TECNOLÓGICO NACIONAL DE MÉXICO

Atena Editora

Año 2026

Rodolfo Martínez Gutiérrez
(Coordinator)

SYSTEMIC DEVELOPMENT FOR SUSTAINABILITY

Case Studies of QHS Methodology and 2030 Agenda in Voluntary Local Reports (VLRs)

TIJUANA, BAJA CALIFORNIA

NODESS Tijuana Baja California

Academic Body ITTIJ-CA-12 Scientific Investigation Group

RIESS

QHS

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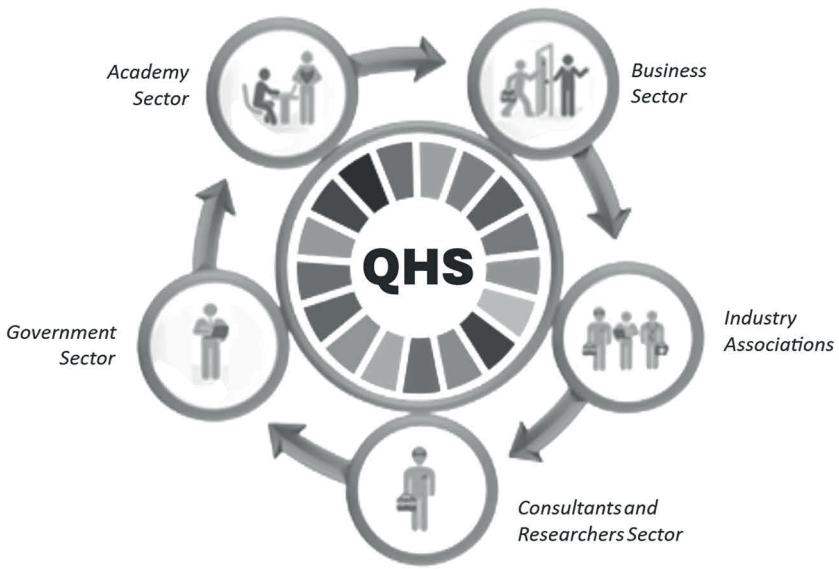

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CONSEJO EDITORIAL

ABOUT THE BOOK AND COORDINATOR

This book offers a concise yet powerful contribution to the understanding and transformation of contemporary territorial challenges within the framework of sustainable development, collaborative governance, and social innovation. Written from a systemic and interdisciplinary perspective, the work integrates conceptual foundations with practical tools that enable diverse actors to engage in collective action and strengthen local capacities. Its central purpose is to provide readers with a clear and applicable framework for addressing the complexity of territorial systems in a rapidly changing world.

A distinctive feature of this book is the incorporation of the Systemic Quintuple Helix (QHS) as a methodological foundation. This model expands traditional approaches by explicitly recognizing organized civil society as a key actor in the co-creation of knowledge, decision-making, and the implementation of public policies. By positioning citizens alongside academia, government, the productive sector, and social organizations, the QHS offers a comprehensive lens for understanding how sustainable transformations emerge from shared responsibility and coordinated action.

Aligned with the 2030 Agenda for Sustainable Development, the book emphasizes the importance of developing competencies for sustainability and fostering innovation ecosystems. It highlights the need for inclusive participation, evidence-based decision-making, and long-term planning as essential conditions for achieving the Sustainable Development Goals (SDGs) at the local and regional levels. Through this perspective, the work positions the QHS as a practical and adaptable model for strengthening territorial resilience, social cohesion, and institutional capacity.

Dr. Rodolfo Martínez Gutiérrez is a professor and researcher at the Instituto Tecnológico de Tijuana (TecNM), where he also serves as Coordinator of the PhD Program in Administration. He holds a PhD in Global Development Studies, a Master's degree in Administration, and a background in Industrial Engineering, complemented by postdoctoral studies at the University of Costa Rica. His academic work focuses on systemic development, sustainable public policy, social innovation, and multi-actor territorial collaboration.

He is the creator of the Systemic Quintuple Helix (QHS) methodology, an innovative model that integrates academia, government, the productive sector, social organizations, and professionals, consultants and researchers; organized citizenship

ABOUT THE BOOK AND COORDINATOR

to strengthen territorial capacities and promote sustainable development. This framework has been adopted in national and international initiatives, contributing to the design of collaborative governance models and the advancement of the 2030 Agenda.

Dr. Martínez Gutiérrez is the national leader of Red RIESS, a network dedicated to the Social and Solidarity Economy, and has coordinated multi-regional projects that link education, research, and community development. He also leads NODESS Tijuana, an initiative focused on food sovereignty and social innovation and has coordinated Voluntary Local Reviews (VLR) in Mexican municipalities, contributing to the localization of the Sustainable Development Goals (SDGs).

