitative	Financial value of the intangible fixed assets of the real balance sheet.	R&D
Learning and accumulation of skills	Qualitative	Rhythm of the firm's experience curve	EXPER
Ecological sensitivity of SE leaders	Qualitative (culture RSE)	Number of ISO certificates, environmental accounting (LCA, green accounts, green dashboards, environmental external costs)	SECOL
Staff engineers, environmental managers in the total employees	Quantitative	Percentage of engineers and environmental managers.	INGENVI
Involvement of business in environmental issues	Quantitative (numbers of producers engineers inventions)	Number of environmental innovations, Patent Filing	BREV
The shape (intra and inter) organizational enterprise: transverse or interactive form	Qualitative	The presence of the cross or interactive form of business promotes the emergence of green innovations	TRANSV

Public Incentives	Qualitative (intensity incentives for green innovation)	Benefits, exemptions granted on the occasion of green innovation, reducing interest rates	SUBV
Market Structure	Quantitative (competition, semi public or private companies, degree of international openness)	Export level, national turnover	MARK
Nature of the business of environmental management tools.	Quantitative (EMS implementation, standards compliance)	Rate of compliance with standards	SME
Consideration of pressure groups (relations with specifiers and contractors)	Quantitative	Turnover with stakeholders interested in environmental innovation	STAKH

Source: the author.

The discussion presented the various determinants that characterize the company's predisposition to innovate ecological level is between separate qualitative factors (experience curve, benefits, exemptions.) and quantitative (rate of compliance with standards, many patents innovation, percentage of engineers, etc.).

Thus, having introduced in the theoretical part a synthesis of different pacemakers-exciters (thirteen pacemakers) in innovative action in terms of determining environment and finding characterizing the ability of the industrial structure to achieve this green innovation, we can consider the number of pacemakers observed by activity as another determinant of this capacity. The higher the percentage calculated on the basis of thirteen stimulator is stronger, the company is sufficiently stimulated and fit by adding other key to innovate.

The empirical investigation into the practices of Moroccan businesses in improving environmental performance:

4.1. General context of the study

Economic development in Morocco was accompanied by a strong industrialization and a population growth rate of 3% per year (2014) which makes an increase in pressure on the environment.

Morocco undertakes to implement the national charter of the environment and sustainable development to in step internationals commitments (Rio Dejaneiro Johansbourg 1992 and 2002) in order to access international markets.

Moroccan environmental situation: With significant natural resources (phosphate, marine resources etc...), the economic and industrial development required an overexploitation of these resources, and environmental degradation following the emissions of gaseous, liquid and solid. Key Moroccan environmental issues revolve around the air pollution, water, soil and natural resource degradation. We note that industrial activity mainly involved in every environmental issue as shown in the following figure:

Note that the most polluting industrial units in Morocco are thermal power plants and phosphate processing plants, refineries, chemical industries and iron and steel industries, paper, food, glass, plastic, metal, asphalt, cement, oils and fats.

As for energy management (energy mix consists of coal with 12,456 GWH, natural gas GWH 2823, 2758 GWH fuel, hydro and wind power 1594 GWH in 2010), we stress n 'exist in Morocco specific certification for energy efficiency or sustainable development. However, this principle can be applied through the ISO 14000, OHSAS 18001 (health and safety) and ISO 9001 (quality). This trio forms the basis of French GAAP Quality Safety Environment (QSE), voluntary approach to which some large Moroccan companies pioneering in this area are becoming interested.

After giving an overview of the Moroccan environmental situation and given that the approach is essentially qualitative, we recall that we had a goal in this empirical investigation, to demonstrate that incremental innovation in the sense of continuous improvement helps to a significant improvement in environmental performance.

For this, we brought in following the recommended methodology and then we will present the results in two parts: the first concerns the results of the implementation of amélioratives approaches (innovative) and justify their relationship with performance components environmental and second places and then we will analyze and classify pacemakers that motivated the companies studied to innovate green.

4.2. Methodology of the empirical study

It is certainly admitted that the purpose of qualitative studies is to understand the linkages and logic of the business experience, interpretations they make, taking into account the specific contexts of each. That is why the search for statistical representativeness has little meaning in our paper that -at privileged unlike much the variety of situations studied and their contribution to the environment. Thus, we conducted surveys 2013 (questionnaires, interview guides) to explore business practices in terms of incremental innovation, in terms of performance improvement environmental and the relationship developed between the two policies. We asked five company with polluting activities how while keep their anonymity by giving a code for each observed firm. The attached table summarizes the cases studied and chosen according to a principle of variety.

Table 6: List of studied industries

Code	Sous-secteur d'activité	Région	Certificat
IAGRO1	Food Industry	SMD*	ISO 9001, GLOBAL GAP, ISO 22000, ISO 14000 CERTIF ONSSA
IBOIS2	Industry Wood	SMD	ISO 9001, ISO 14000
ICIM3	Cement Industry	SMD, Meknès	ISO 14000, OSHAS 18001, SST.
IPHAR4	Pharmaceutical Industry	SMD	ISO 9000, ISO 14644.
IMEN5	PVC and glass Industry	SMD	ISO 9000

* SMD: Souss Massa Draa Region in Morocco

Source: by the author.

