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Strategic Conceptual Framework for Science, Technology and Innovation Activities

San Simón University

Dirección de Investigación Científica y Tecnológica
COCHABAMBA - BOLIVIA

SAN SIMÓN UNIVERSITY

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Gratefulness to UMSS' Community Researchers and the University Directorates involved in this new challenge that the San Simón University has in these next 10 years.

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Contents

Glossary of terms used in the document

Acronym	Full Name
STA	Science and Technology Activities
STIA	Science, Technology and Innovation Activities
ANUCTI	Agencia Nacional de Ciencia, Tecnología e Innovación (National Agency for Science, Technology and Innovation)
APEAESU	Agencia Plurinacional de Evaluación y Acreditación de la Educación Superior (Plurinational Agency of Evaluation and Accreditation of Higher Education)
ESG	Quality Assurance in the European Higher Education Area
CAAURII	Consorcio Académico de Acceso y Uso de Recursos de Información para la Investigación (Academic Consortium for the Access
CEI	Comité de Ética en Investigación (Research Ethics Committee)
CEPAP	Centros de Excelencia Plurinacional para la Productividad (The Plurinational Centers of Excellence for Productivity)
CEUB	The Executive Committee of the Bolivian University
CPE	Constitución Política del Estado (The Political State Constitution)
CRES	Consejos Regionales Económicos y Sociales (Economic and Social Regional Councils)
STI	Science, Technology and Innovation
DAF	Dirección Administrativa y Financiera (Directorate for Administration and Finances)
DICyT	Dirección de Investigación Científica y Tecnológica (Directorate for Scientific and Technological Research)
DISU	Dirección de Interacción Social Universitaria (Directorate for f University Social Interaction)
DPA	Dirección de Planificación Académica (Directorate for Academic Planning)
DRIC	Dirección de Relaciones Internacionales y Convenios (Directorate for International Relations and Conventions)
DUBE	Dirección Universitaria de Bienestar Estudiantil (University Directorate for Student Welfare)
DUEA	Dirección Universitaria de Evaluación y Acreditación (University Directorate for Evaluation and Accreditation)
EBT	Empresas de Base Tecnológica (Technology Based Companies)
EDIU	Estructura de Interfaz Universitaria (University Interface Structure)
ESP	Entorno Socio Productivo (Socio- productive Environment)
EUPG	Escuela Universitaria de Posgrado (University Graduate School)
FOICyT	Fondo Institucional de Ciencia y Tecnología (Institutional Fund for Science and Technology)
FONUCyT	Fondo Nacional Universitario de Ciencia y Tecnología (National University Fund of Science and Technology)
R&D&I	Research, Experimental Development and Innovation
DHT	Direct Hydrocarbon Tax
OTRI	Organismos de Transferencia de Resultados de Investigación (Agencies of the Transfer of Research Results)
PDC	Plan Departamental de Cochabamba para vivir bien 2013 – 2017 (Plan of Cochabamba to live well 2013 – 2017)
PDES	Plan de Desarrollo Económico y Social 2016-2020 (Economic and Social Development Plan 2016-2020)
PIC	Programas de Innovación Continua (Continuous Innovation Programs)
PNCTI	Plan Nacional de Ciencia, Tecnología e Innovación (The National Plan for Science, Technology and Innovation)
PNCTI-SUB	Plan Nacional de Ciencia, Tecnología e Innovación del SUB 2017 - 2026 (The National Plan for Science, Technology and Innovation of SUB 2017 – 2026)
RCU	Resolution of the Honorable University Council
HR	Human resources
RSU	Responsabilidad Social Universitaria (University's Social Responsibility)
RUE	Relación Universidad Empresa (University Company Relationship)
SBCTI	Sistema Boliviano de Ciencia, Tecnología e Innovación (The Bolivian System of Science, Technology and Innovation)
SEP	Sistema de Ejecución Presupuestaria (System of Budgetary execution)
SICTI	Sistema de Investigación Científica, Tecnológica e Innovación (Research System of Science, Technology and Innovation)
SIGESPI	Sistema de Gestión de Proyectos de Investigación (System for Management of Research Projects)
SINUCyT	Sistema Nacional Universitario de Ciencia, Tecnología e Innovación (National University System of Science, Technology and Innovation)
SNICyT	Secretaria Nacional de Investigación, Ciencia y Tecnología (National Secretariat for Research, Science and Technology)
SPIE	Sistema de Planificación Integral del Estado (Comprehensive Planning System of the State)
SUB	Sistema de la Universidad Boliviana (Bolivian University System)
ICT	Information and Communication Technologies
UEI	Unidades Ejecutoras de Investigación (Research Execution Units)
UMSA	Universidad Mayor de San Andrés
UMSS	Universidad Mayor de San Simon
UPSI	Unidad de Provisión de Servicios Información (Unit for Provision of Information Services)
UTT	Unidad de Transferencia de Tecnología (Unit for Innovation and Technology Transfer)
VCyT	Viceministerio de Ciencia y Tecnología (Vice–Ministry of Science and Technology)

1. INTRODUCTION:

The development of mankind is characterized by the experience of the peoples, given its own characteristics and unique rhythms of progress to be made each time more latent poverty and hunger worldwide. Faced with this reality, the 2015 summit of the United Nations, in its document "transform our world: the 2030 Agenda for Sustainable Development", transformative goals and targets of a universal character, people-centered, to streamline the *development sustainable development* in three dimensions: economic, social and environmental. Through global partnerships for prosperity without affecting the *planet*, to balance the human development indices (*people*) in peaceful societies (favoring *peace*) to shorten the gap between countries denominated in developing and industrialized countries.

UNESCO said that with the emergence of the knowledge-based society emerges the so-called economy of knowledge and innovation, which points to social, cultural and economic issues in support of sustainable development. On the other hand, the term "development" in certain currents of the evolutionary economics, is linked to growth based on knowledge. For its part, Jaider Vega (2013) emphasizes the presence of innovation as an engine of economic growth. At the same time Castro E. and Fernandez L. (2013) mention that it is helpful to understand that the knowledge, the capacity of learning and innovation are complementary aspects that occupy a central place in the development of advanced societies. This "era of knowledge" part of the social and dynamic process which recognizes the technological change as a factor inherent to the company and the economic system in which develops, and which are based on the learning and interaction among the various actors, i.e. in the relationship of mutual causality between the institutions, the economy and technology.

In different countries developed or developing it can be observed that the generation of R&D&I accelerates the rates of economic growth and social development. This is the case of South Korea, China and Brazil that have or are taking a leap in their productive structures. This new configuration of human development requires major changes in the systems of Science, Technology and Innovation and a dynamic organization and functioning of the universities involved. The latter are the main generators of R&D&I on the basis of their scientific and technological activities, which should be transferred and put at the service of society as a whole, as part of the University Social Responsibility (USR), much more if it is a public university.

The present document is based on the principle of giving continuity to the process of formation of a critical mass of researchers and the organization of the research system started in the UMSS The year 2000 and take the first steps toward innovation, as a fruitful process that has evolved the third mission understood in Latin America as an interaction and become effective technological transfer. This fact makes it necessary to understand the dynamics existing in different scenarios that try to give an order and some form of organization to the System of Science, Technology and Innovation in Bolivia, which will be addressed in the chapter contextualization and will serve to sustain what was presented as the new proposal for the development of the System of Scientific, Technological and Innovation (SICTI) of the UMSS 2018 - 2027, responsibility given to the Direction of Scientific and Technological Research (DICyT) The Organic Statute of the UMSS.[1]

[1] According to Art. 14 of UMSS' General Regulations for Scientific and Technological Research, in force..

2. CONTEXTUALIZATION

2.1. What will be the economic and social future development for Cochabamba and Bolivia?

The current national government has been raised to develop the country following the philosophy of the "Living Well", initially through the *National Development Plan 2006 - 2011* and more recently in the *Economic and Social Development Plan 2016-2020* (PDES) based on the *2025 Patriotic Agenda*. These documents, guide the actions and results of economic and social policies to be implemented by the Central Government, the Governments of the Territorial Entities, the Private Sector, Social Organizations and Public and Private Universities of the country, which should seek this "Living Well" with respect to "Mother Earth" as the basis for the "Living Systems",[2][3] considering in the Comprehensive Planning System of the State (SPIE) approved by Law of 21 January 2016.

The Agenda 2025 raises 68 13 pillars and dimensions (goals) to build a sovereign and dignified Bolivia with the aim of raising a society and a state inclusive, participatory, and democratic, without discrimination, racism, hatred or division. For its part, the PDES is the disaggregation of the 13 pillars of the Agenda 2025 and constitutes the strategic framework and prioritization of goals, results and actions to be developed in the year 2020. Its implementation involves:

- To deepen the processes of transformation of the productive matrix, i.e., consolidate the conditions for the country to be formed in the center of regional energy integration (energy) and the Center for road safety (Integration Infrastructure /Construction), in addition to providing an important leap in economic diversification, in the industrialization and the generation of higher revenues from hydrocarbons , farming, mining, tourism and industrial processing (production complexes/ technology centers-productive innovation). It is proposed to give greater prominence to small and medium-sized producers, the Community economy and the development of a knowledge-based society and in their own economies and creative.
- Further the advances in social policies, mainly by eradicating extreme poverty, through a greater and better access to education
- , health and basic services.
- Creating compatibility between the industrialization of natural resources and the care of Mother Earth, reducing environmental pollution as a legacy that must be preserved for the enjoyment and well-being of future generations.

In the context of the department, there is a development tool called *"Plan of Cochabamba to live well 2013 - 2017"* (PDC). This plan contains the vision, objectives, strategies, programs and projects that articulate the actions in the short, medium and long term in line with the 2025 Patriotic Agenda. Prioritizes departmental strategic projects 284 and at least 19 projects of national impact, defined in seven strategic axes[4] to be executed jointly by the Autonomous Government Departmental and municipal self-governments. An important feature of the Plan is the grouping of the 47 municipalities in five regions (spaces of territorial planning and development management), according to their similarities cultural, economic and geographic. These regions constitute an important reference for the formation of Regional Economic and Social Councils

[2] Mother Earth is the home that contains, maintains and reproduces all living beings, ecosystems, biodiversity, organic societies and the individuals that compose it.

[3] The systems of life represent the complementarity between the community of human beings that make up Mother Earth, living in harmony and balance.

[4] Comprehensive security and dignity 1; 2; 3 identities and cultures, knowledge, science and technology; 4 production and industry in plural economy; 5 water and food security; 7 6 Mother Earth; political, regional and institutional

(CRES), through which national and departmental policies are intended to overcome the fragmentation and dispersion of public investment.