His academic production includes publications in Springer (AHFE), IntechOpen, Redalyc, Scopus, Atena Editora and other international venues. He has served as editor and contributor to books on sustainable innovation, systemic development, and territorial competencies. In 2025, he represented Mexico as an official delegate at the United Nations High-Level Political Forum in New York, reinforcing his commitment to global collaboration and sustainable territorial transformation.

Recognized for his leadership in designing integrated educational models, Dr. Martínez Gutiérrez has developed the MOOC–QHS framework, which promotes open, inclusive, and collaborative learning ecosystems. His work combines academic rigor, institutional vision, and a strong commitment to democratizing knowledge for the benefit of communities and territories.

TECNOLÓGICO NACIONAL DE MÉXICO

DR. GAUDENCIO LUCAS BRAVO
Academic Secretary of Research and Innovation at the
Tecnológico Nacional de México
Mexico City, Mexico

PREFACE

The National Technological Institute of Mexico in its New Educational Model 2024 integrates four dimensions; philosophical, academic, organizational and linkage. It integrates three principles: the Educational Model "Humanism for Social Justice"; Social relevance, equity and excellence, and continuous improvement. With six transversal axes: Interculturality, Inclusion and Equity, interdisciplinarity, Social Responsibility, Innovation and Vanguard, and Environmental Awareness.

The research project "National Observatory of Social and Solidarity Economy Projects, PRONACES, Research Networks and Agenda 2030" covers several topics of challenges for the integration of the different sectors of society, towards the elaboration of a Voluntary Local Report, which is why the topics and their conceptual description are addressed in the first stage of the introduction.

Through systemic development and policy analysis for sustainable innovation, in turn, the review of administrative and social economy initiatives for technological humanism, which focuses on the integration of ethical and humanistic principles, the social economy seeks to promote social welfare and sustainable development. The conceptual approach aims to describe all the elements that intervened in the experience of the development of the first VLR of the City of Tijuana, theoretical and methodological empowerment.

Voluntary Local Reports (VLRs), according to UNESCO, bring benefits and raise awareness in society. and quality of life to achieve economic growth, social development, and environmental awareness. The 17 Sustainable Development Goals (SDGs) of this agenda aim to alleviate poverty, safeguard the environment, and ensure prosperity for all. A summit on the SDGs was held in 2023 to assess progress and accelerate the actions needed to meet these goals, rights between men and women, good jobs, affordable and clean electricity, clean drinking water and toilets, and economic expansion.

The Research Project of the SECIHTI 2025 Humanistic Research Call 2025: "NATIONAL OBSERVATORY OF SOCIAL AND SOLIDARITY ECONOMY PROJECTS, PRONACES, RESEARCH NETWORKS AND AGENDA 2030" is proposed in the form of a RESEARCH GROUP, in this sense, a proposal for Collaboration of Researchers Members of the SOCIAL AND SOLIDARITY ECONOMY RESEARCH NETWORK (RIESS NETWORK) is presented. see Figure 1, made up of Researchers with National Recognition SNII, with Professors in the process of training as researchers, graduate and undergraduate

PREFACE

students with professional residency and social service activities, from the North, Central and South regions of the national territory. The project seeks to contribute from academia and applied research to sectoral development, with a systemic approach to all sectors of society.

The general objective of the research project is to develop a systematization of actions, programs, projects and initiatives that contribute to the public policies of the national development plan of the Government of Mexico, to the state and local needs, through the linkage of academia, research, local governments, companies, associations and researchers of society.

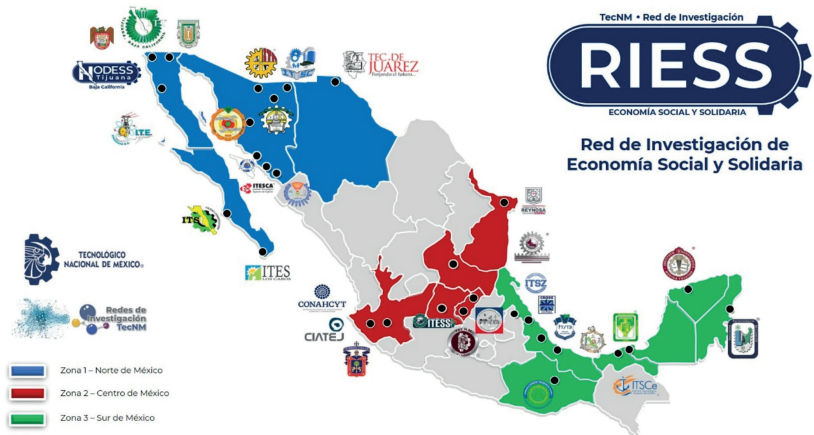

Figure 1: National Map of the RIESS Network

To contribute to the strengthening of ecosystems and social innovation, and the sustainable development goals of the UN's 2030 agenda. Encouraging the development of Voluntary Subnational Reports (VLRs). With the support of students, professors and researchers, all united in a systemic way. Involving high school institutions and thereby encouraging early vocations.

