Science Diplomacy and Higher Education: Case Study of *Prometeo Programme* in Ecuador

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Introduction

Ecuador's higher education system is experiencing changes. The National Constitution of 2008 and the Higher Education Law of 2010 have changed the way Ecuador's universities were funded, administered, and accredited. The importance of research was stressed and drastic changes were made for academic qualifications and employment conditions of full-time faculty-members. This paper details about how Ecuador universities are changing to meet challenges of the technological age.

Currently, there are 57 universities in Ecuador; 29 are public and are under the direct supervision of the country's legislation. In the past, the government as well as students covered financial expenses of public universities. However, since public education has become free after 2008 Constitution, and admission of the students are coordinated by the central government, public universities have lately become completely dependent on government approval with regard to their budgets, curriculum innovation, administration and students admission. On the other hand, private universities receive some financial support from the central government, and have some autonomy regarding curriculum development and administration.

Over the years, questions have been raised regarding quality of education of the institutions, especially the private ones. It is difficult to attract foreign talent to work in Ecuador given the relatively low salaries of university professors compared to other countries. And many Ecuadorians who have pursued graduate degrees in other countries have decided to stay abroad, as salaries

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there are competitive and research opportunities are plentiful, and resources are comparatively easier to have.

Since Ecuador's universities are mostly focussing on teaching at the undergraduate level, the graduate-level education is dispersed and not of standard. Many professors and administrators do not hold master's or doctoral degree; and less than 5 percent of Ecuador's professoriate have PhD degree, that to from abroad. At present, only two universities in the country offer PhD degree in social sciences. In fact, no PhD studies, so far, have been completed in Ecuador.

Ecuador has created a legal framework to reinforce and promote technology and science development. Under this context, public policy, institutions and programmes have been created by the central government. This paper is focusing on one initiative on the higher education, called "Prometeo Programme".

First, the concept of science diplomacy and the way it is connected to education would be narrated. It would describe the attempt to raise the level of Ecuadorsystem of higher education and its impact on faculty and administrators. Next, would be a brief description of the project location and its main characteristics. Then, focus would be on the general information about the Secretariat of Higher Education, Science, Technology and Innovation (SENESCYT). This Secretariat was created to regulate education, science and technology in Ecuador.

Subsequently, it would give details of the singular programme created by the Secretariat— Prometeo Programme, and then its vision and objectives would be chalked out. Following, examples of projects under the programme and their results would be analysed. Finally, there would be assessment and the impact of this programme on Ecuador's educational level.

Approaches to Science Diplomacy

Humanity's greatest challenges – and some of its most promising opportunities – are regional and global. Increasingly, the world requires effective partnerships among scientists, policy-makers and diplomats.

Science diplomacy takes many forms— When nations come together to negotiate cooperative agreements on fisheries management or infectious disease monitoring, they need scientific expertise. When scientists come together for complex multi-national projects in astronomy or physics, their nations devise diplomatic agreements on management and financing. And when political relations between two nations are strained or broken, joint research efforts can give them a way to keep interacting, and build trust. At present, the need for science diplomacy is growing.

More countries are strategically incorporating science into their foreign policy. This author describes national case studies that show key drivers and approaches for how certain countries utilize, or should utilize science diplomacy.

Nature of the science and technology, the speed with which it is developing and spreading, and the extent it is essential to national priorities is leading more countries to look at the international component of their science strategies. The result is greater policy emphasis on the issue broadly defined as science diplomacy, which reflects ways in which countries incorporate science in their foreign policy. This trend is taking place partially because issues the foreign policy community face are becoming more technical, necessitating a greater understanding and use of science and technology.

Countries often need to cooperate at a large scale to address most complex and expensive scientific and shared challenges; requiring successful interaction of scientists and diplomats. The infrastructure is often the most challenging and also most visible of science diplomacy of a country.

Research has historically received very little support in Ecuador universities, and the system does not provide adequate means for successful research: the research infrastructure is outdated, there are no incentives for faculty to do research; there are no mechanisms to attract students to participate in research projects; and there is a lack of understanding of basic research methodology at the undergraduate, graduate and faculty levels.

The Ecuadorian case: Prometeo programme is an innovator for the interchange of PhD students, and presents a unique foreign policy challenges. The interaction with international universities allow Ecuadorian students to be the part of the international challenges, focusing on facilitating dialogue between academics, students, and practitioners of science diplomacy in different fields.

