ECOINVOLUCRATE IN 5Rs. AN ANSWER OF THE ARCHITECTURE AND THE CONSTRUCTION OF ECUADOR FOR THE IMPROVEMENT OF ENVIRONMENT

[1]Pérez Pérez Marina
[1]Universidad de Cuenca, Facultad de Arquitectura y Urbanismo, Research Center Av. 12 de Abril y Agustín Cueva, Ciudadela Universitaria, Research Center of the Faculty of Architecture and Urbanism, University of Cuenca. Cuenca - Ecuador
e-mail: marina.pperez@yahoo.com marina.perez@ucuenca.edu.ec

ABSTRACT

ECOINVOLUCRATE EN 5Rs is carried on at the Research Center of the Faculty of Architecture and Urbanism at the University of Cuenca, in the framework of the PROMETEO Project of the Ministry of Higher Education, Science Technology and Innovation of Ecuador.
Ecuador shows a construction boom with a strong economic nature and intensity, this benefits the financial sector as well as becomes the breeding ground for timely structuring the construction industry and its professionals. Opportunity to structure the management of an elemental area of Sustainable Development.
It started as an answered to the lacks of an integral program aimed at developing common strategies, in which professional activities involving: Sustainable Development, Bioclimatic Architecture and Energy Efficiency, in the training and practice of professional architects and construction of Ecuador.
The main objective is to *involve key stakeholders in the Architecture and Construction in Sustainable Corporate* Culture, promoting economic, social and environmental corporate responsibility, through the implementation of environmental management systems, protecting and improving the environment.
Includes spreading, research, training and business management, in three lines of action. Structured around: Divulgativo Proyect structured with surveys and Technical Conferences; Formativo_E3 Project prior to an investigation in which sustainable criteria identified in architecture, vernacular and current construction of Ecuador, with a parallelism of the objectives that countries with high energy dependence and strategies that professional architectural and construction of Ecuador used innately, training courses to working professionals are enriched; and Resolutivo - Empresarial Project encouraging companies involved in energy dependence development policies, ecological management system designed expressly with the economic parameters of their activity, with which the company is involved in the fight against climate change climate with a Best Practices Guide in 5Rs.
ECOINVOLÚCRATE IN 5Rs is a cross action between education, practice and public policy action in the fight against climate change, and the insertion of Ecuador to the international market.

Keywords: Energy Efficiency, Cut back, Recycle, Reuse.

1.- Introduction

"Architecture is not four walls and a roof; is the arrangement of the spaces and the spirit that is generated within "said Lao-tzu, architectural education is prolonged and complete because the architecture is for and involves people, the architect is humanistic technical soul that integrates the needs of society in a building space that endures beyond those involved in the process. The architecture goes beyond the sketch and construction; hence what Victor Hugo said "Architecture is the book of humanity," the society claims architects trained with clear knowledge of symbiosis architecture and society who recognize and implement that architecture is comfort, safety, livability, sustainability and energy efficiency. The architect formed with a sustainability profile has broad implications for its direct involvement of direct action in the dimensions: social, economic, environmental and institutional [1].

The bioclimatic architecture, eco-architecture, as a breeding ground of architecture that requires a sustainable building, which from the design takes into account the environmental conditions of the environment in which the building is constructed, taking care to achieve a level of welfare inside the property without resorting to artificial air conditioning systems. Architecture and construction that take advantage natural sources of heat, light, ventilation, rainwater and minimize energy losses, also help to architectural elements based on the location, orientation and isolation of their enclosures.

Pushing the limits of the ecological footprint that allows the capacity of the Earth, addressing climate change that threatens the continuity of biodiversity; being about to deplete natural resources and increasing inequality gap between rich and poor countries, between present and future , are just some of the effects which influence the work of architecture, building because is not foreign to these problems, rather it is one of the major players in this change, from the production of materials, transport, construction process, use and maintenance of buildings and, finally, its demolition once reached the end of its useful life, pose significant environmental impacts, it is imperative coordinated actions to the task of educating, from a defined area of knowledge as is the architecture [4].

Ecuador in recent years has presented a construction boom with strong economic character and a particular intensity. Intensity has not only benefited the financial sector but it is the breeding ground for timely structuring of the construction industry and its professionals. Structuring must be understood as an opportunity to design a basic sector in the new low carbon economy.

