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Science, Technology and Technological Innovation Policies for Sustainable Development in Peru

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Abstract

The research aimed to determine the relationship between science, technology and technological innovation (STI) policies and Peru's sustainable development goals (SDGs) in the National Science and Technology System. The research was applied, non-experimental, descriptive, cross-sectional. The population was 300 experts from the National System of Science and Technology of Peru, the sample was 169 experts in science and technology, probabilistic type with random selection. The study variables were: Science and Technology Policy (independent variable) and its characteristic dimensions: generation and transfer of knowledge, incentives, qualified human capital, level of quality and institutionality. The dependent variable was sustainable development and its characteristic dimensions: people, planet, prosperity, peace and alliances. The instrument was the questionnaire; in the case of the science, technology and innovation policy variable, the survey contained 10 questions and in the case of the sustainable development variable, the survey included 18 questions. For both cases, the Likert scale was used. Descriptive statistics and spearman's range correlation test were used for data analysis. It was evidenced that there is a significant ($p \leq 0.05$), moderate and direct ($r = 0.526$) relationship between STI and sustainable development (SR) policies. A significant ($p \leq 0.05$), moderate and direct relationship was observed between STI policies and the dimensions associated with sustainable development goals (people, planet, prosperity, peace and partnerships). The findings suggest that a change, whether positive or negative, in science, technology and innovation policy will lead to a change in sustainable development goals.

Keywords: Science, technology and technological innovation policies, sustainable development, sustainable development goals.

Introduction

Education is supposed to play a vital role in a nation's development. Many countries progressed through education. However, some of them also failed to sustain the development achieved, as these countries failed to provide the skilled labor needed for emerging economies caused by globalization and the rapid change in economic pattern. This now forces policymakers to prioritize the production of skilled labor that can contribute to sustainable development. Countries that achieved sustainable development have given high priority to science and technology education in the formulation of education policies. Peru has several options to generate development, one of them is to take substantial steps in the educational development of science, technology and technological innovation. Knowledge and innovation are determining factors for prosperity and well-being. In the case of Peru, it is at the bottom in Latin America with

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respect to the ability to generate and use knowledge. That is why it is considered appropriate to implement public policies that allow the construction and consolidation of innovation capacities, in such a way as to generate an ideal environment for the performance of activities related to STI.

The performance of STI indices is poor, as investments in research are made at 0.10-0.14% of GDP, below the regional average of 0.6%. On the other hand, it is mentioned that the universities executed only S/. 116 million S/. 704 million, or 16.5%, and that in activities associated with science and technology executed only S/. 39.5 million, 5.6% of the amount to be available for investigation (Bazán and Romero, 2011).Bertola et al. (2005) described the situation in Uruguay with regard to STI, since there is a very low demand for scientific and technological knowledge; supply is concentrated in state agencies; however, if these organisms are withdrawn, supply and demand is very weak. For their part, Dutrénit, Rodríguez and Vera (2006) conducted research to analyze the impact of changes in the design and implementation of Mexico's STI policy on the structure of economic incentives that influence the behavior of STI system agents.

Research by Monroy (2006) contributed to improving the results of the National STI System in Colombia through the proposal of new policies and strategies to significantly strengthen the link between its components and actors. Among the proposals are to promote the formation of human capital, taking into account international parameters; promote the insertion of the SNCTI in the international environment in order to expand the vision, scientific and technological developments; stimulate with different strategies the current interactions between the actors of the system; promote the formation of human capital to support science and technology programmes. According to Pérez (2010) the emergence of independent groups of women in science is manifested to promote research into the relationship between women and science, and the development of women researchers in Mexico began years ago, which has been increasing in different regions of the country. According to Parodi (2013) a factor that affects innovation in Colombia's STI policy are the obstacles that prevent companies from becoming accessible to the acquisition of bank credit and infrastructure required for research activities. That is why it is considered fundamental for the design of training strategies and educational programs for the MYPES, as well as to promote training and training for the growth of companies, development of innovative products and services with added value.

