



# University sustainable development: debates, policies and learning for Ecuador

## Universidad para el desarrollo sostenible: debates, políticas y aprendizajes para Ecuador

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#### ABSTRACT:

In this document, we deal with the debate of policies (such as regulations aimed at strengthening scientific research activity in all its broad and complex dimensions) associated with sustainable development in its connection with the university understood as an institution dedicated to knowledge, science, technology and innovation (Nuñez Jover & García Vacacela, 2017). We briefly describe the problems in the social dimension of knowledge, which in some cases has brought with it relativistic, conventional and irrationalism sequels within the academy, in this fragmented university logic, considering also the increase in coverage and access demands have resulted in the introduction of unequal university circuits, with serious problems of free access to education that in turn limits the creation of science and technology for sustainable development; we proceed to argue the urgency of reviewing the epistemological foundations from which we analyze and habitually create university policies for science and technology, and how these should be oriented towards sustainable development. Also reviewing the model of Ecuador, which has promoted various research programs and mechanisms that together allow us to

#### RESUMEN:

En este documento, nos ocupamos del debate de las políticas (como normativas orientadas a fortalecer la actividad científica investigativa en todas su amplias y complejas dimensiones) asociadas al desarrollo sostenible en su conexión con la universidad entendida como institución dedicada al conocimiento, la ciencia, la tecnología y la innovación (Nuñez Jover & García Vacacela, 2017). Describimos brevemente los problemas en la dimensión social del conocimiento, misma que en algunos casos ha traído consigo secuelas relativistas, convencionalistas e irracionistas dentro la academia, en esta lógica universitaria fragmentada, considerando además el aumento de la cobertura y las demandas de acceso han derivado en la introducción de circuitos universitarios desiguales, con serios problemas de libre acceso a la educación que a su vez limita la creación de ciencia y tecnología para el desarrollo sostenible; procedemos a argumentar la urgencia de revisar los fundamentos epistemológicos desde los cuales analizamos y creamos habitualmente las políticas universitarias para ciencia y tecnología, y como estas deben estar orientadas al desarrollo sostenible. Revisando además el modelo de Ecuador, donde se ha

infer the existence of priorities for science and technology. Coming to the conclusion of the need to move towards a model of higher education that promotes sustainable development. We will go as an illustration to some examples available in Ecuador and the alternative of integral humanism as a starting point to operate a more human research process, allows the researcher to execute research processes focused on the development of society.

**Keywords:** Latin America, University, Sustainable development, Politics, Ecuador

impulsado diversos programas y mecanismos de investigación que en conjunto permiten inferir la existencia de prioridades para la ciencia y la tecnología. Llegando a la conclusión de la necesidad de avanzar hacia un modelo de educación superior que promueva el desarrollo sostenible. Acudiremos a modo de ilustración a algunos ejemplos disponibles en Ecuador y la alternativa del humanismo integral como punto de partida para operar un proceso de investigación más humano, permite que el investigador ejecute procesos de investigación centrados en el desarrollo de la sociedad.

**Palabras clave:** Latinoamérica, Universidad, Desarrollo sostenible, Políticas, Ecuador

## 1. Introduction

The present work approaches the debates, policies and learnings of the Ecuadorian university as a study object, as a process oriented to strengthen the scientific research activity in that level of education in all its extensive and complex dimensions. The scenario in which the sustainable development model is framed is characterized, in the Latin American context, by the unavoidable nature of the need to produce substantial changes in "productive development, distributive equity and the fight against poverty, cohesion, governance, citizenship and social participation; quality education with wide coverage and protection of the environment "as pointed out by Núñez (2009). This document also points out and explains the relationship that exists between the objective of sustainable development and the unavoidable transformations in the models of scientific and technological policies and practices and the institutions of Ecuador that promote them. Feenberg (2012) has emphasized the role of technology asserts that "This is the underlying problem on which the future of industrial civilization depends" (p.13). In his view, this requires a critical theory that rejects the idea of technology neutrality and technological determinism (Nuñez Jover & García Vacacela, 2017).