Ecuador: location and special features

Ecuador is located in South America. It has four regions-the Galapagos, the Coast, the Andes and the Amazon. Due to its location in the middle of the world, this nation is among the 17 most biodiverse countries. It has exotic and endemic species of flora. Within its territory 1,600 species of birds, 350 species of reptiles and 400 species of amphibians can be found. This country has around a sixth of all vegetal life of the planet in less than 1 percent of its surface.

Its cultural diversity can be found in 15 indigenous nationalities, 13 native languages and different customs, gastronomy and festivities. To preserve its flora and fauna, many protected areas have been created and are safeguarded by legislation. Nature and cultural diversity of the country bring a great potential to plan a variety of research projects (Senescyt, 2018). Given these advantages, such as unique flora and fauna, its government has seen development opportunities and has looked for opportunities to exploit them in favour of its development. A need to create technology and conduct research to improve social and economic conditions has resulted in changes on Ecuador's public policy; seen on the legal area.

Ecuador's Constitution has created a framework under which education has been given priority on the public policy area. It promotes and encourages science and technology development as a platform to attain a good quality life for its citizens (Asamblea Nacional República Del Ecuador, 2008; Senescyt, 2018). Under this framework, the Secretariat of Higher Education, Science, Technology and Innovation (SENESCYT) has been created.

Its mission is to direct public policy on areas such as science and technology with the aim of promoting research, innovation and technology transfer. This would be achieved through elaborating, executing and evaluating policies, programmes and projects. As part of this promotion of development of science and technology, this Secretariat has established Prometeo Programme.

Prometeo has been named as an emblematic programme for the country due to its scope and objectives. Its creation was driven by the idea of founding development on the training of human talent. The main objective of this programme is to develop research capacities of higher education institutions and governmental entities to strengthen strategic sectors of Ecuador. It is aimed to have foreign and local experts with extensive experience on their fields of study. A number of fields of knowledge have been established as priority by the government. Among these, are production and innovation, life and natural resources, economics, business education, administration, social and behavioural sciences and art and culture (Senescyt, 2018).

Prometeo Programme: Technology and knowledge creation

Ecuador public policy has been focused on creating an environment that offers conditions attractive not only to national but to international researchers. It has promoted natural and cultural advantages of this country due to its geographical location and cultural diversity. Prometeo Programme has become a development tool for Ecuador, as it focuses on the specific needs of the country, its growing opportunities and strengths. This has been achieved due to priority areas of the government where studies are needed and projects are to be executed. The reason of setting these guidelines is to make these projects go along with the development objectives set by the government, and thus have a real impact on the society.

Ecuador's universities were in need of a change, and the 2010 Higher Education Act, compelled faculty-members to seek advanced degrees; and universities paid greater attention to research.

Among the activities that researchers have to carry out are execution of a research project, transfer of knowledge to national research and academic teams, promotion of research networks and international cooperation, review and publication of papers and books, publication of research results, organization of seminars, lectures and workshops. seventy seven percent of the researchers worked with universities, polytechnics and trained 57000 professors till 2014 (Senescyt, 2018). Through all of these activities, assurance is that the knowledge is not centralised and it is reachable to people. Importance of sharing information is highlighted, and it should be used in a way that has wider impact on the society.

One of the research projects developed under Prometeo Programme was focused on the agricultural area. Maria Carmen Tarsila Martinez Gomez, a Spanish researcher, decided to develop a project to stimulate the defense system of a local plant named "lulo" to avoid use of fungicides or chemical components. Martinez chose Ecuador for doing this project because of the advantages offered by the Prometeo Programme. She was keen to work in a developing country, and was attracted to Latin America because of its culture and language. One of the most remarkable aspects of this project was that it was for the first time that genetic analysis of lulo plant could be carried out. According to the researcher, the main beneficiaries of this study would be farmers, since huge loss of product could be avoided by the application (Senescyt, 2017).

The Prometeo Programme allows scientists to work on its flora that is unique in this part of the world. It is important to highlight that this kind of projects have offered the opportunity to have access to plant life that was not studied earlier. Given that the studies are done under the parameters based on the country's needs, they have a direct impact on Ecuadorian society. These studies have allowed researchers to work on projects and come out with results that improve agricultural sector and would directly impact local economy.

Another project developed under the Prometeo Programme was on water resources. Francisco Alcala decided to apply for this programme because of Ecuador's weather, geography and environment. His study was focused on the evaluation of climate change on the underground water resources on Tungurahua province. This project gave the first data on the chemical components of the rain. It is important to highlight that this project was designed under the priority areas by Prometeo Programme (Senescyt, 2017).