Although Ecuador does not present energetic dependence, however the objectives of PROMETEO project "*To fortify research, teaching and knowledge transfer on specialized topics for the benefit of Ecuador. In addition to promote and advance science, technology and knowledge ancestral as a platform for the achievement of Good Living"* and linking international structures, is the breeding ground for the Prometheus Project ECOINVOLUCRATE launch the program in 5Rs as an initiative of their work plans and engages in combat climate change. And while the commitments made by industrialized countries to reduce greenhouse gas emissions and EU targets 20/20/20, do not directly affect the current state of Ecuador. However the University of Cuenca echoing policies PROMETHEUS project of integrating international structures, involving their curricula and adds its participation in ECOINVOLÚCRATE EN 5Rs, enhancing cross-action between teaching, practice and public policy action in the fight against climate change, and the insertion of Ecuador to the international market.

So that in order to lay the foundations on which the professionals in architecture and construction, have a close reference to engage in the fight against climate change, hence the systematic study of landscape architecture and traditional construction

current of Ecuador, identifying variables of sustainable architecture, and serves as a documentary source of sustainability in Ecuador.

1.1.- Issue

With the incipient increase in construction in Ecuador is the time of ordering the future of construction from new parameters. First is resize the construction sector, in relation to social needs, avoiding speculative play typical cycles in industrialized countries, and then develop comprehensive policies for the rehabilitation and upgrading of existing buildings contribute to solving, quality and efficiency, the country's needs.

For this propose strategies from which a qualitative leap in existing around the construction is required; specify which objectives are essential for the construction of Ecuador is involved in the fight against international climate change.

With planning strategies and their dissemination and implementation, defining objectives of the activities which in some cases are connected together shortly, as the development of policy, the design process, production of materials management and use of buildings, etc., in a system, which is the construction sector with its subsectors.

In response to these concerns the ECOINVOLUCRATE EN 5Rs program which includes their development, dissemination, research, training and business management, structured in three lines of action, the Project Informative around surveys and Technical Conference aims, Formative Project _ E3 Energy Efficiency Strategy with an investigation in which sustainable criteria are identified in the architecture and traditional construction and the current architecture of Ecuador, with a parallelism of the objectives that have been imposed countries with high energy dependency and strategies that professionals in architecture and construction of Ecuador used innately, with results continuing education courses for working professionals are enriched to date are occurring through a virtual platform with e-learning method and b-learning; and Operative-Business Project encouraging energy dependence companies involved in its development policies, ecological management system, designed expressly with the economic parameters of their activity, through which the company is involved in fighting climate change with a Guide to Best Practices in 5Rs.

2.- Development

Sustainability in architecture considered beyond the aspects related to the environmental performance of the building, energy efficiency or carbon footprint also ensures healthy living spaces, and moreover, gives importance to the social spaces.

However the construction sector, with subsectors influences, creates substantial environmental impact. The buildings contribute greatly to increased emissions and pollution, both during the construction process and throughout their lifespan once completed. And the generation of waste, construction, maintenance and demolition of buildings, has increased prospects and challenges for reuse or recycling.

Through this ECOINVOLUCRATE is to have the documentary bases of architecture made with sustainable construction in Ecuador; in order to identify sustainable models and the particular characteristics of outstanding architectural and construction projects with strong sustainability and energy efficiency strategies based on passive uptake, both public and private initiative, which serve as reference in the study of bioclimatic architecture, sustainable construction and energy efficiency in buildings of Ecuador.

The building sector began to study the impact of construction on the environment in 1987, when it was tried for the first time the issue of sustainable development at the

World Commission on Environment and Development, 42nd session of the United Nations. However, it has not been found references to study directly linked to the construction of buildings and comfort conditions for users with sustainable criteria for the specific case of sustainability in architecture and construction of Ecuador environmental impact, based to which the following unknowns are established:

- To what extent traditional building systems in Ecuador are preserved?
- Is passive measures of bioclimatic design are present in building architecture Ecuador?
- How were integrated industrial construction materials with traditional materials, construction processes taking place in Ecuador?

With reference to the Plan Nacional del Buen Vivir 2013-2017, noted the degree of involvement of Ecuador policies on sustainability, identifying in paragraph 7. Guarantee the rights of nature and promote sustainability, territorial environmental and global. In this context defined the specific objectives of ECOINVOLUCRATE EN 5Rs, which are:

- Provide clear criteria of sustainability and their involvement in the actual construction sector in Ecuador, identifying the necessary causes for a change towards sustainability occurs.
- Identify lines of aid, grants and funding, at local and national level, linked to sustainable construction through regulations and legislation related to the principles of the National Plan.
- Provide the field of architecture and construction of a database in which current knowledge is collected, existing legislation, measures are being used in the practice of architecture and construction to achieve a sustainable profile Enhancing supply of green jobs and identify the construction industry and architecture already working in this line.