2.2. Where research is going in the national and regional context

The fourth pillar of the Patriotic Agenda refers to the *scientific and technological sovereignty; it* proposes to overcome the scientific and technological unit to boost the economy, change the productive matrix and the primary standard exporter in the country. For this task, this agenda is 5 goals: (*i)* ***Research and Development of Technology***, which includes the transfer of technology to production complexes and companies, the management of information of the Sovereign State in a cloud, through the agency of e-Government, the implementation of the of Knowledge citadel and the installation of the Pharmaceutical Industrial Complex; *(ii)* ***Technological Innovation of nutritious foods,*** we should consider the risk management and climate change to increase productivity, capacity and transformation of[5] their own nutritional products of the regions of the country; *(iii)* ***technology with knowledge*** where inter-scientific technological packages are developed with emphasis on agricultural production; *(Iv) The* ***Ancestral and Natural Medicine*** with the development of natural products and the Bolivian pharmacopoeia from its biodiversity; and finally the *v)* ***Scientific Professional Training and Specialization*** for which all entities and companies will be allocated a percentage of its resources to R&D and will be incorporated professionals to public enterprises and national technological innovation centers.

For its part, the Vice Minister of Science and Technology (VCyT), has promoted and led the development of the *National Plan for Science, Technology and Innovation* (PNCTI) based on broad consultation processes to socio-productive sectors, academic and government, within the framework of existing policies. This "new" Plan, integrates the proposals of the Bolivian System of Innovation and the Sectoral Plan for Science and Technology (both developed the year 2009). The Plan is based on three grounds: the first, ***science and inclusive technology*** considered in the three subparagraphs of article 103 of the Political Constitution of the State (CPE), which expresses the political will of the State for the development of the processes of research and innovation; the second***, training of talents*** for the science and technology related to the objectives of the Law on Education and art. 97 of the CPE, which manifests the gradual level qualification; and finally, the ***scientific and technological sovereignty*** synthesized in the previous paragraph.

The Bolivian System of Science, Technology and Innovation (SBCTI) is defined in the PNCTI as the *set of inter-related and complementary actors, which use the science, technology and innovation…*". The three sectors in a functional manner, the complainant of science, technology and innovation, the generator of knowledge,[6][7] and the government[8] and sets three types of instruments:

Regulations: constituted by the CPE, the Education Act 2025, the Patriotic Agenda, the PDES, the own PNCTI and the Draft Law on "Development of Science, Technology, Innovation and Knowledge" that will regulate the system.

Linking*:* It considers the *National Agency for Science and Technology (*ONCYyT) dependent of the VCyT as the governing body of the Science, Technology and Innovation (STI) in the country, which channels resources through the *Fund for Science, Technology and Innovation* for R&D projects and the formation of HR graduate in science. *A*s mechanisms for the transfer of research results is the *Bolivian System of Scientific and Technological Information* that allows to articulate the supply and demand of scientific information,

[5] Potato, quinoa, corn, wheat, coca, tarwi, 'azaí', amaranth, millmi kanawa, chia and others

[6] Integrated by society as a whole, from farmers and indigenous peoples to public and private companies (micro and large)

[7] The community is composed of the universities and research centers, institutes, governmental and private organizations related to the generation of knowledge, technological development and innovation.

[8] Entities with specific function to generate, regulate, promote, and implement policies related to scientific and technological development of the country.

and the *Transfer of Research Results* (OTRI) within the sector of knowledge. Finally, an instrument part of the recovery, protection and use policy is the *knowledge and skills of the Peasant Indigenous Peoples.*

Operational*:* looking to consolidate and streamline the SBCTI with *networks of research and innovation platforms* aimed at *Research Centers and Institutes* (government, public and private) matching the eight strategic sectors[9] of the PNCTI, the generation of *Science Parks and Business Incubators Technological Base* as spaces of encounter between the productive sector and of knowledge generated by new labor market. It also seeks to promote and encourage the development of solutions to regional needs and productive niches between the sectors of knowledge (government, public and private), which are known as the *Plurinational Centers of Excellence for Productivity* (ESCAP). Finally, we have three instruments referred to the social appropriation, popularization and foresight of the CTI.

The CPE establishes that the whole of the educational system is subject to monitoring, measurement, assessment and accreditation of educational quality; all of which must be carried out by an independent public institution and specialized (Art 89). In this regard, the Act of Education 070 in section V, creates the Agency of Evaluation and Accreditation of Higher Education University (APEAESU) as a decentralized entity formed by a directory and a specialized technical team, subject to regulation by means of a supreme decree (instrument is not yet prepared). experience in public universities on evaluation and accreditation is concentrated in degree programs as pilot of accreditation mechanisms in the countries belonging to MERCOSUR in the regional context and the Executive Committee of the Bolivian University (CEUB) in the national context. With regard to graduate programs offered in Bolivia, these are not required to conform to any standard to ensure quality. However, the interior of the CEUB, exists as a General Regulation of Graduate Studies that considers certain aspects of quality.

In the regional context of Cochabamba, there is an official document of the government or the municipalities that try the theme of development in aspects of CTI. One of the studies referred to the Innovation System of Cochabamba (SIC) provides that:

The SIC shows insufficient units that meet the role of structures on the inside as well as interface between the different environments, existing ones are weak and isolated between the environment of knowledge and the productive, thanks to the activities of extension of the environment of knowledge that is mainly supported the demands of the micro and small business. On the other hand, medium and large company has no explicit demand for science and technology, which shows that the complainant does not invest in R&D. This is a clear reflection of the legal vacuum that weakens the institutional and cultural framework of the sic. (Gutierrez F. and Zurita E., 2016)

In this regard make it clear that the term "environment", referring to what is known as SBCTI sectors in PNCTI.

2.3. The Situation of Higher Education in Bolivia

The CPE in Chapter 6: *Education, Multiculturalism and cultural rights* in its section II, ensures higher education undergraduate and graduate programs in universities. In Bolivia 59 universities offer higher education, 17 public and 42 private universities, which are recognized by the Ministry of Education; 15 of the 59 universities make up the Bolivian University System (SUB) that are represented by the CEUB according to article 92, paragraph II of the CPE. According to the National Institute of Statistics (s.f.) The year 2011 undergraduate tuition at private universities was approximately 104,000 students (22%), whereas in the public universities was approximately 366,000 (78%). The public universities of the

[9] Components established through participatory workshops with the three system environments: 2 1 Health, agricultural development, industrial processing and manufacturing 3, 4 local knowledge and ancestral knowledge of the indigenous peasant, 5 natural resources, the environment and biodiversity, energy, 6 8 7 Mining, Information and Communication Technologies

backbone, La Paz (UMSA), Cochabamba (UMSS) and Santa Cruz (UAGRM) concentrate the 60 per cent of the enrolment of degree at the national level. In the Cochabamba region are established 11 public and 2 private universities with an enrollment of approximately 96,700 students, of which the UMSS represents the 69%.

The CEUB is the organ of coordination, planning and programming of the activities of the SUB, which has generated an Organic Statute, regulations and provisions that guide the rules within the universities. Account with nine secretaries, of which the National Secretariat for Research, Science and Technology (SNICyT) is responsible for: strengthening the activities of scientific research, technological development and innovation, through the formulation of policies, strategies and plans; to promote the national and international relational databases of the National System of Research, Science and Technology; coordinate the activities that take the research units and the organization of events to strengthen the system,[10] as well as the National Secretariat for graduate and continuing education is intended to program, organize, coordinate, plan and evaluate the policies and activities to strengthen the system of Graduate of the Bolivian University, among other specific objectives seeks to improve the quality of programs Graduate through processes of evaluation - Accreditation. Finally the National Secretariat for Evaluation and Accreditation has as its major objective coordinate, plan and drive the processes of evaluation and accreditation and/or programs of the SUB and among other specific objectives, to promote the improvement of the quality and relevance of education in the processes of teaching and learning, research, and social interaction.

In the present management the National National Secretariat for Research, Science and Technology (SNICyT) has launched the *National Plan for Science, Technology and Innovation of the SUB 2017* PNCTI (2026 -SUB). This Plan proposes the formalization and institutionalization of the National University System of Science, Technology and Innovation (SINUCyT) with the participation of actors from government, academia, the productive sector, and civil society. The coherent and inter-related articulation between these four entities will generate answers to problems in a comprehensive manner with impact environmental, social and productive, given the participatory approach, equitable, and sustainable. The SINUCyT is then in a system that has the ability to convert the results obtained by the sector generates knowledge in technical solutions, economically viable for the plaintiffs' knowledge, leading to technological changes and innovations that contribute to the economic and social development of our country.

It is proposed that the SINUCyT assume the model quad helix and a system of open innovation, characterized by three levels of responsibility: (a) *Strategic*, formed by the board of directors[11] and the Council[12] of research and innovation policies; (b) *Tactical*, formed by the *National Agency for Science, Technology and Innovation* (ANUCTI), the Regional Innovation Systems and the Regional Platforms in the 9 departments; and (c) *Operating System*, made up of those who carry out activities of R&D&I.

In order to ensure the viability of this model, it is proposed the creation of three central elements: (i) National University Fund of Science and Technology (FONUCyT), which is a bag provided by the universities for the financing, so competitive projects, training of talents and strengthening of research centers of SINUCyT; (ii) ANUCTI which is the body that will manage and channel the FONUCyT , and promotes the creation and/or strengthening transfer units and the construction of regional systems and departmental

[10] National Secretariat: Executive, 2 1 3 Academic, Administrative and Financial, Institutional Development 4, 5 of 6, Assessment and Accreditation of International Relations, 7 of graduate and continuing education, 8 of Research, Science and Technology, Social Interaction and 9 Extension U.

[11] The Directory is a collegiate body that aims to establish national policies for the processes of research and innovation , as well as assess SINUCyT in a general way the work of the various instances of the System

[12] It is an instance of staff that supports the Directory for the elaboration of policies that promote or encourage the processes of research and innovation of the SINUCyT and other studies for decision-making in the Directory

innovation platforms; and (iii) Institutional Fund for Science and Technology (FOICyT), a set of resources that each university has to finance their activities in science and technology.

The *National Plan for Science, Technology and Innovation of SUB 2017 - 2026* PNCTI-SUB (5) raises strategic objectives related to: (i) Build, institutionalize, develop and strengthen the capacity and the scientific and technological potential of the SINUCYT; (ii) integrate the space of knowledge, scientific and technological development of the university system and promote its links with the productive sector, the state and society, becoming the engine of economic growth and development; (iii) implement programs and R&D&I projects of national scope in knowledge-generating units in coordination with public and private institutions and the State within the framework of national policies, priorities and demands of society, by ensuring The sustainable use of natural resources; (iv) promote training, specialization and training of human resources and increase the highly specialized human talent in the SINUCYT and the country; (v) Develop mechanisms and instruments that give to the ANUCTI of a system of administration, management and funding of suitable support.