The investigation into these companies had the main questions: how you improve your environmental performance? Environmental performance is what is always compatible with industrial competitiveness? Is incremental innovation stimulates you to improve your environmental contribution?

We organized all the results from questionnaires and interview guides in the form of a summary on the economic problem, the environmental corresponding problem, and the corrective action deemed continuous improvement (incremental innovation).

4.3.1 Summary of Environmental incremental innovations introduced

CASE	Economic problem	Environmental problem	Corrective action	Objectif
IAGRO1	Anomalies process planning citrus supplies Insufficient space intermediate stocks and quality deterioration due to exposure to room temperature. Problem of non-conformités Increased number of defective cans. Excessive cost of energy	Production Waste Production losses after Value Added. Perishables management difficulties. Problem facilities. Increased waste and discards, poor value for money Low product safety.	Shared management GPA implementation of supply (Process innovation). Optimization of the production KANBAN (Process Innovation) DMAIC Six Sigma approach or (ISO 14000) Adoption of the MSP method (approach DMAICS) 6 Sigma (incremental innovation) Photovoltaic panels.	Reduce inventory, reduce discarding, to reduce the exposure time at room temperature. Performance Improvement Process Modeling: citrus industry chain Tin can default to 0 and increase productivity 15%.
IBOIS2	Failure of quality and defect in the production chain	Non safety of installations Depletion of scarce raw materials.	MSP method (Innovation processes)	Identify defects that lead to non-quality products and processes.
ICIM3	Stability furnaces and operating risks. High energy cost.	Need energy alternatives cleaner and cheaper	Cooking machines Adaptation consumer waste thermal energy generators (innovation process).	Increase the likelihood of alternative waste fuels
IPHAR4	Meeting the needs for heating, cooling and ventilation (more charges in full production time)	Wasted energy during non-production time	HVAC system that allows the eve of the air handling system commissioning time outside occupation	Optimization of energy through a heat recovery
IMEN5	Several defective items	Waste of resources, energy, changes of articles. Non quality problem	DMAIC approach Quality control system	Reduction of defective items in the model, material and color)

The IAGRO1 case that has problems of non-compliance, finds that in the DMAIC process (Define Measure Analyze Improve Control) an effective tool to help control the variability of non-conformities in the process and to control the causes.

The process of quality adopted by the company and required by ISO 14000 has very tangible economic benefits such as reducing the use of raw materials, reducing energy consumption, improving process efficiency, reduction of waste etc.

As for the problem of the deterioration of the quality of the product because of its exposure to room temperature (generates waste products after added value and increased delivery times), it was resolved by method KANBAN (just in time) under the Lean Manufacturing approach that aims to eliminate waste of sources producing additional costs and burdens.

The Six Sigma method has also been adopted within the company (by the definition of critical process parameters, the analysis capabilities of process improvement and reduced variability, control and management of the process). The results of the case observed allow 31% increase in process capability and 39% for the coefficient of process capability and the reduction of defective boxes by 9%. For the issue of energy efficiency have been proposed several solutions ranging from the use of speed and frequency inverters to optimize the storage of cold and heat, the use of low-energy bulbs, audits energy (ISO 14031). Indeed, substitution of the consumption of energy by the ordinary energy photovoltaic plate provides an electrical generating direct current with a peak power of a photovoltaic panel is of the order of 100 to 200 watts per square meter.

The case of IBOIS2 is based on the approach to statistical control of the MSP process to improve the chain of production of packing cases this has made it possible to identify and evaluate defects and malfunctions and eliminate costs non quality and the irreversibility effects production chain. In this industry which uses the wood as raw material, the operators are put in place in 2006 Process of recycling and recovery of waste wood shed Environmental considerations.

For the cement industry, proceeded to the substitution of diesel oil, coal and coke oil by cheaper and cleaner fuels (the shredded tires and olive pomace). If a crack 11% substitution in 2014 against 17% promised. The case of the pharmaceutical industry is interested in energy savings and has implemented solutions for optimizing energy. It concern the standby time of the air outside occupation processing system (gain of 253.52 DH / J), energy optimization through a skimmer heat (gain of 54.63 DH / J), and by determining the blowing conditions (1.936 KW of energy gain).

Faced with problems of poor quality, the carpentry industry in DMAIC améliorative a solution by implementing a control system that identified the causes of the machines (poor sharpening the disk of the sewing machine, cleaning brush), of means (lack of security, unfavorable working conditions), the matériuax (profile striped material, non-compliant). The approach also offers solutions such as security compliance products, improve the upstream, continuous verification of dormant dimensions, improved measurement processes, formation of operators. Each of industrial proposals incremental type of answers in reality a component of the environmental performance and thus contributes to the overall performance of industrial structures as summarized in the following table:

Table 8: Relationship between incremental innovations and components of environmental performance

Innovation / Method	Overall performance				
	Objectif	Reduced pollution	Security of facilities (processes)	Product safety	Resource depletion
Six SIGMA	Non compliance		*		*
KANBAN	Stock	*		*	*
MSP	Processes				
Optimisation énergétique	Ressources	*			*
HVAC	Ressources		*	*	*
Système contrôle qualité	Product	*	*	*	

Source: by the author.