Another project was executed by professors and students from the Salesiana Polytechnic University and they worked together with the Prometeo Programme. Their project focused on designing and developing a wireless system that would allow monitoring patients suffering from Parkinson. This tool would revolutionize diagnosis of the illness as it would register precisely the disease progress. This work was done by Monica Huerta for the Prometeo Programme. She had 20 years of experience on the electronic area related to medicine. Students from Salesiana University and also a neurosurgeon ,with experience on Parkinson disease, were involved. Besides creating new knowledge, this project allowed students to get involved with research. It received awards such as — "Matilde Hidalgo award to Education, Science, Technology and Education" and "Award thesis project, devices design" (Senescyt, 2018).

This project would clearly improve the quality of life of Ecuador's citizens. It would have a tangible effect on the social area, especially, in the health-care system. Another benefit from this is that it allows youth to get involved. This is an example of how the experience and knowledge acquired by the leader of the project is shared with local students. Shared knowledge means that this area of expertise can be deepened in future studies; and the results can be improved and the scope of impact would be widened and would benefit larger population.

Results

Up to December 2014, there were 819 Prometeo researchers, who prepared 912 projects and published 265 articles in indexed scientific journals. And 100 of the researchers were Ecuadorians, the rest came from 48 countries. One of the main economic attractions includes a monthly allowance from USD 4 320 to USD 6 000. The scheme has invested USD 27 million between 2013 and 2014. It planned to allocate USD 20 million on 2015. The Polish psychologist Mariusz Wotonciej arrived in the country in November 2013 to measure impact of culture and education on the youth entrepreneurial spirit. It also plans to promote inclusion of people with mental disabilities as well as creation of playful learning spaces for children. He is writing a book reviewing his programme: it includes improvement of a tool to diagnose skills of seniors at school (Senescyt, 2017).

The projects chosen to be a part of Prometeo Programme are linked to the needs of the higher education centres. The first step for applying to this Programme is to approach to the host university. Scholarships are only granted when the project cannot be developed by Ecuadorians. The Spanish researcher David Vila, who works as a fellow at the Institute of Higher National Studies (IAEN), emphasizes that the main strength is the stability and adequacy of the institutional work climate, along with the ease of focusing their resources towards research. And the weaknesses of the programme is the normal phases of initial development of any research system. He works as a part of the Good Knowledge / FLOK Society project. (Senescyt, 2017).

Despite the positive impact of the projects executed under Prometeo Programme, weaknesses have been detected too. One of the problems was that when researchers arrived to the host institution, they did not have adequate equipment in the laboratories. Given this situation, they were limited to focus only on administrative tasks. In addition, there were complications while training local professors due to lack of motivation, time and learning flexibility.

Lack of equipment and organization on the side of host institutes is an obstacle for researchers. It is important to highlight that this represents misuse of resources of the central government as the researchers were not able to work on the project they were supposed to develop. There should be a complete assessment of not only the need of studying a determined area of knowledge but there should be a combined work between SENESCYT and the host institution to assure availability of required equipment to carry out investigations.

Ecuador faces changes on its education system. These are happening fast and their results would only be evaluated in future to determine whether these changes have brought the desired effects.

Conclusion

This paper has developed the concept of science diplomacy focused on education. It has defined the characteristics of Ecuador like its location and natural assets. It also highlighted the way in which this country's public policy has created the legal framework and institutions to promote development of knowledge and technology. With the help of three projects driven under Prometeo Programme, this article has exemplified the impact that research has in agriculture, hydrology and medicine. Moreover, the areas of research had been defined accordingly with the development plans set by the national government. This means that the technology and knowledge resulted from this programme was of use and had a positive impact and would improve social and economic conditions of this developing country.

Research has historically received very little support in Ecuador's universities and the system does not provide adequate means for successful research: the research infrastructure is not updated. One of the most important things that the government has to invest in is to give latest equipment to universities so that researchers can fulfill their objectives.

There are no incentives for faculty- members to do research. In addition, there are no mechanisms to persuade students to participate in research

projects, and there is a lack of understanding of basic research methodology at the undergraduate, graduate and faculty level.

Ecuador's universities were in the need of a change, and the 2010 Higher Education Act forced facultymembers to seek advanced degrees and universities to pay greater attention to research.

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