Gras and Bortagaray (2013) affirms that development strategies and thinking assume a normative perspective according to principles and values of a set of options, priorities, means and objectives. Through a review of the current STI plans of Bolivia, Colombia, Ecuador and Peru, STI policy and how it relates to inclusive development was analyzed. According to Núñez and Montalvo (2015) in Cuba, the STI policy aims to create national innovation systems in order to have better competitiveness in terms of its economies; on the innovation side, there is a desire to increase production and use knowledge to achieve economic development. Marticorena (2004) explains the need for a strong institutional framework to expand the STI agenda and the current marginality. This marginality is expressed in the public and private budgets allocated to R&D activities. When the country was closed in the nineties, there were no general guidelines for the institutions involved in STI activities to allocate their expenses to the relevant and priority issues according to the policy guidelines that were defined by the government and it is since 2001 that the State has made reference development plans for each region of the country; at the same time, CONCYTEC made the call to social,

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academic and business organizations, as well as to sectors of the State, from which STI programs were produced. Diaz and Kuramoto (2011) they detail that the Peruvian economy has gone through an expansionary cycle that allows to recover GDP levels and that Peru could increase investment in infrastructure and improve the quality of both basic and higher education, since there are deficiencies in terms of physical and human capital.

In this way, science, technology and innovation are considered fundamental variables for the achievement of the 2030 Agenda for Sustainable Development and the SDGs. If an effort is made to modernise capacities in this area, STI would promote improved productivity and economic growth, as well as social inclusion. For many years the National STI Policy has been implicit and has been governed by the supply-side approach i.e., developing science and technology where it has greater capacity and not taking into account demand i.e., taking into account the needs and interests of the population that contribute to national development. In this sense, the objective of the research was to determine the relationship between science, technology and technological innovation policies and the sustainable development objectives of Peru.

Methodology

The research was applied, non-experimental, descriptive, cross-sectional. The population was made up of 300 experts from the National System of Science and Technology of Peru. Hence, the sample was probabilistic with random selection and was made up of 169 experts in science and technology. The study variables were: Science and Technology Policy considered as an independent variable, and its characteristic dimensions: generation and transfer of knowledge, incentives, qualified human capital, level of quality and institutionality. The dependent variable was sustainable development and its characteristic dimensions: people, planet, prosperity, peace and alliances. The research instrument was the questionnaire; in the case of the science, technology and innovation policy variable, the survey contained 10 questions and in the case of the sustainable development variable, the survey included 18 questions. For both cases, the Likert scale was used. Descriptive statistics and Spearman's rank correlation test were used for data analysis with the help of SPSS version 25 software.

Results

Table 1 shows a description of the perception of experts in science, technology and innovation (STI) and its characteristic dimensions. It is shown that 0.6% perceive a low level with respect to the STI Policy. Likewise, 36.7% perceive an average level, while 62.7% of the experts surveyed responded to perceive a high level of compliance with the STI policy. Similarly, it is shown that 0.6% perceive a low level with respect to the generation and transfer of knowledge of the STI Policy, 65.7% a medium level and 33.7% a high level of compliance with the Generation and Knowledge Transfer dimension of the STI policy. On the other hand, 6.5% perceive a low level with respect to the Incentives of the STI Policy, 70.4% a medium level and 23.1% a high level of compliance with the Incentives of the STI Policy. In this sense, 8.9% perceive a low level with respect to the qualified human capital of the STI Policy, 68.6% a medium level and 22.5% a high level of compliance with the qualified human capital dimension of the STI policy. Likewise, 1.2% perceive a low level with respect to the quality level of the STI Policy, 50.9% an average level and 47.9% a high level of compliance with

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the quality level dimension of the STI policy. Finally, 1.8% perceive a low level with respect to the Institutional dimension of the STI Policy, 61.5% a medium level and 36.7% a high level of compliance with the Institutional dimension of the STI policy.

Table1. Frequency distribution of the variable Science, technology and innovation policy in Peru in 2021 and its characteristic dimensions.

Science, technology and innovation policy		
Levels	N°	%
Low	1	0,6
Medium	62	36,7
High	106	62,7
Total	169	100,0
Dimension		
Knowledge generation and transfer		
Levels	N°	%
Low	1	0,6
Medium	111	65,7
High	57	33,7
Incentives		
Levels	N°	%
Low	11	6,5
Medium	119	70,4
High	39	23,1
Qualified human capital		
Levels	N°	%
Low	15	8,9
Medium	116	68,6
High	38	22,5
Quality level		
Levels	N°	%
Low	2	1,2
Medium	86	50,9
High	81	47,9
Institutionality		
Levels	N°	%
Low	3	1,8
Medium	104	61,5
High	62	36,7