At the same time, this plan recognizes the importance of the experiences generated to the interior of UMSS and UMSA in management and research capabilities, therefore, it assigns them the role of transferring experiences in the implementation, management and financing of programs and projects of CTI to the other universities sisters and the ANUCTI. We propose to develop a management model transparent, demanding in quality, for the implementation of research and innovation projects competitive grants, the same that will collect and enhance the experiences gained in the management of R&D projects at UMSS.

Given the heterogeneity of the research and development of different universities in the SUB, have been identified and prioritized areas and lines of research on the basis of their experiences, abilities, socio-technical feasibility and potential regional, in direct support to the sectors identified in the PNCTI of VCyT. The areas identified are: (i) Health and Life Sciences, (ii) Agricultural and Forestry, (iii) Biodiversity, Natural Resources and Environment; (iv) mitigation of and adaptation to climate change, (v) Integrated Management of Water Resources, (vi) Mining, Energy and Hydrocarbons, vii) Economics, Social Development, Education, Law, State and Society, viii) Knowledge Management and New Technologies, ix) Transport, Roads and Communication, x) Industrial Development, Technology and Innovation.

2.4. Degree of development of Research and Innovation at Universidad Mayor de San Simon

The Universidad Mayor de San Simon, founded in 1832, is one of the 15 autonomous universities and public Higher Education, governed by the Constitution of the Bolivian University, its own Statute and Regulations (teaching, load, assistant, research, etc.). The autonomy and the joint co-student teaching constitute the basic principles underlying the academic freedom and the three activities which are fundamental: *training, research and interaction.*

The *University Council* is exercised by the government of UMSS between Congress and Congress subject to statutory principles and to the resolutions of the congress. It is formed by the Rector, the Vice-rector, and the deans of the faculties, university heads, teachers and student delegates. The *Rector and the Vice-rector* are elected officials by joint teacher-student vote, the first represents and directs the university in all the activities, while the attribution of the second are mainly address the academic and scientific activities of the University.

The executive structure of the UMSS is composed by the Rector, Vice President and 7 university addresses, 4 of which depend on the Rectorate's Directorate for Administration and Finances (DAF); University Directorate for Student Welfare (DUBE); Directorate for International Relations and Conventions (DRIC) and University Directorate for Evaluation and Accreditation (DUEA)- and 3 dependent of the Vice Rector's Office - Directorate for Academic Planning (DPA), Directorate for f University Social Interaction (DISU) and

Directorate for Scientific and Technological Research (DICyT)- and the University Graduate School (EUPG), and even if it does not a Directorate, organically it is at the same level of them and it is also dependent of Vice Rector's Office.

Within its academic structure, UMSS has 14 faculties[13] that offer, 50 races to grade level and technical level 25, a community of approximately 70,000 students, with a staff of 1,800 between teachers and researchers. There is also training at the graduate level in the 2014 bid 67 Management graduates, 23 specialties and 18 masters "professionalizing" to 5,222 graduate students. Unlike the education degree, which is completely subsidized by the government, the graduate training "professionalizing" is self funded with the matriula of students; the graduate studies based on research which have recently begun, are now subsidized by Sida and ARES.

In the framework of the obligations imposed by the law, the Constitution of the Bolivian University and its own rules, UMSS every five years produces a Development Plan as a planning tool with a medium-term strategic vision. The last "Development Plan 2014 - 2019", raises four areas of policy and/or strategies: Training of excellence (commitment to their students), Research (generation and management of knowledge for the scientific, technological and social), Interaction (commitment to economic and social development of their community) and Management of Support (commitment to excellence and transparency), each one of them has described its strategic objectives, operational, goals, strategies, indicators, responsibilities and implementation period.

Up to the year 2002 research programs and projects were concerns and responses to the opportunities provided by international and national cooperation, that is to say, they were characterized by a fragmentation and dislocation of the same in the units of inquiry. It was only on the basis of the elaboration of the *Action Plan for the organization and development of the system of Scientific and Technological Research of the UMSS*" that is given, an organizational framework and functional activities of Science and Technology (ACT) in the UMSS. This plan, with a vision of 10 years, defined a number of strategies in the short and medium term - in the normative framework, science policy, financial and organizational - which will help to improve the quality, effectiveness, efficiency and impact of research activities, considering its integration with the other functions of the University, expressed in Institutional Development Plans. The evaluation of the implementation of this plan and an analysis of the expertise accumulated until 2011, led to the elaboration of the document known as the "Conceptual Framework of Research in the UMSS 2012 - 2021" as a reference for a process of planning and construction.

At present, 11 of the 14 Faculties with Research Institutes, 9 Institutes execute research programs and projects and two institutes (Science and Technology, and agronomy) constitute programmatic and policy coordination spaces. To this 9 we add 23 research centers between University Centers and Faculty Centers (Appendix 1), that hereafter we will refer as Research Execution Units (UEI), which have the infrastructure (buildings, laboratories, equipment and instruments) and sufficient staff (researchers, technical personnel and support staff) to run programs and/or projects R&D&I. To the 32 UEI, we can include other 20 units, departments and programs, which eventually reported research projects but, in spite of having human capacities and infrastructure installed, its main job is not R&D&I.

With regard to the staff in research in accordance with Frascati Manual nomenclature (Appendix 2), 515 people are involved in STA, 287 are researchers, 39 R&D Scholarship holders, 60, technical staff and

[13] The facultative level has an academic autonomy and its governance is similar to University autonomy, where the highest governing body is the Facultative Conference, the instance of political decision is the Facultative Council, however the authorities that represent it are the Dean and the Academic Director, with attributions similar to those of the Rector and Vice-Rector at the facultative level, these are also elected authorities by students and teachers votes.

129 support staff. The universe of researchers (326 people, according to Frascati Manual R&D Scholarship Holders is a researcher), 65 have the degree of Doctor, 186 master's and 75 bachelor's degree (Data Survey to research units in 2016). The year 2000, the 6% had a Ph.D. degree, 47% Master Degree or equivalent and 46% Bachelor's Degree, on the other hand, now we can see that the 20% are Ph.Ds., 57% Masters and 23% Graduates, showing a growth in 16 years, not significant in amount but in capacity building.

Historically, the development of research activities has been associated with the financing of the majority of the international cooperation from Sweden, Belgium, Holland, Switzerland, Germany, Spain and Canada, and to a lesser extent of Italy, the United States, the European Union, the UN, among others. Also cooperation agreements have been entered into with some international agencies such as CyTED, FAO, OAS, World Bank and NGOS. At the same time andl funding of the act at the national level (except for the payment of wages to researchers) can be found in the public universities on the basis of Supreme Decree No. 28421 of 21 October 2005, where the use of resources of the Direct Hydrocarbons Tax (DHT) to power the components of:

1. Academic Infrastructure and equipment,
2. Evaluation and accreditation processes under the legislation in force.
3. Quality improvement programs and academic performance,
4. Scientific research, technology and innovation in the framework of the plans of development and production at the national, departmental and local levels,
5. Social interaction programs targeted at vulnerable population with high rates of poverty.

In this sense, at the beginning of 2008, a group of professionals of the DICyT developed the *Framework Program for Research Promotion using DHT funds*", approved with RCU No. 33/08 dated August 22, 2008, and it is from this event that the UMSS has designated the 25% of the DHT for activities related to the component 4 of the previous paragraph. In this last time - May 2017-, was adopted "to establish that the percentage of 25% will be devoted to the areas of research and the Program to Improve Quality and Academic Performance" with RCU No. 24/17.

The planning of the STA has made it possible to establish priority thematic areas and institutional arrangements to strengthen them with programs, projects, as well as subjects associated to the formation of human capabilities. The first 10 years, the axes reflect a character discipline on subjects such as: (i) agricultural production - Post-harvest technology - Agro - food security, public health ii), iii) biodiversity and management of natural resources renewable, iv) assessment and management of water resources and (v) the humanities and social sciences. To enable the universality to the interior of the UMSS was generated an area referred to as *cross-cutting themes*, themes such as energy, Information and Communication Technologies (ICT), climate change among others. It was in this first period was established the so-called *Partner Organizations to Research Projects* (OAPI) as a means of linking non-systemic environment with R&D projects

By the year 2012, given the maturity of several of the units of inquiry and without leaving aside to the least favored, focused on the thematic axes toward the resolution of problems or needs of the medium, by facilitating the transfer of research results to the Socio- productive Environment (ESP), without leaving aside the scientific quality of the projects. For this reason there is a substantial change to the thematic axes, from a disciplinary approach toward the achievement of socio-economic objectives such as: (i) food security and food sovereignty, ii) production technology and industrial development, (iii) protection and improvement of the health, iv) production, distribution and rational use of energy, v) habitat and human settlements and (vi) social development and citizen participation.

In the course of 14 years (2003-2016) has been consolidated Research Fund, which currently has resources from SIDA, as well as the DHT and the logic of incorporating additional resources (international, national and local). Through the System for Management of Research Projects (SIGESPI), this fund has made it possible

to finance 155 R&D projects, in seven rounds and 27 projects are in full implementation as part of the 8th call for proposals. The philosophy of the SIGESPI is characterized by its competitiveness in aspects of scientific quality and social relevance (institutional, local and national) and responds to institutional priorities with regular calls and open to institutional research teams, agile and transparent procedures fostered by programming principles.

It has been able to motivate, stimulate, encourage and promote the ACT through the Horizontal Program with the support of 225 attendance at international scientific events as rapporteur or speaker, the dissemination of scientific books/journals 55, the realization of 44 projects for the popularization of science, the organization of 22 international scientific events and the skills of the scientific community with 53 55 training workshops, internships of specialization/upgrade and 39 stays of external researchers in research centers in the UMSS; all of this with the initial aim of generating a culture of research. On the other hand, in spite of the existence of mechanisms that tend to facilitate the dissemination of the results of research are few yet, the researchers that show what is produced through articles or books of international coverage, in order to obtain through appointments, an assessment of the scientific product, a situation that could be attributed to the lack of incentives of the scientific production in the community of researchers (devaluation of the scientific production).

In this same vein, while the UMSS not recovered in the amount of publications indexed as the UMSA, in qualitative variables of bibliometric indicators (high-quality publications, index of specialization and others) stands out above the UMSA. In addition we must consider that in the self-evaluation workshop held in June 2009 in the city of La Paz, to different cooperation agencies, the UMSS reported 242 people as part of its community of researchers, nearly half of the community of the UMSA (467), this is not as an argument to justify the smaller amount of publications, but to make a reflection on the number of researchers of the UMSS that represents the 52% of the population of researchers of UMSA. In this same perspective to increase the amount of publications indexed, we should assume any policy that allows optional journals indexed with quite trajectory and periodicity as "*Search*" of the Faculty of Economic, "*Agriculture*" of the Faculty of Agronomy or "*Science and Technology* of the Faculty of Technology.