All of the above to develop a National Observatory of Social and Solidarity Economy Projects that allows the analysis, diagnosis and strengthening of initiatives aligned with the Sustainable Development Goals (SDGs), through applied research, training and inter-institutional collaboration, in order to promote sustainable development strategies in communities and productive sectors of Mexico. aligned with the National Development Plan.

PREFACE

RIESS NETWORK

The specific objectives are:

- Develop a monitoring and analysis system within the National Observatory of Social and Solidarity Economy Projects, which allows the collection and evaluation of information on initiatives aligned with PRONACES, Sustainable Development Goals (SDGs), facilitating decision-making and the improvement of strategies in communities and productive sectors.
- Implement massive training and training programs at the regional level throughout the national territory, aimed at students, teachers and community actors on issues of social and solidarity economy, research methodologies, and tools for sustainability, promoting the generation of projects with social and economic impact, through social service activities.
- Foster inter-institutional collaboration and linkage with key actors, including academic institutions, government agencies, and civil society, to strengthen the development of strategies to develop VOLUNTARY SUBNATIONAL REPORTS (VLR) that contribute to the well-being of communities and the fulfillment of the 2030 Agenda.

TECNOLÓGICO NACIONAL DE MÉXICO

TIJUANA, BAJA CALIFORNIA

DR. RODOLFO MARTÍNEZ GUTIÉRREZ

SNII Researcher - Level 2 SECIHTI

National Leader of the TecNM RIESS Network

SECIHTI Project Technical Manager: IH-2025-G-26

Tecnológico Nacional de México, Campus Instituto Tecnológico de Tijuana

Baja California, México

INTRODUCTION

The justification as a precedent to the research project on the relevance, importance and innovation is linked to the relevance of the continuity of this research project directly affects the needs of strengthening and specialization in the lines of generation and application of knowledge in the Postgraduate Program of Administration of the Department of Economic and Administrative Sciences. both in the master's degree in Career Guidance Administration, which has a program of activities to enter the National Postgraduate System (SNP of CONAHCYT), and the new Doctorate project in Administration of the TecNM, with lines of research in Sustainable Development.

Registries of nations that voluntarily report each year, whether at the state, regional, or even local level, cooperation among all facets of society can lead to unexpected results. Because of this, the main responsibility of SDG 4 in the education sector is to act as a catalyst for change and leader, integrating, inspiring and articulating the various facets of society. The involvement of local actors in the preparation of the Voluntary Local Report (VLR) is crucial.

With 32 States and 2,475 Municipalities in Mexico (official name: United Mexican States) it has 131.1 million inhabitants and is expanding at a growth rate of 0.9. This gives rise to the obstacles that Mexico must go through in the stages of empowerment, awareness and taking specific actions according to the particularities of each locality.

In addition, Mexico's Voluntary Local Reports (VLRs) are included in the UN's 2030 Agenda reports and cover 8 of the 32 state governments and 5 of the 2,475 municipal governments [20]. VNRs and VLRs have become the cornerstone of monitoring the global implementation of the 2030 Agenda for the Sustainable Development Goals (SDGs), as they help to fine-tune the implementation strategy. The collaborative work of the Members of the Social and Solidarity Economy Research Network (RIESS Network) will align intellectual, methodological and systemic articulation capacities to contribute in the Municipalities of Tijuana Baja California, Hermosillo and Agua Prieta in Sonora, and in the State of Veracruz, the Municipality of Úrsulo Galván.

Generating knowledge around the 2030 Agenda is essential to drive its implementation and to ensure sustainable progress around the world. This involves research, education, and collaboration processes that connect diverse sectors to analyze and solve challenges related to the Sustainable Development Goals (SDGs).

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Some key strategies include: Interdisciplinary research: Exploring how the SDGs are interrelated and how to address them holistically, involving sectors such as the economy, education, environment, and health. International collaboration: Exchange of ideas and good practices between countries, organizations and communities. Education and awareness: Incorporate the SDGs into academic curricula and disseminate them among the population to encourage their commitment and action. Development of technological and methodological tools: For example, systemic methodologies such as the Systemic Quintuple Helix (QHS), which integrate key actors in the generation of solutions.