The arrival of the 21st century has sharpened the great challenges faced by the university since the end of the last century. Contemporary society sees higher education institutions as spaces for the production of knowledge, where on the one hand, research processes for the production of new scientific and technological knowledge (Nuñez Jover & García Vacacela, 2017) come together, and on the other hand, processes of postgraduate training of those actors called to produce this new knowledge (García Vacacela, Mera, & Villavicencio Bermudes, 2017), both one or the other, aimed at responding to social needs and contributing as much as possible to processes of innovation and transformation in the different areas of life.

Scientific and technological change undoubtedly involves universities. Consequently, it seems appropriate to move towards a model of higher education that promotes sustainable development, including the fight against poverty and social inclusion. This debate is taking place in Latin America and is promoted by the Union of Latin American Universities (UDUAL) (Larrea Santos & Granados Boza, 2016).

In this process of rethinking universities and their social function, it is possible to take advantage of new approaches to science, technology and innovation, including concepts such as technology and social innovation, innovation systems for inclusive development, science of sustainability, integrated science, among others. From these concepts, it is possible to rethink the role of the university in technological change (Nuñez Jover & García Vacacela, 2017). Some examples will allow us to illustrate that it is possible to promote research and innovation agendas that serve the purposes of sustainable, inclusive development. It seems appropriate to do so in the prelude to the year 2018, when Latin America and the Caribbean will commemorate the centennial of the Cordoba Reformation. We think this is a good opportunity to discuss these issues in depth.

## **1.1. The University in Ecuador, the vision from Latin America**

The university, by its nature, is an organization based on knowledge, with different emphases depending on the university concerned, and whose mission is to generate or create, transmit and disseminate knowledge. The generation of knowledge is usually associated with the function of research; the transmission of knowledge with the graduate and postgraduate teaching function; and the dissemination or dissemination of knowledge with the function of knowledge transfer. Being an organization intensive in knowledge, its ability to manage the creation, transmission and dissemination of it, becomes crucial in the contemporary world. But the attention to the social dimension of knowledge in some cases has brought with it relativistic, conventionalist and irrationalism sequels. Notions such as truth, rationality, objectivity, all touchstones of scientific praxis, have often been displaced. Usually epistemology has focused its attention on scientific knowledge, especially from the points of view of its nature, justification and validity. The requirements that something must fulfill to be recognized as genuine knowledge, the conditions of possibility of that knowledge, its relationship with the objects that are known, among other problems, have traditionally attracted the attention of epistemology. This type of reflection has almost always considered irrelevant the social and historical context in which knowledge is produced. Meanwhile, the social dimension of knowledge, and science as its most systematic expression -has almost always been addressed by the sociology of knowledge and science and also by the social history of science (Morles, 1996). In these perspectives, problems of impact, institutionalization of science, among others, are discussed.

Since the late 80s of the twentieth century, with different national intonation, higher education systems in Latin America began an expansion and differentiation on various restrictions and dualisms that have limited and limited those transformations (Nuñez Jover, 2009). This expansion has been fundamentally quantitative, with high social lags, imbalances and national asymmetries; reduced and differentiated quality, low equity and focused on a professional degree and face-to-face training; this is partly associated with poor regulation, paradigmatic resistance, lack of systemic policies, high institutional autarchy and strong commodification (Aragonés, 2011).

Since 1980, Ecuador has experienced a process of social commodification in all its spheres. Differentiated systems were built in access to health, education, and social security, in which these goods were based on the purchasing power of citizens. The State was built as a market residual and of poor quality, as a self-fulfilling prophecy to justify privatization processes. In this way distinction and social stratification was built. Along with that, a productive structure dependent on export commodities with zero added value was deepened, in the name of market freedom, while the importation of industrialized and technological goods with high added value was deepened.