Also, within the training component of the Action Plan at its inception and Concept Notes in this last time, it has achieved the training to Doctoral (PhD) level of 39 professionals, of which 77% were incorporated into research centers and currently (2017) 29 are in training with Sida funds under sandwich model. On the other hand, 10 doctoral students are being trained in cooperation with ARES of Belgium, under the same conditions of Sida Scholarship holders and in complementary themes. There is also a number of researchers who are self-employed; they had access to the scholarships offered by different agencies to conduct their studies in universities abroad. Finally, between the year 2015 and 2016, we have designed and are being executed 6 local master programs in science with 62 master students.

With reference to the so-called University Company Relationship (RUE), with SDC have been generated two companies (EBT) - SEFO and CIFEMA-SAM , who work with the agricultural sector in favorable conditions for both the University of farmers' groups as members of the company. In the same way, the Unit for Provision of Information Services (UTT) dependent on the faculty of technology development capabilities and activities in the UMSS INNOVA-Project which was formed as a national reference in innovation, university scientific research dialog with non-governmental organizations and productive social agents with the model of the triple helix, which are clusters of food and leather. It is also had experiences in the generation of *spin-off* promoted by undergraduate students to participate in events such as INNOVA-BOLIVIA. On the other hand, personnel of the DICyT has designed a structure of University Interface with the mission *"to plan, manage and promote the relationship University - Social Productive Environment and relationships of researchers with the innovation system of Cochabamba and Bolivia, to put in value in the social productive environment and society in general, the research based on the knowledge and skills of the*

Universidad Mayor de San Simon and the opportunities provided by the environments" . In this new model, the UTT and mixed companies becomes a specialised operating arm in the management of clusters (way of responding to the needs of PyMEs in developing countries) and EBTs respectively.

In terms of **research facilities** in UMSS, we have taken the first steps to establish a Metrology Center with the purchase of specialized equipment of type 1 and type 0 with funds of DHT, as well as with reference to ICT, there is a university Master Plan, currently, in the process of implementation through the Unit for Provision of Information Services (UPSI), which among other activities poses to restructure the intranet, internet, and network support services, in the prospect of providing efficient service in topics of clusters and repositories for several centers and Work Station for simulation work; at the same time we will be able to improve the conditions of access to indexed journals offered by the *Academic Consortium for the Access and Use of Information Resources for Research* (CAAURII), of which the UMSS is an active member.

The implementation of all the initiatives described above, has made it possible to visualize the research in a national and international context and positioning the DICyT-UMSS as a reference entity within the academic and scientific community of Bolivia. For example, currently the SIGESPI is being used by the SDC as a model for the management of R&D projects in a national context and DICyT provides support in scientific quality assessment processes. On the other hand, the "PNCTI - 2016 - 2027" is taking at the national level, several of the strategies implemented in the UMSS. In the sectoral context some instruments and tools such as the one described above, the scientific and technological potential, System of Budgetary Execution (SEP), among others, have been transferred to the UMSA as part of a mutual commitment to growth.

A general assessment of research shows that the UMSS has been able to take advantage of the cooperation schemes and develop capacity for research in terms of scientific competence, research infrastructures and management skills of the research, reflected in their "self-assessment", "Scientific and technological potential of the UMSS"and "Institutional Strategic Plans". It is an important way to go in this process initiated by the year 2000 and continued in 2012, in terms of strengthening research capacities for the institution is fully capable of developing high-quality research and socially useful, in order to transfer it to society.

3. OBJECTIVES

Given the new configuration raised in the international context (Agenda 2030), national (2025 Agenda, PDES, PNCTI), regional (PDC), sectoral (PNCTI-SUB) and institutional (2014-2019 Development Plan and the Concept Note of 2012 -2021 Research of the UMSS), the ***overall objective*** of the research as a substantive function of the University can be expressed as follows:

> *Research is a substantial activity in UMSS, aimed to contribute to development processes of the department and of the country through the generation of new knowledge useful and transferable to social and/or productive sectors. It is inherent in this activity to contribute to the universal progress of knowledge and be linked to graduate programs in science to be part of the activities of Scientific Research, Technological Development and Innovation recognized by society.*

The strong link with the environment expressed for this decade requires, in principle, the commitment of the *authorities*; to make viable processes and standards that must be generated and enable a new legal and

organizational structures, and the effective participation *of managers and researchers* to facilitate the generation of knowledge in mode 1 and mode 2 and to respond to the global goal.[14]

On the other hand, to get closer to the overall objective, SICTI of UMSS must have a dynamic environment, effective, integrated and socially responsible; whose processes, mechanisms and products have relevance and quality and are closely related to the development of the Cochabamba region and the country, but also contribute to the overall advancement of knowledge.

In this way, and similar to the Conceptual Framework 2012-2021 raises two specific objectives according to their field of action:

- *In the sphere of research programs and projects in the areas of institutional interest, regional and national levels, with results recognized and used by the scientific community in general and of the national scientific graduate studies are carried out in the framework of the Agenda of graduate training in science recognized at the national and international level, in research centers of the UMSS in collaboration with partner organizations.*

After the first five years, most of the projects are executed within lines prioritized institutionally (mode 1 and mode 2) and concludes with products disseminated and transferred in the most appropriate means. Also as part of the formation of the critical mass of UMSS and other allies, run several own graduate programs of study in science and/or with a double degree (master and doctoral programs).

- *SICTI offers a favorable environment for research, innovation and scientific training, supported by a system of adequate and efficient management that incorporates principles of planning and quality assurance.*

In the medium term, we will have consolidated the organizational, operational and support reforms to give functionality to SICTI, and the link of the scientific research to graduate program will be consolidated. In addition, it will be operating a linking and transfer model (the so-called OTRI by the government) with the Regional Innovation Systems, National and the claimants[15] that you have as a public university, this serves as a reference to the Universities sisters of SUB.

4. RESULTS

Considering that the efforts to develop a normative framework, organizational and functional, are still weak, in the first five years is to generate and consolidate the instruments of articulation and dynamisation of SICTI. In the second half of the decade it is expected that gradually all units of management and execution of research, naturally assume their roles as part of the system and the relationships between them are clear and specific. At the end of ten years, the system should work in harmony and all elements contribute to the achievement of the overall goal.

[14] The term **mode** refers to *a form of knowledge production, to a complex of ideas, methods, values and norms* that have grown to control the spread of the Newtonian model to more and more areas of research to ensure its conformity with what is considered a healthy scientific practice" (Gibbons, 1997, p. 13)
1. Mode of knowledge production, characterized by being purely disciplinary and stimulated by academic interests for the advancement of science.
2. Mode of knowledge production, characterized by the application context, transdisciplinarity and social responsibility to meet the explicit needs of any external agent.

[15] Is that natural or legal person who is constituted in recipient of the almost free transfer of research results generated by UMSS, as demonstration of University Social Responsibility

With regard to the activity of scientific research, technological development and innovation of the Research Units, the specific objective and strategies of the Strategic Action Plan detailed below will be effective if:

- There has been an increase in the scientific community with the incorporation of new doctors.
- It has been qualified researchers with graduate studies in science and there is the conditions necessary to provide opportunities for graduate training: local, sandwich and face-to-face in universities abroad.
- M.Sc. and doctoral programs in science are executed under collaboration schemes with Bolivian and foreign institutions of higher education with criteria of quality assurance of the quality and relevance, framed in the Agenda of graduate training in science.
- A program mobilizing operates normally for refreshment and short training in research and management activities in science and innovation.
- University infrastructure is appropriate, adequate and common use (buildings, facilities and equipment) for the development of science and technology activities.
- We have access to resources from UMSS' Research Fund for R&D Projects – competitive projects, induced projects, graduate training and innovation-, horizontal program -publication of articles, internships, other-, and infrastructure.
- We have access to resources from FONUCyT for inter-university R&D projects and to opportunities of international funders' agents for collaborative research.
- UMSS research affects positively the achievement of the objectives of economic and social development of Cochabamba and Bolivia.
- We disseminate the results of research in the most appropriate means and are transferred in favorable conditions for researchers, UMSS and ESP.
- The STIA's outputs achieved are disseminated, popularized and/or socialized for the well-being of society.
- We have formed team networks, multi-, inter- and trans- disciplinary, to address issues set out in the PDC, PDES and PNCTI in the country.
- We encourage scientific debate to generate leadership and/or create spaces for collaboration and cooperation culture inside SUB.
- Researchers and research units participate in the different models of existing Innovation Clusters, Technology Based Companies, Spin-off.
- We participate in the research networks and innovation platforms established in the PNCTI and we interact with the CEPAP.
- We collaborate with the training of researchers from other universities in SUB and governmental entities, according to the Agenda of graduate training in science.
- The exchange program for R&D teacher/tutor and scholarship holder work. It enables the execution of graduate programs in science.
- The Research Units and researchers develop all its activities in Science, Technology and Innovation (STIA) with considerations on the care of the environment, ethical and bioethical.

When we speak of the creation of an environment favorable to the development of research and innovation, it is understood that the specific objective has been achieved if the actions foreseen in the Plan of Strategic Actions have led to:

- The organization of the STIA is formalized and the structure responds to the new model.
- The policy environment is favorable for the development of research and graduate studies in science; these consider standards of quality assurance at national and international level.
- EDIU is completely operational, responding to the innovation systems, regional and national levels.
- Research facilities are permanently available: metrology services and maintenance, access to bibliographic resources, high performance computing cluster, and work station among others.

- UMSS has failed to implement the ICT Master Plan, for the support, development, improvement and expansion of academic and research activities in the fields of science, technology and innovation.
- There are mechanisms and constant flow of communication and information between research units, researchers and the own DICyT.
- The Information System that gives support to the STIA is used routinely by the scientific and social environment
- The DICyT and the different units involved in the SICTI, have sufficient staff trained in management of research.
- The administrative processes are efficient and constitute a support to researchers to devote most of their time to STIA .
- The Research Fund is operating on a permanent basis to support SIGESPI, Horizontal Program, Exchange Program and the Agenda of graduate training in science.
- The scientific production transferred and published in indexed journals is valued.
- The bibliometric production of the UMSS has increased and at least one journal has been indexed.