2.1.- Results

The research activities have focused on the first step in making a diagnosis of.

- The characteristics of the architecture and the traditional construction of Ecuador and the presence of sustainability.
- The presence of sustainable criteria in the architecture and the current construction of Ecuador.
- Aid, grants and funding for sustainable architecture and efficient construction and rehabilitation regulations.

As a preliminary activity was performed valuations:

- Knowledge and mastery of sustainability criteria in the professional architects and construction of Ecuador.
- Performance of official entities in the international guidelines of sustainable development in architecture and construction of Ecuador.

It has been applied a survey on-line at the following types of architects (fig. 1 "Facts architects respondents") made with the technique of Likert, fifty items, in four groups, scale of 6 levels of responses, Very Agree, agree, Ignoring, Disagree, Strongly Disagree and NP (not applicable).

PERFIL PROFESIONAL	
Estudiante	7%
Egresado	14%
Profesional JR	25%
Responsable de proyecto u obra	15%
Experiencia de mas de 10 años	23%
Experiencia de mas de 20 años	15%
Otros	1%

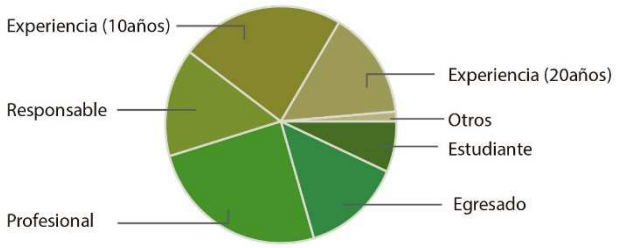

Fig. 1 "Facts respondents architects" Source: the author.

The survey consists of a series of statements relating to knowledge and application of sustainable criteria in architecture and construction. Among the most relevant search results a positive and open attitude to proposals was observed in 70% in the Likert scale, as seen in the following (fig. 2 graphics "Criteria professional practice Sustainable Architecture and Construction").

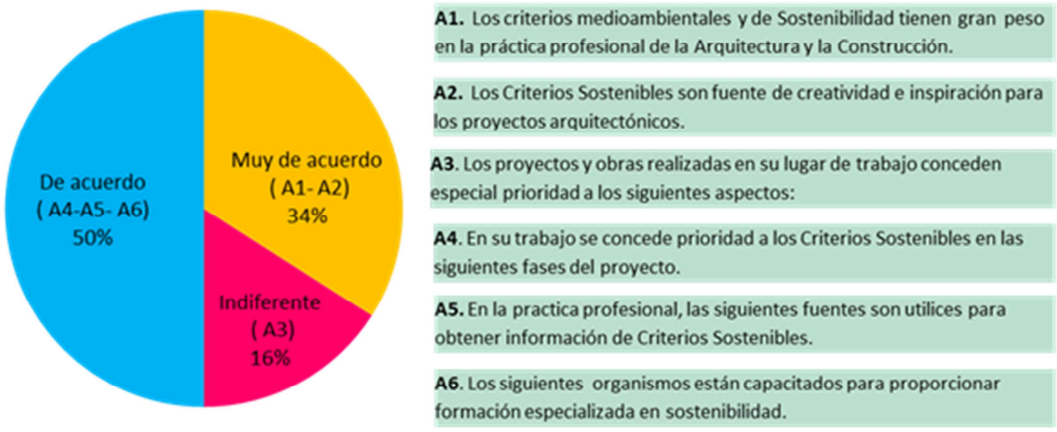

Fig. 2 "Sustainable Criteria for the Professional Practice of Architecture and Construction". Source: the author.

Laying the foundation for a conceptual framework of state of the art knowledge of the sustainable criteria in architecture and construction, with working professionals from Ecuador.
With an analysis of the vernacular architecture of Azuay and Cañar, central Ecuador, has been studying the presence of passive strategies in the construction of Ecuador.
With the current architecture are being studied residential sets of the 60's to the present and administrative buildings, which is being conducted bioclimatic studies to identify the degree of comfort and eventually make a proposal for rehabilitation.