Table 2 shows a description of the perception of experts in science, technology and innovation in relation to the Sustainable Development Goals (SDGs) and their characteristic dimensions. It shows that 1.8% perceive a low level with respect to the sustainable development goals, 55% a medium level and 43.2% a high level of compliance to achieve the sustainable development goals. In that order, 0.6% perceive a low level with respect to the People dimension of the SDGs, 64.5% a medium level and 34.9% a high level of compliance with the People dimension of the SDGs. Similarly, 0.6% perceive a low level with respect to the Planet dimension of the SDGs, 62.7% a medium level and 36.7% a high level of compliance with the Planet dimension of the SDGs. Likewise, 3.6% perceive a low level with respect to the Prosperity dimension of

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the SDGs, 70.4% a medium level and 26% a high level of compliance with the Prosperity dimension of the SDGs. Similarly, 2.4% perceive a low level with respect to the Peace dimension of the SDGs, 71.6% a medium level and 26% a high level of compliance with the Peace dimension of the SDGs. Finally, 5.9% perceive a low level with respect to the Partnerships dimension of the SDGs, 79.9% a medium level and 14.2% perceive a high level of compliance with the Partnerships dimension of the SDGs.

Table2. Frequency distribution of the variable sustainable development goals in Peru in 2021 and its characteristic dimensions.

Sustainabledevelpmentgoals		
Levels	N°	%
Low	3	1,8
Medium	93	55,0
High	73	43,2
Total	169	100,0
Dimension		
People		
Levels	N°	%
Low	1	0,6
Medium	109	64,5
High	59	34,9
Planet		
Levels	N°	%
Low	1	0,6
Medium	106	62,7
High	62	36,7
Prosperity		
Levels	N°	%
Low	6	3,6
Medium	119	70,4
High	44	26,0
Peace		
Levels	N°	%
Low	4	2,4
Medium	121	71,6
High	44	26,0
Alliances		
Levels	N°	%
Low	10	5,9
Medium	135	79,9
High	24	14,2

Table 17 shows the relationship between science, technology and innovation policies and their characteristic dimensions with the sustainable development goals in Peru in 2021. It shows that there is a significant ($p \leq 0.05$), moderate and direct ($r = 0.526$) relationship between STI and sustainable development (SD) policies. Likewise, there is

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a significant (p≤0.05), moderate and direct (r= 0.291) relationship between STI policies and the People dimension. In this order, it was evidenced that there is a significant relationship (p≤0.05), moderate and direct (r = 0.270) between STI policies and the Planet dimension. Similarly, it was observed that there is a significant (p≤0.05), moderate and direct (r= 0.155) relationship between STI policies and the Prosperity dimension. Similarly, it is shown that there is a significant relationship (p≤0.05), moderate and direct (r = 0.160) between STI policies and the Peace dimension. Finally, a significant (p≤0.05), moderate and direct (r= 0.226) relationship between STI policies and the Alliances dimension was evidenced.

Table 3. Relationship between science, technology and innovation policies and their characteristic dimensions with the sustainable development goals in Peru in 2021.

Sustainable development goals	Science, technology and innovation policies	
	Spearmanrankcorrelation	
	Coefficient	P value
	0.526	0.000
Dimension		
People	0.291	0.000
Planets	0.270	0.002
Prosperity	0.155	0.044
Peace	0.160	0.042
Alliances	0.226	0.003

Discussion

According to Gómez (2018), the SDGs mention that although it is true that it has been proposed to reduce extreme poverty and inequality, because the Millennium Development Goals neglected these points, as well as most of the countries that signed this agreement; it causes that the changes are not carried out. According to Girón (2016) he details that "with the SDGs and the 2030 Agenda it is assumed that, by closing the gap of inequalities between countries, within them, between men and women, as well as the care of the environment, it will be possible to achieve a change in the way in which and how we produce, the improvement and safeguarding of the public good, as well as raising incomes from decent employment"; however, the democratic change in Peru together with the management of public policies leave a part of society defenseless. According to Gamboa (2015) for the peace sphere to be carried out, solid, effective and transparent institutions are required, in such a way as to guarantee access to truthful information and protect rights. The same author points out that, while it is true that there is a proposal to promote a global partnership for development, in order for it to be carried out, it is appropriate to revitalize that partnership so that the objectives do not remain solely on good intentions and thus that the collision between them is as little as possible; for which a political will is required, which is almost nil in the country.

Conclusions

It was evidenced that there is a significant, moderate and direct relationship between STI and sustainable development (SD) policies. A significant, moderate and direct relationship was observed between STI policies and the dimensions associated with the sustainable development goals, namely; people. planet, prosperity, peace and alliances.

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The findings suggest that a change, whether positive or negative, in science, technology and innovation policy will lead to a change in sustainable development goals.

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