5. PLAN OF STRATEGIC ACTIONS:

5.1. Reason to Be

The Plan of Action to implement the results presented in this document (2018-2027), is based on the principle of continuing to advance in the process of construction started the year 2000, the progress achieved so far thanks to the Enhanced - mainly Sida, and in the latter time ARES-, the considerations described in the history of the different agendas and plans, and the recommendations of the two consultancies contracted by SIDA (impact assessment and quality assurance). Understanding that, "move on" goes beyond merely carrying out a greater volume of activities, it is also research products acquire increasing quality and, therefore, will be recognized as such and contribute both to scientific knowledge and technological development applicable to the solution of problems of production and the generation of welfare for society in general.

Somehow the evaluation of the scientific quality and relevance necessary in all the proposals contained in the program. Sida-UMSS, have improved the quality of the R&D projects, however a significant proportion of their products have not yet managed to become results with productive application or social status, or have been published in scientific journals indexed, because the knowledge produced is not linked to productive activities or studies do not offer adequate responses to complex problems, given that the projects address only some aspect of such problems (discipline).

The current criterion of definition of thematic priorities for areas of knowledge and organizational units of implementation, has led us to the situation described above. Therefore in this opportunity is part of the initial establishment of areas of opportunity raised by the different contexts (Appendix 3), which are validated as priority axes for the generation of knowledge in mode 1 (discipline and multidisciplinary) in participatory workshops clinicians in a home and subsequently consolidated into institutional sectoral workshops (Appendix 4). From these workshops have been made up of representatives of sectoral networks (3 members) in a joint workshop (Appendix 5) have been established on the basis of thematic by socio-economic objectives or problems to solve, programs that go in a sense of knowledge generation in mode 2 (inter- and trans- discipline). These two contexts are those that will allow us to set the Agenda for Research and Innovation (this document and the specific proposals for the different partnerships) and the Agenda of graduate training in science in a complementary way.

The set of actions in this plan are considered necessary, they rescue for the future, elements -recognized as success factors- such as the selection of proposals for competition (competitive projects), the allocation of resources based on institutional priorities and/or projects directed to the solution of problems ("induced projects "), support for short training and training in national graduate programs of study in science, addressed mainly to UMSS' researchers and the community in general, the association of research units (internal, sectoral universities sisters of SUB-national- government research units -, and international cooperating universities-), the improvement and optimal use of the infrastructure and therefore the promotion to research networks formation, the massive dissemination of results and their linking in national and international level, the joint work mainly between DICyT, EUPG, DUEA and DISU to generate a favorable environment for research and graduate studies in science, as well as a systemic linking to social productive sector, and the separate administration of the resources for research through the Research Fund. Then what is at stake in this new conceptualization is to ensure that the results and potential, each of these elements is developed to the maximum possible.

They are also favorable elements for the implementation of the planned on this opportunity, in addition to the experience in management, the increase in the campus of researchers with a doctoral level as a result of an institutional policy expressed in the RCU No. 24/17 which manifests the granting of DHT scholarships for UMSS teachers to engage them in graduate training processes at the level of M.Sc. and Ph.D. in science; the existence of new equipment, the allocation of resources to the Framework Program for Research Promotion, DHT funded, and made viable by the government in its Basic Regulation of Pre-investment, access to resources from the FONUCyT, the opportunities provided by the 2030 Agenda, Agenda 2025, PDES, PNCTI, as well as the centralization of cooperation to research in DICyT.

5.2. Areas of action

In response to questions such as what is to be done to achieve greater volumes of high- quality research results? Or what about elements of the university system we should act to achieve the proposed objectives?, it is established that an appropriate way to organize the "collective" strategies included in this plan, part of the conception that there are four platforms for decision-making and actions for the SICTI. Each of the platforms is inter-related and mutually reinforcing in a transversal way for the achievement of the two specific objectives, as a result of the overall objective, all this requires decisions for its implementation and taking action to make them operational. For this reason, the Plan includes strategic objectives in which there is the possibility and necessity of acting in each platform and some topics of actions that need to be developed in the Regulation Framework, Organizational Framework, Scientific Policy Framework the Financial Framework to respond to RSU understood from the approach of the University of Lüneburg[16].

Considering that the document is based on the constructive process of the system, the strategies raised in the four platforms, does not rule out what has been achieved so far, rather try to keep the good things that have been done so far, it improves what is not working properly and it is emphasized in the approach to strategies proposed to implement in this period. What is the maturity of the system, reason for which the model described in Appendix 6 is very similar to that raised in UMSS' Conceptual Framework of the Research for the period 2012-2021, where it is established that the system in addition

[16] We take the year 2000 to start with 238 researchers according to UMSS' Action Plan for the Organization and Development of the Research system. And the data from the year 2016.

to being articulated, should allow their functions be implemented without delay, relationships have to be fluid and administrators must ensure that the resources are delivered on time to stakeholders.

5.2.1. Scientific Policy Framework

The Scientific Policy Framework is made up by a set of strategies in the short, medium and long-term for the promotion and development of research activities and institutional innovation, reason why its design corresponds to DICyT for approval by the relevant authorities and its resulting implementation. These are a complementary response to scientific policies emanating from the national government, the departmental government and the CEUB. It also foresees aspects such as the adoption of the draft Law for the Promotion of Science, Technology and Innovation in Bolivia.

On the other hand, we consider aspects such as the low annual growth rate of the researchers' community that is 1.9% per year[17] in relation to the 3.3% of university teachers[18]. The critical mass of Ph.Ds. has increased substantially but not enough. The weak encouragement to participate in short training programs to generate skills in the areas of management, administration, leadership, research skills and others; the insufficient impact of scientific production in the international context; the lack of a link between graduate training, research units and their activities; the weak culture for continuously planning and evaluating, the weak systemic link with the ESP; the insufficient facilities to support research units e.g. ICT, scientific information, knowledge management, means that contribute to the improvement of product quality (metrology services) and permanent improvement of infrastructures.

Strategies.-

- Increase the critical mass of researchers with a Ph.D. degree, considering generational and gender changes, taking into account the following: EUPG speeds up the validation of researchers' graduate degrees in science who studied in foreign universities; Researchers use RCU No. 24/17 to carry out studies in national scientific graduate programs or in universities abroad; Finally, based on judged experience (in competitive projects) we can create the conditions in order to catalog researchers with a vast trajectory (two articles published in indexed journals during the last 5 years) similar degree to a Ph.D.
- Commission researchers with a Ph.D. degree (minimum 80 hrs. per month) to collaborative research teams with foreign universities, that apply their proposals to supranational entities or institutions that encourage collaboration with Latin American universities, or to teach, tutoring, or be members of the academic committee in the national scientific graduate programs to be developed.
- Promote the execution of national scientific graduate programs, with international quality assurance considerations. First we must verify the technical-academic feasibility based on the available human capacities, infrastructure, equipment, institutional and social relevance, R & D scholarship holders critical mass, economic and financial feasibility from DHT, FONUCyT and the opportunities provided by the PDES and PNCTI. These programs are aimed at training UMSS' researchers, the staff from other SUB universities, and interested institutions.

[17] We take the year 2000 as first with 1103 teachers according to UMSS' data from "Universidad en Cifras 2002"and according to the Department of Academic Staff at the end of the year 2016 we had 1800 teachers.

[18] Thus defined, the social responsibility of a University (public or private) include the pursuit of the objective of human development and the evaluation of the extent to which its essential activities (research, teaching, technology transfer, and governance and organization) contribute to that goal (University of Lüneburg 2008)

- Facilitate the generation of an exchange program that takes into account the mobilization of teachers/tutors in the national context with SUB partners and cooperating countries towards Bolivia (North-South and South-South established in the 2030 Agenda) with the purpose of complementing the critical mass of teachers/tutors still limited in some scientific graduate programs, the mobilization of R & D scholarship holders within the country should also be considered (training in other facilities in Bolivia), for specific training in the cooperating countries (South-South and South-North) and for the attendance to scientific events that allow the accumulation of credits necessary for their graduate training.
- Generate incentives for researchers' scientific production: in the short term, granting special support in the mobilizing programs (horizontal, exchange, permanent training and other). In the medium term, giving bonus to scientific production, with the implementation of the researchers ladder which considers first the guidelines of the STI law proposed (which establishes research as a strategic sector, researchers with scientific production would not be subject to the salary ceiling) and second the activities of graduate programs in science as part of the career ladder, in order to raise the value of the activities developed by the teachers/tutors.
- Develop an evaluation cycle for R & D projects and science graduate programs; for R & D projects, based on consolidated tools for ex-ante evaluation, we are currently validating the tools for continuous evaluation (activities monitoring, indicators and outputs) and we will generate the mechanisms for the ex-post evaluation in order to establish the quality of performance results. In the same way, for graduate programs in science, we will create an appropriate space to allow permanent evaluation (at the beginning, during and at the end) and accreditation, so we guarantee quality assurance.
- Promote the development and use of ICT, guaranteeing access to scientific information sources through CAAURII or other means, in order to have updated knowledge of the "state of the art" and progress in the specific field of their research works, the use of fluid communication technologies between the different elements of the system and external networks, besides generating information regarding staff, projects, research outputs, publications, infrastructure among other. Some modules of the above mentioned have already been developed, but they still need to be completed to have regular data flow online.
- Consolidate the operation of the Horizontal Program for Research Promotion, aimed at promoting short training courses on skills and/or competencies such as leadership in research, education, supervision, preparation of successful grant proposals; R & D projects management and administration, research teams management, public management, etc. for researchers and research managers in both faculty's units and DICyT. Also, research results dissemination and popularization through the most appropriate means (attendance to scientific events, publication of scientific articles, journals, books, popularization projects among other) and establish a communication plan for Science, Technology and Innovation.
- Establish the full functioning of the University Interface Structure (EDIU) that allows UMSS to participate in Cochabamba and Bolivia's Innovation System, taking into account different particularities and/or forms of innovation already developed within UMSS and those planned for the future; that is, minimally to consider platforms to boost innovation, technology transfer and business undertakings (clusters, EBT, Spin off), ensuring that our participation favor intellectual property and the character of San Simon as Public University.
- Systematize demands from the social and productive environment through EDIU, which has its department working in this activity and also has the collaboration of DISU. This can be achieved mainly by the active participation in the innovation system of Cochabamba, the Continuous Innovation Programs (PIC) that the national government has and with mechanisms such as:

promotion of inverse fairs, working tables between ESP representatives and research teams, blogs to pose specific problems. Likewise, we must create spaces in which UMSS offers its knowledge and technology capabilities to stimulate innovation. In this case, it will be important, to update periodically: the programs, axes, thematic priorities, demands and capacities to visualize the research areas of opportunity and technological development socially useful.