The alternative of integral humanism as a starting point to operate a more humanizing research process, allows the researcher to execute research processes focused on the development of society. But above all the development of its potentialities. Thus, science develops the capacity of the human being to transform society. It is because of the creativity of man that science exists, a significant human product created from the natural world in which it lives.

Since approximately 2010, Ecuador has promoted various research programs and mechanisms that, together, allow us to infer the existence of priorities for research, science and technology. The UCSG in consonance with the Christian faith and the National Plan of Good Living from the SINDE promotes research with a social purpose, having clear the principles of ethics and responsibility with the role that the academy has with society, without having commercial intentions or marketing of science.

## **1.2. The Autonomy of Science and Technology Systems of Latin**

# America and its research model

Policies aimed at creating "national innovation systems" have been accompanied by guidelines for financing research that seek to articulate it to the business world, but the agendas do not usually reflect the interests of the most disadvantaged sectors. As the distribution of income is so unequal, these sectors do not usually benefit from local innovation, also oriented towards the consumption of higher income sectors. The alternative would have to come from a deeper social movement that installs a true "economic democracy" where the economic model is oriented primarily to meet the needs of the entire population: needs for food, housing, health, transportation, education, ie, the basic human needs that face the problems of poverty, exclusion and inequality. Something like the aforementioned before Larrea and Granados (2016): "build the Society of Good Living based on the social management of knowledge". For this, other socio-technical trajectories will have to be built, another pattern of knowledge production. As a result, new possibilities would open in the exploration of the scientific-technological frontier.

The construction of an "autonomous technological capacity" is affected by a variety of social factors (Sábato and Mackenzie, 1982):

- a) Interest groups that benefit from technological dependence
- b) The weak competition of the State that must fulfill one of the leading roles, and its limited capacity to apply and enforce decisions of a technological nature.
- c) The intellectual alignment of the groups of the ruling class that postulate that nothing can change because 'we are not capable' and of other groups that postulate that nothing can change because 'they do not leave us'.
- d) The modality of existing rationality, according to which it is better business to import technology than to produce it locally.
- e) Cultural dependence, according to which all foreign technology is better because it is foreign.
- f) The value system in force, according to which addressing the superfluous consumption of elites has priority to meet the essential consumption of the majority of the population.
- g) The mimicry of the periphery, which leads to copying even the worst products and processes of the center.
- h) Local financial mechanisms, which do not provide risk capital for the production of technology but which guarantee all the 'prestigious' import of technology.
- i) The scarce articulation between the protagonists of the process: State officials, businessmen and managers and scientists and technicians.

All these formulated more than 20 years ago the causes listed remain valid. They serve the previous notes to remind us some basic points in the face of a policy discussion: knowledge, science, research, the postgraduate are social constructions. Their trajectories, modes of organization, ethos, articulations to society, are the result of a constellation of social circumstances that determine them while receiving their influences. Knowledge, science, technology, innovation and society constitute a seamless fabric. This network is deeply imbued with economic, social and political interests and their associated values.

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## 2. The case of Ecuador

Since 1980, Ecuador has experienced a process of social commodification in all its spheres. This social shipwreck came hand in hand with processes of exclusion in the country. (Ramírez, 2016). Together with this and in the name of market freedom, a productive structure was institutionalized with the aim of exporting with no added value while the import of industrialized and technological goods with high added value was increased, in an accelerated manner. During the government of the citizen revolution in Ecuador, the Constitutional Assembly of 2007 states in article 386: "The State, through the competent body, will coordinate the system, establish

the objectives and policies, in accordance with the National Development Plan, with the participation of the actors that make it up "(Constituent, 2008).