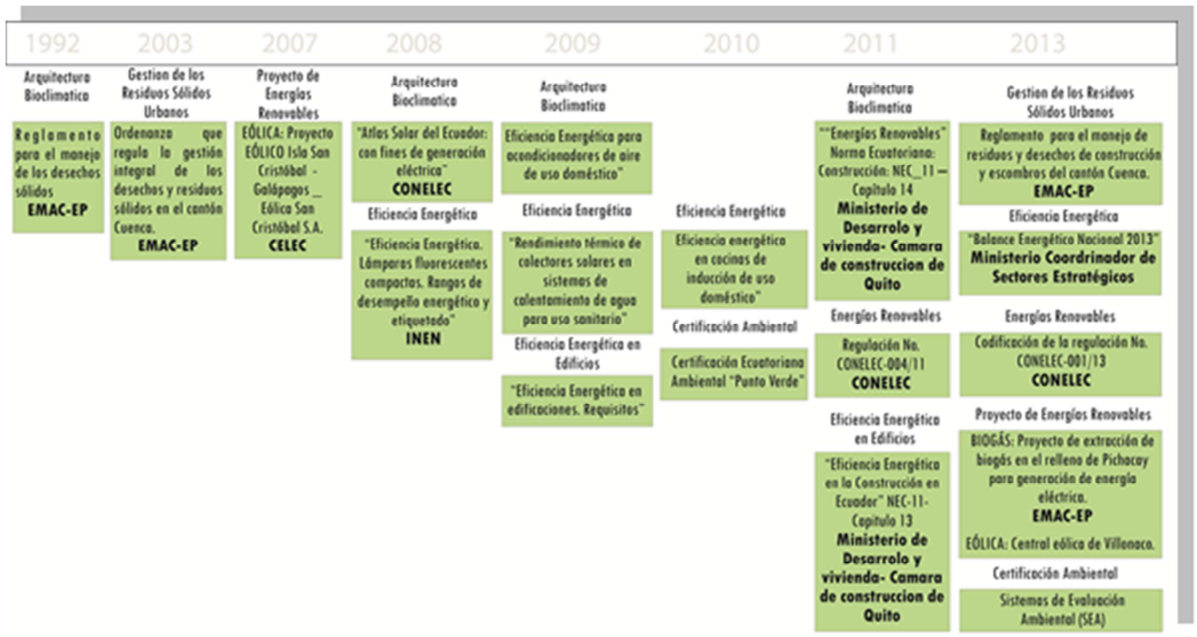

Fig. 3 "Historical evolution of legislation construction of Ecuador in sustainability". Source: the author.

The analysis made in the legal field of sustainable construction, has been made as a documentary research and as review of regulations and legislation, as well as officers on active projects in Ecuador. In the following chart (fig. 3 “Evolution historic legislation construction of Ecuador in sustainability”), you can see the historical evolution of regulations, legislation and official projects in Ecuador.

With investigations of ECOINVOLUCRATE EN 5Rs program, they are laying the groundwork for structuring and enriching the content of training courses Formative Project Strategy Energy Efficiency in the framework of action are occurring through online platform by b-learning method.

Besides the knowledge obtained were proposed to be considered in the Syllabus Construction after a review that was conducted, and collateral development, prior review of matters related to the research taught at the Faculty of Architecture and Urbanism University of Cuenca, a proposal to involve them in the thematic content will be.

5Rs ECOINVOLUCRATE on various fronts has allowed construction relate to the concepts of sustainability, however the main beneficiary is the University of Cuenca through the Faculty of Architecture and Urbanism that as the main source of continuing training initiatives.

In addition:

- The professional architects and construction entrepreneurs, independent professionals, postgraduates and undergraduates, to which training courses are targeted.
- The future students of the Faculty of Architecture and Urbanism, which will study subjects with a criterion of Architecture and Sustainable Construction.

3.- Conclusions

In prospective vision of building in Ecuador in recent years has presented a substantial increase in construction with a marked economic and a particular intensity, coupled with the incipient evolution of construction is changing the urban image with an intensity that has not only benefited the financial sector but it is the breeding ground for timely structuring of the construction industry and architecture.

Structuring since ECOINVOLUCRATE in 5Rs is understood as an opportunity to benefit professionals in the construction field through its sub-group form the determinant of the new low carbon economy, hence the need to lay the groundwork for germination actions as ECOINVOLUCRATE program 5Rs provide answers to improve the environment.