- Promote the execution of R & D projects financed by the Research Fund. We want to maintain competitive projects that will follow the logic of periodic calls in order to continue promoting the research culture; and under schemes of selection processes, the induced projects will be able to be funded at any time of the year, after forming interdisciplinary research teams to look for scientific solutions to real problems set out by society; and finally the R & D projects linked to graduate training in science, considering that graduate research topics are a set of projects that must be made viable together. In all cases, projects must consider Bioethics and Environmental Protection as established in the emerging regulations and respecting the rights of peoples.

5.2.2. Regulatory framework

We propose the adaptation of the regulatory framework that reorders and regulates adequately the development of STIA within UMSS. This framework must be the minimum necessary, leaving a wide margin of flexibility, to create a scenario that favors the promotion and facilitates the development of research activities, getting rid of rules and regulations that condition, discourage or hinder such activities. Due to the national situation and the development tendencies of humanity, the generation of regulations must take into account the concerns emanating from the CPE in relation to issues such as gender, discrimination among other.

The strategy approach responds to decontextualized regulations in force since the 1990s, away from current processes for the creation, promotion and transfer of scientific and technological knowledge; the lack of encouragement to work in research suppose an important brake on the promotion, incentives and consolidation of research; the lack of resource allocation for research in UMSS general budget; the existence of a new Law on Science and Technology that will possibly be addressed until the end of 2017 in the Plurinational Legislative Assembly of Bolivia and the forthcoming elaboration of the General Regulation of Research and Researcher of SUB.

We propose that UMSS' legal and regulatory body contemplates the constitution, relations and functioning of SICTI integrating units and, mainly, that each unit accepts its role, without assuming competences that interfere with their correct performance. So, it is expected that by the middle of the period the entire normative legal framework for the new model will have been generated, and most of the STIAs be developed within this framework. At the end of the period it is expected that all the units of the system accept the new order and its rules as part of the daily wok and contribute to the harmonious functioning of the system.

Strategies.-

- Based on existing consultancy works and current university regulations, it is required to Generate and Update the necessary and sufficient regulations for the new SICTI's normative system, considering the national mandates, guidelines issued by CEUB and international recommendations for their implementation during the next 10 years (regulation: General Regulations for scientific and technological research, researcher ladder, intellectual property, technology transfer, use of equipment, research units operation among other).

- Prepare regulations to link STIA with **graduate programs in science**, considering the model generated in San Simon[19] and currently implemented in six local master programs on Science. This task implies the active participation of DICyT, EUPG, and DUEA, in order to implement it, in the short term, in view of international standards to obtain joint degrees with national and international organizations.
- **Establish guidelines to guarantee the quality of research processes and graduate programs in science**, based on what APEAESU may regulate in the national context and CEUB in the sectoral context. It is also important to consider the "Standards and Guidelines for Quality Assurance in the European Higher Education Area"[20] (ESG) as recommended in Lennart Ståhle's report.
- **Design standards and procedures to carry out periodic evaluation of** STIA **and graduate programs in science** to guarantee and ensure their quality and relevance.
- **Generate ethical, bioethical and environmental protection codes** to regulate scientific, technological and innovation activities that take place within University. The principal pollution generators (such as research laboratories, service and production units), will elaborate protocols and procedure manuals of good environmental practices for their operation (reduction, collection, reuse and waste management) in accordance with the current environmental legislation.

It is recommended that all norms, regulations, guidelines, etc., promote participatory work of all the stakeholders seeking their legitimacy because this will favor their approval by university decision-making bodies, such as the Honorable University Council and the Rector's Office. However, it is important to consider that the time for their elaboration is limited.

5.2.3. Functional Organizational Framework

A good regulatory framework and scientific policy framework are not enough, if they are not accompanied by an adequate organizational and functional basis and a strong political will for the development of SICTI, giving DICyT a leading role as a promoter, organizer, guiding entity and that make STIA profitable. Some reasons why SICTI should have a new order and operation are based on the fact that graduate programs, evaluation and accreditation, interaction, international relations and research areas are separated in the organization chart, which may hinder their articulation; the high degree of autonomy and decentralization of competences that still exists in the faculties, makes difficult the organization and functioning of stakeholders and does not respond to an institutional research planning; in most faculties, research units organization has a disciplinary nature, which does not agree with the current trends when obtaining scientific and technological knowledge framed in inter and trans-discipline tending to research networks association.

Strategies.-

- Although DICyT has implemented functions to increase and mobilize human talent as well as to stimulate STIA, we still need to **create and incorporate interface competences** declared as EDIU in the scientific policy framework.
- **Restructure research units**. We propose to create institutional research Units and Networks, that is to say, of university scope (not in the faculties), related to the thematic areas prioritized and defined in section 5.3. , based on different criteria: organizational rationalization, human

[19] It establishes credits according to the following percentages: 50% research, 25% specialization and 25% "basic" training, with 2 years of full time dedication in the Research Units.

[20] Standards and Guidelines for Quality Assurance in the European Higher Education Area translated to Spanish as "Criterios y Directrices para el Aseguramiento de la Calidad en el Espacio Europeo de Educación Superior" by the National Agency for the Evaluation of Quality and Accreditation, ANECA.

talent optimization, efficient and effective use of infrastructure (buildings, equipment, supplies, software) protecting the environment and financial resources; fostering teamwork and multi, inter and trans-discipline. On the other hand, it is necessary to establish the minimum capacity conditions (human resources and infrastructure) for creating and in some cases consolidating research units in the faculties.

- Manage graduate programs; it is intended that research units play an important role in the creation and development of graduate programs offer, providing teaching and thesis tutoring services as well as offering their facilities for student internships.
- To form scientific research committees that will have the function of advising and generating a favorable environment for all the axes and/or programs, as well as the protection of the environment in relation to scientific, technological and innovation practice. On the other hand, ethical and bioethical aspects will be regulated based on the experiences generated in the Faculty of Medicine through its Research Ethics Committee (CEI).
- Establish a Metrology Unit to support Research Units that guarantees that scientific equipment is operable at all times, and that the data of its measurements are obtained with exact instruments.

5.2.4. Financial Framework

The importance of working on the strategies of this platform lies mainly in seeking financial sustainability for SICTI and, subsequently, making administrative-financial aspects viable to enable the implementation of other platforms strategies as proposed. This as a result of one the weaknesses that we have been dragging on since September 2009, when it was decided to assign resources coming from cooperation to the public administrative management. We propose:

- to consolidate and increase UMSS" Research Fund, described as FONUCyT in PNCTI – SUB, using national resources from the investments proposed by the government in the PNCTI, for graduate training in science, the innovation platforms, and the opportunity to obtain resources from other sources as expressed by PDES in its 4th pillar: *"All the organizations and companies linked to productive sector, water, environment, telecommunication, health and other will allocate a percentage from their resources to scientific research and technology development"*. Using resources from international cooperation that look at this new proposal, part of SUB universities, and where science training (critical mass generation), research (process of generating new knowledge), and innovation (process of transferring results) are linked. To this end, UMSS has as counterpart: the amount of the salaries of the staff linked to ACTIs, the critical mass of researchers with Ph.D. degree, research units' infrastructure, and DHT resources allocated to research.
  - As a way to increase resources for ACTIs, at a national level, we have to encourage the access to FONUCyT funds for R & D projects and obtain resources from it for training other researchers of SUB universities in national graduate programs in science at UMSS. In the international context, we have the possibility of accessing funds for collaborative projects from the *Horizon 2020 Program*, *Research Council UK* among other. To this end, the scientific production of our researchers must be raised enabling them to be part of this type of funding.
  - In the medium and long term, the EDIU, as part of its technology transfer platforms and business undertakings, will be able to generate royalties that should be part of the Research Fund, in order to make it sustainable over time.
  - According to Lennart Ståhle's report, the Ministry of Economy at this moment only guarantees the use of DHT (biggest own income source for ACTIs) for research topics, reason why, in the short term, we propose funding graduate programs in science through the Research Fund, considering that it finances R & D Projects, Infrastructure and the Horizontal Program

(generating the necessary conditions to support graduate programs as established in scientific policy), the three forms of scientific mobilization, making possible the execution of these graduate courses. In the medium term, we should make the necessary arrangements before governmental instances, to make the graduate programs in science financially viable as a single package, with the argument that PDES and PNCTI give this responsibility to public universities but it is a government function to subsidize them in order to achieve the 4th pillar referred to Scientific and Technological Sovereignty.

- The way in which State agencies' expense, purchases and hiring control systems are applied inside UMSS overlap pre-existing internal norms, generating a multiplication of controls and bureaucratic steps that delay operating costs disbursements for research units, these cause a heavy application, considering that it is a mixed system of the government and the central administration of UMSS. In order to resume agility in administrative processes (situation prior to 2009), it will be necessary to evaluate and re-engineer administration processes, which, while complying state regulations, eliminates all control, authorizations and unnecessary documents.
- As part of this re-engineering, we can consider the functionality of the administrative-financial platform that was changing over time, considering that initially it had the main task of supporting researchers with their administrative procedures and now it became a unit that only cautions the use of resources within the framework of the systems established by SAFCO Law. The possibility of **generating a space for researcher's attention within DICyT should be seen in order to fulfill the main role of administrative agent**, leaving DAF to fulfill its main function with the resources coming from cooperation. This will allow us to follow the Impact Evaluation Consultancy recommendations in order to optimize the work of administrative and support staff, making it efficient or reassigning roles and responsibilities to make research processes easier, looking for agile, simple and transparent administrative processes as the norms allow it. At the same time, the accounting data on investments and operative expenses in research will have to be available in a timely manner, transparent, and detailed, so that, at any moment, we know the degree of execution in any project that receives resources.

5.3. Scientific research and technological development socially useful

The conceptualization process of research priorities associated with graduate studies in science, starts from problematic cores reading and finding opportunity areas and sectors, declared in different international, national, regional, sectoral and institutional plans in force. All along with what is understood as "*life systems*", the trilogy environment and natural resources, human development and economic development, has allowed to establish 8 priority research axes for the generation of knowledge in mode 1 (discipline and multidiscipline, as described in sections 5.3.1 to 5.3.8.) and the establishment of 5 programs in mode 2 (inter- and trans-discipline, as described in sections 5.3.9 to 5.3.13.). These two contexts will allow establishing, in a complementary way, the Research and Innovation Agenda (Conceptual Framework and specific proposals for different donors) and the Agenda of Graduate Training in Science.

Workshops in each area had as central objective to validate the name of the proposed axis, the identification of the sub-axes to be prioritized, the definition of principles and efficiency actions for research activities, the identification of graduate proposals in sciences and shaping axis' research networks. In the case of graduate training programs in science, the enthusiasm to work for the first time in inter-facultative workshops, led to suggest initially 77 master programs and 23 doctoral programs in the 8 axes. Therefore, we considered the development of instruments to establish the technical and academic viability of each of these proposals to include them in the document. The application of this instrument is leading to the reduction of the graduate programs proposed, however,

the complexity of this task has caused that this information is not yet available because the 8 networks are still in this process.