The National Plan for Good Living 2013-2017 (PNBV) clarifies the relationship to an articulation of science and technology in the development of the country, and its 2017-2021 update deepens this relationship. Although most of the national objectives proposed in the PNBV mention the importance of S & T, the promulgation of a national policy on the subject is still pending. In Chapter 5 "National Development Objectives for Good Living", the role of technology, innovation and knowledge as engines of the transformation of the State is recognized; in this section, the ecuadorian university is mentioned as a fundamental actor. In this same context, PNBV 2013-2017 positions the Yachay Experimental Technological Research University as a model that generates human talent, knowledge and social innovation. Additionally, it is mentioned that Yachay's research lines are: Life Sciences, Nanosciences, Information Technologies, Renewable Energies and Climate Change and Petrochemicals. As for the prioritization of research lines, the UCSG is based on its installed capacities and what is defined by the National Development Plan 2017-2021.

The Agenda for Productive Transformation 2010-2013 (ATP) is synchronized with the PNBV 2013-2017. This document mentions the need for innovation and entrepreneurship policies for the ATP, assuming the existence of a policy system that regulates S & T activity; In other words, it seeks to strengthen innovation and entrepreneurship by strengthening the fundamental basis of research (due to its relationship with the PNBV). The ATP incorporates innovation policies, such as: (i) Strengthening research institutions, (ii) Articulation of research institutions, educational centers and the private sector, (iii) Access to financing for research, (iv) ) Access of the productive sector to research and development of products, (v) Acquisition of capital goods and technological packages, (vi) Development of trained human talent, among others. The ATP proposal includes policies that directly or indirectly involve the development of the research, but they remain in a general scope.

## **2.1. The science and technology policies in Ecuador decade (2007-2017)**

In 2007, the document National Policy of Science and Technology and Innovation of Ecuador 2007-2010 developed by Senacyt was disseminated. In this document it is mentioned that "the National Policy of Science and Technology, is oriented to the transformation and progress of the country in 5 large areas of national priority, such as (i) sustainable agriculture, (ii) environmental management for development, ( iii) industrial and productive development, (iv) energy and its renewable alternatives, (v) information and communication technologies (ICT), (vi) biotechnology, (vii) recovery of public research".

In July 2010, the Senacyt draws up and publishes the National Science, Technology, Innovation and Ancestral Knowledge Plan, in which it defines 6 major national challenges and 6 national policies aimed at strengthening the framework processes of integral formation with the Political Constitution of Ecuador and the National Plan of Good Living, documents that make up the State's governance platform in search of improving the living conditions of the population, however it is not until December 2016 that the National Assembly approves the "Organic Code of the Social Economy of Knowledge" , Creativity and Innovation " , being an innovative law project for the region, which seeks to change the country's production model and prioritize the talent and innovation of Ecuadorians. The main objective of this code is to regulate the SNCTISA with the National Integration System, the Higher Education System and the National Culture System (National Assembly of Ecuador, 2016), in order to generate a social culture of knowledge, creativity and social innovation.

The first book of the code clearly identifies the creation of the National System of Science, Technology and Ancestral Knowledge, it defines the organs and functions that make it up, also establishes the guidelines of the National Plan for the Social Economy of Knowledge, Creativity,

Innovation and Ancestral Knowledge to delineate the guidelines that will allow achieving the objectives 8, 10 and 11 of the National Plan of Good Living, also proposes that the economic model of Ecuador passes from primary to exporter and presents a new model of Productive Matrix to turn the country into a supplier of knowledge, products and services with added quality value, strengthening technical support so that intellectual property and author, collective and individual rights in the scientific and cultural sphere are protected correctly (National Assembly of Ecuador, 2016).

Book 2 defines the guarantees to the freedom of responsible, ethical and respectful research with the human being and nature; rescuing, taking advantage of and enhancing ancestral knowledge, this through the establishment of mechanisms to increase the number of national and foreign scientific researchers in the SENESCYT and accredit them through strict processes of probity and validation of professional and ethical quality. In addition, this book promotes the career of scientific researcher, said professional must be subject to the Regulation and Escalon of Scientific Investigator, defining also that their remunerations will be determined in each area and Human Talent coordination subject to the LOSEP. It promotes social innovation, and defines it as "the creative and collaborative process in which a product, good or process with added value is introduced that modifies social behaviors to solve everyday problems" (National Assembly of Ecuador, 2016).