ACKNOWLEDGEMENTS

This scientific work has been sponsored by the Prometeo Project of the Ministry of Higher Education Science, Technology and Innovation of the Republic of Ecuador. The article is part of the research project "ECOINVOLUCRATE EN 5Rs", conducted by the author at the Faculty Architecture and Urbanism at the University of Cuenca (Ecuador) within the Prometeo Project SENESCYT.

REFERENCES

[1] CHACON, R. y PAMPINELLA B. 2011. Educación para la Sostenibilidad: Formación académica de Arquitectos y Urbanistas. Universidad Autónoma del Estado de México. EDUCRE. Artículos arbitrados. ISSN 1316-4910, Año 16, Nº 53, Enero –Abril de 2012.
[2] GARCÍA NAVARRO, J.; GARCÍA NART, M.; NICOLÁS RODRIGO, J. L. (2001) *Buenas prácticas para la mejora de las condiciones de vida en las ciudades. INFORMES de la construcción. Vol. 53, núm. 475, septiembre-octubre 2001*.
[3] INSTITUTO DE LA CONSTRUCCIÓN DE CHILE. (2012) *Manual de Diseño Pasivo y Eficiencia Energética en Edificios Públicos*, mayo 2012. ISBN: 978-956-8070-04-5.
[4] CASTILLO C. A. y DEL CASTILLO O. M. (2009). La enseñanza de la sostenibilidad en las Escuelas de Arquitectura españolas. La Serena (Chile), octubre de 2009. http://habitat.aq.upm.es/boletin/n42/ac-ccas.html (Consulta el 21 de mayo de 2014).
[5] SENPLADES, Secretaria Nacional de Planificación y Desarrollo, (2013) *"Plan Nacional de Buen Vivir 2013-2017"* Quito, Ecuador.
[6] EVANS, J. M. y SCHILLER S. (2013). *"Promoción de Eficiencia Energética y Uso de Energía Solar en Vivienda del Ecuador".* 2013
[7] CONELEC, Consejo Nacional de Electricidad (2008). *"Atlas Solar del Ecuador, con fines de generación eléctrica".* 2008
[8] CONELEC, Consejo Nacional de Electricidad (2013). *"Regulación no. 001/13". 2013.*
[9] CONELEC, Consejo Nacional de Electricidad (2014). *"Regulación no. 014/14, Codificación de la Regulación no. 001/13".* 13 de marzo 2014.
[10] CONELEC, Consejo Nacional de Electricidad (2011). *"Regulación no. 004/11. 4 abril 2011".*
[11] CONELEC, Consejo Nacional de Electricidad. *"Plan Maestro de Electrificación 2013-2022".*
[12] EMAC, Empresa Municipal de Aseo de Cuenca (2003). *"Ordenanza que regula la gestión integral de los desechos y residuos sólidos en el cantón Cuenca".* 1 abril 2003.
[13] EMAC, Empresa Municipal de Aseo de Cuenca (2013). *"Reglamento para el manejo de residuos y desechos de construcción y escombros del cantón Cuenca".* 26 febrero 2013.
[14] INEN, Instituto Ecuatoriano de Normalización (2008). *"Reglamento Técnico Ecuatoriano 036:2008".* Quito, Ecuador, 2008.
[15] INEN, Instituto Ecuatoriano de Normalización (2009). *"Norma Técnica Ecuatoriana, Rendimiento térmico de colectores solares en sistemas de calentamiento de agua para uso sanitario. NTE INEN 2 507:2009".* Quito, Ecuador, 15 mayo 2009.
[16] INEN, Instituto Ecuatoriano de Normalización (2009). *"Norma Técnica Ecuatoriana, Eficiencia Energética en Edificaciones: requisitos. NTE INEN 2 506:2009".* Quito, Ecuador, 2009.
[17] MAE, Ministerio Del Ambiente Del Ecuador (2010) Certificación Ecuatoriana Ambiental "Punto verde"

[18] MINISTERIO COORDINADOR DE SECTORES ESTRATÉGICOS (2013). *"Balance Energético Nacional"* 2013.
[18] MINISTERIOS DE DESARROLLO URBANO Y VIVIENDA – CÁMARA DE LA CONSTRUCCIÓN DE QUITO (2011). *"Norma Ecuatoriana de la Construcción de Ecuador, NEC-11, Capitulo 13: Eficiencia Energética en la Construcción en Ecuador, Capitulo 14: Energías Renovables".* 2011.
[19] MINISTERIO DE SALUD PÚBLICA (1992). *"Reglamento para el manejo de los desechos sólidos, Acuerdo ministerial 14630".* 3 agosto 1992.