The relationship observed between incremental innovation and environmental performance is justified by the contribution of the latter is to product safety or the safety of installations or the reduction of pollution or the optimization of resources is to all four components together.

In the following section we will try to identify the links found between sub sector and stimulators of adoption of incremental innovations in environmental type.

4.2.2 Analysis stimulators

According to the data analysis of questionnaires and interview guides engaged with the environment responsible for the observed companies where we asked about the number of stimulatory activity by mobilizing them to invest in favor of the environment, we raise the following table:

Table 9: Number of pacemakers by business

Activity	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	∑ S
IAGRO1	*	*	*	*				*	*	*	*	*		9/13
IBOIS2		*	*	*	*	*	*	*	*	*	*	*	*	12/13
ICIM3		*	*	*	*	*	*	*	*	*		*	*	11/13
IPHAR4			*			*		*	*	*		*	*	7/13
IMEN5	*		*			*	*	*	*	*	*	*	*	10/13
Total citations	2	3	5	3	2	4	3	5	5	5	3	5	4	

Source: the author

We found that the most important scores are those of the wood industries, glass carpentry and cement industry, certainly highly polluting activities, but also very motivated to engage in environmental action Other activities are much more motivated by the pursuit of industrial competitiveness and the competitiveness of the market. They are the food industry (canning).

The pharmaceutical industry is also driven by regulatory compliance and especially the safety of medicines. The most influencing and most cited stimulators (as observed) in the survey are looking for environmental performance, fiscal pacemaker, state subsidies, protection of intellectual property rights and respects the regulations.

We also analyzed two types of companies: those giving priority to industrial competitiveness (the latter is essentially motivated by economic and industrial type pacemaker's improvement continues to innovate green) and environmental performance comes as a result. And those giving priority to environmental performance and the weight of tax penalties that drive them to invest in favor of the environment.

Table: Classification of cases studied by pacemaker

	Type of pacemaker	Objectif	Result at	Observed Cases
Group 1	Incremental innovation	Industrial competitiveness	Industrial and environmental competitiveness	IAGRO1, IPHAR4, IMEN5.
Group 2	Environmental performance and taxation	Decrease pollution, optimize resources, facilities, and secure the product	Environmental innovation, industrial competitiveness, economic and environmental	ICIME3, IBOS2

Source: By the author

Summary of results

In a context where markets are imperfect (too much pollution and not enough innovation) industrial structures respondents believe that the best way to achieve their industrial competitiveness is to improve their performance environmental using incremental type of innovations.

-We Note the importance of the contribution of incremental innovations to improve industrial competitiveness of companies (safety of installations and products, pollution reduction, resource optimization). This contribution is consistent with the pillars of environmental performance.

-The Observed companies promote environmental innovations incrementally kind (tangible and short term), more than the radical environmental innovations that are less visible and uncertain.

-In A context where markets are imperfect (OCDE 2010) [36], the main stimulators of businesses to innovate in favor of the

environment, the tax pacemaker, the state subsidies, rights protection intellectual property and respects the regulations.
According to the interview guides with responsible companies we noted the tendency to promote environmental innovation introduction a public dimension to meet the standards public authorities on one side and eligible for incentives of subsidies other side.
-The effectiveness of environmental innovations are based on complementarily and coherence between the quest for industrial efficiency, response to public standards and contribution to environmental performance.
-Finally, We cannot ignore the failure of the dynamics of environmental innovations in Morocco, either at low innovations dedicated to the reduction of environmental degradation, either at their inability to perform lower cost of environmental objectives.

Conclusion

In conclusion, we recall that our starting point was to demonstrate that the industrial structures in their continuing search for overall performance, find themselves implicitly involved in dynamic environmental innovation strategies directly or indirectly contribute to improving the environmental performance (internally) and sustainable development in general.
According to a large literature, we made a theoretical synthesis of the different internal and external pacemakers to environmental innovation and we deduced the determinants of the ability to innovate in favor of the environment.
The empirical investigation discussed two key points in the first point we have demonstrated how the implementation of simple and innovative solutions help them to answer some economic and environmental issues and the second point we analyzed the influence different promoters in the definition of perception and motivation of industrial structures in environmental innovation By observing the specific context of the study (Moroccan case), we asked several other questions that deserve to be studied to know: is this the emergence of industrial countries is does it at the expense of environmental quality (since Morocco is a country of relocation of polluting industries)? Or is that innovative companies in the sense of environment does it really innovate to reduce environmental degradation or are they t much interested in potential new market share through this orientation? (Environmental commitment between taxation and strategic choices).

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