5.3.1. Health and life sciences

Develop research and training processes for human resources with a trans-, inter- and multi-disciplinary approach in the area of health and life sciences, which allows having scientific evidence and influence decision-making, responding to the needs and demands of society, from a systemic, integral and inter-sectoral perspective, to prevent, maintain, restore health and ecosystems, improving the population quality of life. For this purpose, the following axes are prioritized:

- Access to health and determinants of health.
- Prevention, diagnosis, control and treatment of non-communicable diseases.
- Prevention, diagnosis, control and treatment of infectious-transmissible diseases
- Health management
- Education for health
- Medicines and food for health
- Interculturality and health
- Research on life sciences
- Information systems in health and life sciences
- Epidemiological surveillance

5.3.2. Transportation systems, telecommunications, ICT and other

Transportation systems, telecommunications and ICT are integration and development factors of society. The combination of these basic technologies devoted to information process and transmission and the tendency to codify all types of information gives rise to other paradigmatic technologies in the current world. The sub-axes prioritized are:

- Telecommunication systems
- Knowledge management
- Smart community
- Energy efficiency
- Robotics and artificial intelligence
- Software development
- Measurement, control, simulation and automation
- New ICTs
- Security management systems
- Mobility, transportation and infrastructure systems
- Regulations for transportation systems, telecommunications, ICTs and other
- Theoretical informatics

5.3.3. Energy, mining and hydrocarbons

The production, transport, distribution and rational use of all forms of energy, mining and hydrocarbons, which constitute the support of country's sustainable development, environmentally friendly through research and innovation in order to generate technology and knowledge . This implies axes like:

- Energy generation and transformation
- Uses of energy
- Planning, management and energy policies

- Transmission and distribution of energy
- Thermal engineering and energy systems
- Mitigation and regeneration of the environment
- Materials science
- Hydrocarbons transportation and industrialization
- Nuclear energy
- Exploration and extraction of hydrocarbons

5.3.4. Water and soil

As water and soil are finite, scarce and vital resources subject to permanent deterioration and inequitable access, we must generate greater knowledge and technology in an inter- and trans-disciplinary way through research and scientific training to contribute for the sustainable management of both resources. To this end, the following prioritized axes are planned:

- Water and soil environmental management
- Water and soil governance
- Quantification of water and soil resource
- Technology for water and soil use
- Risk management and climate change

5.3.5. Biodiversity, natural resources and environment

Humanity is experiencing a period of high loss of biodiversity, deterioration of environmental services, over-exploitation of natural resources, environmental degradation and pollution. The search for solutions through knowledge generation by means of research and technological development is a priority to mitigate the negative effects of this problem in order to improve the quality of life of human beings in harmony with nature. Its prioritized axes are:

- Development of technology applied to environmental problems.
- Studies of flora, fauna, biota in general and their functionality in ecosystems.
- Potentialities, valuation and sustainable use of biodiversity and natural resources.
- Studies of the atmosphere and biogeochemical cycles.
- Evaluation of the impact of anthropogenic activity on biodiversity and environment.
- Mitigation of adverse effects, protection and restoration of fundamental biodiversity and environment components for the maintenance of environmental services, human health and adaptation to climate change.
- Management and integral support to strategies for biodiversity and environment conservation.

5.3.6. Industrial development, production, technology and innovation

Promote industrial development from scientific and technological research, to boost innovation and learning systems, improving the economic and competitive efficiency of productive sectors.

- Development of green technologies and Circular Economy
- Improvement of industrial production and technology
- Productive sectors, productivity and competitiveness
- Management of industrial social-environmental responsibility
- Development of industrial products and manufacturing processes
- Management of innovation processes, technology transfer and entrepreneurship

5.3.7. Agriculture and forestry

Generate and develop knowledge through disciplinary and trans-disciplinary research, seeking appropriate technologies to strengthen food security and sovereignty of the population, preserving biodiversity and natural productive bases (soil, water, flora and fauna) in order to respond to the growing demand for food and improve the quality of life.

- Sustainable agriculture
- Sustainable management of agrobiodiversity and ecosystems
- Harvest, post-harvest and processing of agricultural and forest products
- Water management for agriculture and forestry production
- Genetic, agricultural and forest resources
- Management of environmental, agricultural and forestry information
- Local peasant development and plural economy
- Agricultural and forestry infrastructure and mechanization
- Risk management, natural disasters and adaptation to climate change
- Forest management, plantations and agroforestry systems
- Livestock production systems

5.3.8. Socio-cultural dynamics

Contribute to the holistic understanding of problems that make society through the generation of knowledge that contributes to the development of science and to respond to social demands

- Social economic development
- Population, territory and environment
- Socio-political processes and dynamics: state, society and agents
- Socio-cultural dynamics, imaginaries and heritage
- Methodological and epistemological perspectives

The definition of 5 interdisciplinary programs is still in preparation, with a structure similar to the 8 prioritized axes. For the moment, it has only been possible to agree on the names of these programs:

5.3.9. Degradation of the Environment and Climate Change

5.3.10. Food Security and Sovereignty

5.3.11. Design, Production and Productive Social Environmental Innovation

5.3.12. State Society and Territory

5.3.13. Management and Use of Energy Resources

6. QUALITY ASSURANCE:

The governance in Latin American universities especially in Bolivia has many limitations, which coincides with the views expressed by Jamil Salmi[21], who argues that "the democratic election of the governing bodies and of the main academic leaders encourages academics to impose their personal interests above the academic excellence. Often the decision-making processes are taken of corporatism and are too long, complex and

[21] Member of the Governing Board of the International Institute for Educational Planning, the International Advisory Network of the UK Leadership Foundation for Higher Education, and the Editorial Committee of OECD's Journal of Higher Education Management and Policy.

plagued by bureaucracy and inefficiency". The statement coincides with the reality of the UMSS, as was described in Section 2.4 of the background, however, even in these conditions; progress has been made in the assurance of quality in university education, with the accreditation of 58%[22] of the academic units of degree in the UMSS. The self-evaluation processes for the purpose of improvement and accreditation had with the technical and academic advice of the University Directorate for Evaluation and Accreditation (DUEA).

Usually, evaluation processes comprise three types: self-evaluation or internal evaluation, external evaluation by academic peers and synthesis evaluation. In addition, there are two systems to evaluate academic units of degree, such as: ARCU SUR System of MERCOSUR and the Bolivian University System (SUB).The System ARCU-SUR includes 4 dimensions[23] to accredit academic units of degree, by methodological regulation adhere after RANA[24]call, in the case of Bolivia is managed by CNACU[25]. The calls include the area of Engineering: Civil, Mechanical, Chemical, Electrical, Electronic, Industrial and agronomy; in addition, the degrees in Architecture, Medicine, Veterinary Medicine and Nursing, in the case of UMSS. The accreditations allow the recognition of studies, diplomas and certificates in academic terms and not exercise of the profession.

Once approved, the general regulations for the evaluation of academic units of degree, graduate programs and institutional evaluation, in the National Congress of Public Universities and of special regime, the Bolivian University System disseminates them through The Executive Committee of the Bolivian University, through the National Secretariat of Evaluation and Accreditation to all the universities in the country. The evaluation areas for undergraduate academic units and graduate programs comprise 10 areas[26], which are different in their variables and indicators. These evaluation processes are initiated on a voluntary basis and are intended to progressively improve the quality of institutional management of university education.

The evaluation system of the Bolivian University is considered less rigorous according to Lennart Ståhle in its report[27] highlights, above all, the nature of voluntary participation and definition of flexible evaluation agenda, which in the case of the system ARCU-SUR is subject to a call and has set times for each stage of the process until its conclusion with the issuance of the Opinion of accreditation or postponement.

In the case of the Quality Assurance System, the component of graduate programs, has a first internal filter in University Graduate School of UMSS, that frames their academic actions in the guidelines set out in the "General Rules of Graduate Studies" of the Bolivian university system and its own internal regulations approved by the highest executive authority of UMSS, through Rector's Office resolutions. On the basis of the areas of evaluation of graduate programs established by the Bolivian university system and the experiences of self-evaluation of scientific programs of graduate courses, DUEA is planning to construct and validate the assessment indicators, in pilot form, with Sida-UMSS' master programs in science, in order to create a solid basis for the assessment of future M.Sc. and Ph.D. programs in science to be held at university.

In UMSS to start already have experiences of successful evaluation, as the M.Sc. program in food chemistry, technology and bioprocess" that develops in the research unit of the Faculty of Sciences and Technology, which the report cited Lennart Ståhle manifests itself as follows: "*The structure and content of the plan*

[22] *Executive report of DUEA, year 2017.*

[23] 1.-Institutional Context, 2.- Academic Project, 3.-Infrastructure and 4.- University Community, each with its components for evaluation and accreditation.

[24] National Accreditation Agencies Network.

[25] National Committee of University Majors.

[26] It considers ten dimensions, 1: Legal and Institutional Standards, 2: Mission and Objectives, 3: Curriculum, 4: Administration and Academic Management, 5: Teachers, 6: Students, 7: Research and Social Interaction, 8: Educational Resources, 9: Financial Administration and 10: Infrastructure.

[27] External evaluation of quality assurance systems in the field of graduate research and training at Universidad Mayor de San Andrés (UMSA) and Universidad Mayor de San Simón (UMSS) of Bolivia, as well as the national system through The Executive Committee of the Bolivian University (CEUB).

assume that there are conditions for a good quality". This statement puts in evidence the actual start of assurance of the quality of the graduate studies in science, to be an emerging issue in the institutional resurgence of the university.

The Plan is making clear the premise to only perform useful research and recognized by the scientific community, implementing the system of university quality assurance in all academic units, with emphasis on the research and master's and doctoral programs in science. The cooperation of Sida and ARES, constitutes a crucial opportunity to consolidate systems of quality assurance in research and graduate programs. Initially we have the advice of Lennart Ståhle-Sida and 2 Ph.D. students in assessment and accreditation of ARES.

Finally, we should mention that, in the sectoral workshops 8, the enthusiasm of researchers led to consider 77 master and 23 Ph.D. programs in science for the 10 years considered in this plan. As part of the responsible development of this document, in this specific case we had to generate an instrument called ". "Form of Technical -Academic Considerations for the Development of Graduate Studies in Sciences " (Appendix 7), its immediate application, allowed to filter the graduate programs of studies in science viable in the short, medium and long term, with the minimum necessary considerations, to care for quality assurance.