Book 3 proposes a new knowledge management model that replaces the Intellectual Property Law, which develops a set of tonalities of intellectual property forms considered in the Constitution of the Republic of Ecuador, providing a balance between the rights of holders of intellectual property rights, be they creators or merchants and users, competitors and citizens. It is necessary to highlight the establishment of new forms of intellectual property: public, private, community, state, associative, cooperative and mixed; It also establishes the type of goods allowed in goods that guarantee fundamental rights, which are related to strategic sectors, goods related to biodiversity and ancestral and traditional knowledge.

Book 4 creates incentives to strengthen human talent, responsible research and social innovation, also proposes that the beneficiaries of financial or administrative tax incentives are SNCTISA actors that are accredited, registered or approved by the competent authorities.

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### **3. Discussion**

The LOES Reform proposal is produced as a result of the LOES Subcommittee of Evaluation detecting in its report situations that need to be modified around higher education in the following aspects: "1) The system of distribution of resources for the Private institutions do not depend on the number of students with limited economic resources, which limits compliance with the constitutional provision; 2) Allocation of resources to non-accredited institutions; 3) Breach of article 30 of the LOES; 4) Type of scholarships awarded; 5) Heterogeneity of the tariff systems of the grant allocation procedures; and 6) Deficiencies regarding the timeliness of Accountability Processes. "; in order to avoid the existence and permanence of particular higher education institutions that are far from quality standards and financed with public resources.

The General Provision of the COESIC establishes that the Higher Education Council must allocate a percentage of the FOPEDEUPO to fund postgraduate scholarships in public institutions of higher education, as long as the principle of gratuity in the undergraduate is guaranteed.

Among the topics that are proposed to reform are the mechanism for the typology of universities and polytechnic schools; the percentage of designation of scholarships for professors and research according to the typology of HEIs; the exoneration of the ICE and customs duties, as well as in relation to scholarships and financial aid for students; the accreditation will be valid for three years; among others.

One of the most relevant aspects that is inserted in the proposals of reforms to the LOES has to do with the prohibition of profit of the universities, due to the contraction of contracts or agreements with legal entities that are domiciled in tax havens or in countries that have a lower

tributary tax to that of Ecuador.

The proposed reforms to the LOES seek to guarantee the quality of Ecuadorian higher education and, at the same time, avoid tax evasion and illicit enrichment through the manipulation of higher education institutions.

In addition, the proposed modifications tend to streamline the procedures for public procurement for research and teaching in public universities, as well as the possibility of autonomous management of self-management funds, which will allow the acquisition of goods and services to be framed in the particularities of HEIs

### **3.1. Sustainable development and the UCSG**

The Catholic University of Santiago de Guayaquil in Ecuador has also incorporated technology and social innovation policies, the result of which is the incorporation of ecomaterials into its work agenda since 2010. It started with the project "Pilot Plant for research, production and technological transfer in use of innovative Ecomaterials for the construction of low-cost housing" financed by the Secretariat of Higher Education, Science, Technology and Innovation (SENESCYT) of Ecuador and the University. The project developed an innovative system for medium-scale production of alternative construction materials, whose essential characteristic is to be environmentally sustainable, emphasizing the use of *Guadua angustifolia* as raw material.

From the social perspective, the project contributed with cheap technologies and low level of environmental pollution to reduce the costs of popular housing in Ecuador, framed in concrete proposals of construction models that use a high percentage of ecomaterials, without sacrificing the characteristics of decent and adequate housing. The project also seeks to contribute to the reduction of environmental pollution generated in the manufacture of construction materials such as concrete and steel, which release large amounts of CO<sub>2</sub> and SO<sub>2</sub> into the atmosphere, while reducing the amount of consumption of electric power.