7. BUDGET:

The budget version presented below is not the final given the situation of national scientific graduate programs that are still under construction (due to their approach with quality assurance considerations) and taking into account their towards 5 Ph.D. programs and possibly 15 M.Sc. programs to execute in the medium and in the long term. The estimated budget for the next ten years is expressed in Bolivianos:

Group	Detail	Funding Source				Grand Total
		TGU*	DHT	Another National Sources	International Cooperation	
Research Fund	Exchange program for teachers /tutors				9.000.000	9.000.000
	Exchange program for R&D Scholarship Holders				6.000.000	6.000.000
	Short training program for the staff involved in research				8.000.000	8.000.000
	Program for Research Promotion			1.000.000	3.000.000	4.000.000
	Program for Popularization of science			500.000	1.500.000	2.000.000
	Competitive R & D projects			15.000.000	15.000.000	30.000.000
	Induced Projects on R& D		8.000.000	8.000.000	8.000.000	24.000.000
	R & D projects for graduate scientific training **		35.000.000		35.000.000	80.000.000
	R&D Post-doctoral projects				12.000.000	12.000.000
	Infrastructure and scientific equipment		15.000.000		15.000.000	30.000.000
	Projects to generate innovations		7.000.000		7.000.000	14.000.000
Research Management	Updating and design of rules and regulations				2.000.000	2.000.000
	Dynamization of the University Interface Structure (EDIU)		2.000.000		10.000.000	12.000.000
	Training in STA management and administration				2.000.000	2.000.000
	Overhead (fieldwork, supplies, other)				5.000.000	5.000.000
	Quality assurance (evaluation cycle, infrastructure quality assurance program)		7.000.000		15.000.000	22.000.000
Support to Scientific Graduate Programs ***	Training in National Graduate Programs		30.500.000		10.000.000	30.500.000
	Graduate training in sandwich modality		5.200.000		42.000.000	47.200.000
	Graduate training abroad in a face-to face modality (Scholarships)		3.300.000		0****	3.300.000
Support services	Implementation of ICT Master Plan				5.000.000	5.000.000
	Metrology and maintenance		6.000.000		6.000.000	12.000.000
	Bibliographic Resources		1.000.000			1.000.000
Total Funding Source		640.000.000	120.000.000	24.500.000	216.500.000	1.001.000.000

* University Treasury: Comprises salaries of the staff involved in STA (researchers, R&D scholarship holders, technicians and support staff), basic services of the units involved (water, energy, communication and other) and maintenance of UMSS infrastructure.
** R & D scholarship holder mobilization at national level.
*** It considers in DHT source, the payment of the substitute teacher (payment per hour 55.90 Bs. per hour) to fulfill the scholarship holder academic activities and in international cooperation the payment to a foreign professors if needed.
**** It does not consider the payment to foreign universities because they were granted through Scholarships.

8. PARTNERS AND DONORS COORDINATION

One of the pillars of the proposal for this period establishes the participation of national and international partners and donors in two ways. On the one hand, to exploit as much as possible, the capabilities generated within UMSS and build on these the so-called Scientific and Technological Sovereignty proposed by the government. On the other hand, take advantage of the opportunities offered by the different funders to stimulate the STIA and mobilize the research community with the purpose of generating additional resources for research.

At national level, we intend to socialize this proposal visiting different universities, part of SUB, and other governmental bodies in order to generate interest on it and that they decide to be part of the "national partners of UMSS". They will play an active role in graduate studies in science when the national entity, become part of the graduate training with the support of infrastructure or highly qualified human resources with Ph.D. degree to be part of the academic staff, and a passive role when a member of the national entity becomes a R&D scholarship holder in the national scientific graduate studies that UMSS leads. To be part of this way of working the entity will invest in the maintenance and mobilization of its R&D scholarship holder. On the other hand, the experience of the research teams to able to participate in calls in order to obtain grants for R&D projects, such as UMSS' competitive projects and the projects PIA-ACC[28] funded by SDC, allows UMSS lead teams in partnership with other SUB universities to participate in calls launched by the ANUCTI or other instances.

A unique case at national level is the association between UMSS and UMSA to develop two doctoral programs (one in each university) as a pilot project, using Sida funds. The complementarity of both universities lies in the fact that the academic staff responsible for UMSS Ph.D. program will assume the role of a scientific board for the PhD students of UMSA and vice versa.

In the international level, we will look for institutions interested in being part of this new way of working and in becoming "international partners of UMSS".

On the one hand, we will search for scholarship opportunities for our researchers in Universities that offer doctoral training in face-to-face and sandwich modalities in the areas related to the prioritized axes, preferably the least strengthened axes, considering that the critical mass of researchers with a Ph.D. degree is still insufficient.

On the other hand, for the national graduate programs in science that are viable (technically and academically), we will promote the mobilization of foreign teachers to be part of the academic staff of the above mentioned graduate programs.

Finally, the universities that have collaborative projects with UMSS' researchers, who take on the challenge of participating in programs such as Horizon 2020, Research Council UK, ARES, Sida, among others, and the organizations that work alongside UMSS on Quality Assurance and Research Management will become our partners.

9. INTERNAL EVALUATION OF THE CONCEPTUAL FRAMEWORK

The Universidad Mayor de San Simon's precepts, as a public university, the RSU understood from the approach of Sustainable Human Development established by the University of Lüneburg and the emerging situation of several agendas and/or international, national and sectoral plans between 2014 and 2017, have

[28] Applied Research Projects for Adaptation to Climate Change (PIA-ACC).

allowed establishing the foundations of this proposal. Understanding that the sustainable development in its three dimensions (social, economic and environmental) is linked to knowledge society from the perspective of evolutionary economics, in this sense Universities have an essential role in the development of humanity, reason why the so-called *Scientific Research* and *Technological Development Socially Useful* (section 5.3) establishes research priorities as a response to national requirements, and with the responsibility of proposing them according to the capacities (human, economic and infrastructure) generated and available within UMSS, in the short and medium term, as well as with a prospective vision of the country's development in the long term. The establishment of the thematic priorities implies giving relevance to Cochabamba and Bolivia's development, reason why different strategic actions have been proposed in the four SICTI platforms that build the relevance from a scientific point of view. In other words, the internal evaluation of the conceptual framework in relation to poverty reduction in this proposal makes these two considerations indivisible.

The productive sectors, national, departmental and municipal governments are the responsible for poverty reduction in Bolivia. They will have better possibilities to create wealth using scientific knowledge and technological developments generated within UMSS to pour capital into the Bolivian society as a whole, looking for the general welfare, for example induced projects. In this sense, it can be said that compliance with this proposal is a necessary condition, but not enough to reduce poverty, reason why the concept of innovation and the link between UMSS and ESP has been given greater importance, taking into account the progress of the INNOVA - UMSS project and the creation and full operation of an EDIU.

The application of the Strategic Action Plan through the organically recognized executing units and labor-stable researchers, the participation of undergraduate and graduate students, the execution of national scientific graduate training programs using the settled capacities of UMSS' Research Units and the "national partners", the incorporation of R&D&I projects in the annual operational plans of the units, are elements that guarantee the academic sustainability of the proposal.

In terms of institutional sustainability, according to the Organic Statute of the Bolivian University and the Organic Statute of UMSS, Scientific and Technological Research is an indivisible part of university academic life. In the same way, UMSS' current Development Plan establishes nine research policies with their corresponding strategies. A retrospective look of the research institutionality in recent years clearly shows the transition from a willful research to an institutional one, currently making efforts to improve its management and with the capacity to assume new commitments, as it has done with the different international cooperation agreements, giving continuity to them even when we have changed authorities.

More than one strategy in the financial framework platform refers to financial sustainability for this proposal. The proposed budget has been done with real estimations, showing reasonably increasing incomes and expenses, in line with the evolution of recent years, and with the institutional administrative capacity, the diversity of funding sources shows less vulnerability, considering that the institutional decision to assign up to 25% of the DHT resources to research has also been diversified to the training of researchers at a graduate level.

In this document, minimizing any environmental impact resulting from research activities becomes our first concern due to priorities and research programs conceptualization on the understanding that the environment affects the quality of life and the sustainability of development. For this reason, in the regulatory framework, we propose a strategy to lay the legal foundations for environmental regulation and control as an inherent element in the quality of scientific activities; and within the framework of scientific policy, in the short term, we intend to perform specific tasks such as emissions control, waste control and other as well as environmental impact studies, so that in the long term, we structure an environmental management system, first in the field of research and later to cover the work of UMSS.

Bolivian legislation, expressed mainly in the CPE, is one of the most advanced in terms of **gender, discrimination and human rights** issues due to emerging social trends. In this sense STIA's new regulation approach cannot ignore these considerations in its elaboration since they are part of the strategies proposed. Regarding gender aspects, there is an increasing incorporation of women to professional practice, once considered "typically masculine", nowadays due to a growing institutional will within the scope of the Sida-UMSS Program, it can be seen that the proportion of women with a Ph.D. degree has been around 46%, doctoral candidates belong to 44% and in local master programs in sciences, there is a positive proportion of 52% of women who are being trained.

According to what has been stated, the wide and diverse research activity to be developed in the next 10 years, has implications on **ethical considerations**, in general, and bioethics in particular, as central elements of institutional behavior. The design of ethical and bioethical codes established in the regulatory framework will promote responsible behavior and good practices of scientific work at UMSS. Additionally, the Research Ethics Committee, as part of an organizational framework strategy, will have powers in terms of reflecting, issuing reports and making recommendations on ethical principles, enforcing intellectual property, respecting life and health, avoiding any type of experimentation with humans and other living beings that put their health and life at risk.

A government intervention exceeding the recognized principle of university autonomy, would mean the disappearance of the Conceptual Framework, the dismantling of the system and the loss of part of the staff, this constitutes the greatest **external risk**, although there is also a latent risk in relation to the reduction of DHT resources due to the decrease in fuel prices in the international market or that the government decides to reduce them as part of its policy to "invest" in the companies considered as strategic.

Part of the **internal risks** is due to UMSS' governance that may hinder the approval of the required actions. The degree of autonomy that faculties have and/or that personal interest could become a difficulty when implementing normative and organizational framework strategies. Also, the permanent improvisation of daily activities to which Units are subjected to may constitute a risk when planning, monitoring and evaluating this document, as well as the empowerment of units aimed at managing economic resources. They may put their welfare before the scientific community when implementing financial framework strategies.

Intellectual property is new within UMSS' research work, and we have generated recently a proposal for its regulation which is being reviewed by university instances that work on this (Organization and Methods, and Legal Advice), this issue becomes crucial when we refer to the link between UMSS and ESP, which in this case is very strong, with the constitution of an EDIU that will allow UMSS to be linked to **Innovation Systems** such as Cochabamba's system and Bolivian Innovation System.