The UCSG physically and administratively integrated the necessary components for linear innovation with ecomaterials, at the beginning the project had an area of research, an industrial design workshop, a management unit and a medium-scale production plant; Methodologically, the project started with a thorough investigation of the available technologies in Ecuador and Latin America, later the bibliographic material collected was incorporated into the "Exposition of Materials Bank" located in the *Guadua* library within the campus of the University, this added to interviews with technical actors from institutions related to construction, technical visits, tests of materials laboratories and resistance tests generated 9 types of construction materials, which are currently in the process of obtaining a patent.

Of the 9 types of construction materials obtained, the case of the "ESTER BAN" used in the "Pedro Vicente Maldonado" Scientific Station, which Ecuador maintains through its National Navy in Antarctica, whose use is motivated by the need to mitigate the risk, stands out. of loss by fire of human lives and of research infrastructure, as it happened before in the bases "Belgrano II" and "Comandante Ferraz" of Argentina and Brazil respectively.

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## **4. Conclusions**

Only five institutions of higher education are authorized to offer a PhD, from a total of 59 universities and polytechnic schools. These are: the Latin American Faculty of Social Sciences (Flacso), Andina Simon Bolivar University, Polytechnic High School of the Littoral (Espol), the San Francisco University of Quito (USFQ) and the National Polytechnic School (EPN).

In total there are 18 programs approved by the National Secretariat of Higher Education, Science, Technology and Innovation (Senescyt).

At the Universidad Andina, in Quito, there are seven programs, of which six are linked to the social sciences. The other is administration.

In Flacso, however, there are six PhDs in progress. All linked to Social Sciences. La Espol has a program in Applied Computer Science, the San Francisco, a PhD in Microbiology. And the EPN has six programs such as the PhD in Water Resources and Applied Mathematics.

The National Higher Education Information System of Ecuador (Sniese) registered 4 068 fourth level titles in 2014 and 3 603 in 2013. There was an increase of 12.91%.

The majority of PhDs were obtained in Spain due to the ease of the language. Statistics include doctorates and master's degrees.

The increase, in part, has to do with the national regulations that require teachers to have a PhD in order to be able to climb the salary ladder and give a permanent chair.

Article 150 of the Organic Law of Higher Education (LOES) states that to be a full professor of a public or private polytechnic university or university, professionals must have a graduate degree corresponding to a doctorate (PhD or its equivalent) in the related area. in which he will hold the chair.

People who do not have this type of degree, according to this law, will have the opportunity to obtain it until 2017. But there is an exception for professors and researchers who reached the category of main holder before the LOES was in force and who does not have a PhD degree. They will not lose their job or their salary will be affected.

According to the Senescyt, between 2007 and 2015, 1,582 scholarships were awarded for doctoral studies abroad. Production and innovation sciences such as Nanotechnology, Animal Production, Mareography, Agoindustria represent the area of knowledge with the most scholarships with 41%, followed by those of Life Sciences (Biochemistry, Botany, Microbiology, etc.) and the Social Sciences.

What has been discussed so far allows us to grasp the dynamics of research in Latin America. Undoubtedly, very important advances are appreciated, especially in terms of production and dissemination of knowledge. The problem of socio-economic use of knowledge is presented as more complicated. Apparently, there will be a need for persistent public policies that allow the articulation of supply and demand for knowledge, transforming the "fabric of relationships" that allows knowledge to fully fulfill its social function. In this document we have argued the need to link transformations in development models with changes in scientific and technological practices and university policy models. If we are committed to sustainable development, it is essential to incorporate into our institutions practices of the science of sustainability, integrated science, technology and social innovation and promote socially inclusive innovation systems. All this challenges the universities. In 2018 Latin America and the Caribbean will commemorate the centenary of the Cordoba Reformation. We suggest that it is a good opportunity to discuss these issues in depth.

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