The development of the Collection of 6 books (4 in Spanish, 1 Portuguese, and 1 in English).

1. OBSERVATORIO MUNICIPAL DE COMPETENCIAS PARA OBJETIVOS DEL DESARROLLO SOSTENIBLE (ODS) AGENDA 2030
2. ECONOMÍA SOCIAL Y SOLIDARIA; CASOS DE ESTUDIO REGIÓN NORTE DE MÉXICO
3. ECONOMÍA SOCIAL Y SOLIDARIA; CASOS DE ESTUDIO REGIÓN CENTRO DE MÉXICO
4. ECONOMÍA SOCIAL Y SOLIDARIA; CASOS DE ESTUDIOS REGIÓN SUR DE MÉXICO
5. DESENVOLVIMENTO SISTÊMICO PARA SUSTENTABILIDADEESTUDOS DE CASO DA METODOLOGIA QHS
6. SYSTEMIC DEVELOPMENT FOR SUSTAINABILITY; CASE STUDIES OF QHS METHODOLOGY AND 2030 AGENDA IN VOLUNTARY LOCAL REPORTS (VLRS)

They are derived from the authorized research project of the "Humanistic Research 2025" Call of the SECRETARIAT OF SCIENCE, HUMANITIES, TECHNOLOGY AND INNOVATION (SECIHTI), of the project: "NATIONAL OBSERVATORY OF SOCIAL AND SOLIDARITY ECONOMY PROJECTS, PRONACES, RESEARCH NETWORKS AND AGENDA 2030", in Research Group Modality, involving the members of the Social and Solidarity Economy Research Network (RIESS Network) of the National Technological Institute of Mexico (TecNM) based in the National Technological Institute of Mexico (TecNM) at the Tijuana Campus.

INTRODUCTION

The members of the RIESS Network express our gratitude to Mr. Ramón Jiménez López, general director of the Tecnológico Nacional de México (TecNM), Dr. Gaudencio Lucas Bravo, Academic, Research and Innovation Secretary of the TecNM and Mr. José Guillermo Cárdenas López, director of the Technological Institute of Tijuana for all the support received in the activities developed in the RIESS Network at the local level. regional, national and international. Special thanks to the Secretariat of Science, Humanities, Technology and Innovation (SECIHTI) for the support for the development of applied humanistic research activities that contribute to local development with national impact throughout Mexico.

RIESS NETWORK

BOARD OF DIRECTORS · REGIONAL LEADERS

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On March 6, 2024, the Tecnológico Nacional de México awarded the LETTER of ACCEPTANCE of the Social Economy Research Network (RIESS Network) in the NATIONAL Category, issued by the Directorate of Postgraduate, Research and Innovation in Mexico City. Accepted Research Network with a validity for the period from January 2024 to December 2027. The agreements of the meeting of the RIESS Network was the formation of a Strategic Plan of the Network for the 3 years of validity, products will be established by Working Commissions for the rest of the members under a series of meeting activities to configure lines of action by Northern, Central and Southern Regions of Mexico.

INTRODUCTION

RIESS NETWORK · MAIN OBJECTIVES

1. Human resources training: promote undergraduate and postgraduate theses, professional practices and social service.
2. Linkage: strengthen local, regional, national and international collaboration.
3. Applied research: projects aligned with PRONACES (National Strategic Programs) and the SDGs of the 2030 Agenda.
4. Innovative methodology: use of the Systemic Quintuple Helix (Methodology QHS in Spanish), which integrates government, academia, companies, associations, and consultants to analyze sectoral ecosystems.
5. Consolidation of NODESS: support for the Social and Solidarity Economy Development Nodes as spaces for innovation and sustainability

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CHAPTER 1

INTRODUCTION TO SUSTAINABLE DEVELOPMENT AND CONCEPTUAL ASPECTS[1]

Rodolfo Martinez Gutierrez
Instituto Tecnológico de Tijuana

1. INTRODUCTION

Economic degrowth and sustainable green growth represent distinct yet interrelated approaches in the pursuit of transitioning towards a more environmentally conscious and socially equitable model of sustainable development. Both approaches aim to redefine the existing paradigm of perpetual growth, advocating for increased efficiency in the utilization of natural resources and the establishment of social justice and equality. The concept of degrowth initially surfaced as a proactive reaction to the complex economic and environmental dilemmas that arose during the initial years of the 1970s. The concept of "post-capitalism" was first coined and popularized by the influential Austrian-French social theorist André Gorz during the transformative decade of the 1970s. The concept of "degrowth" is deeply rooted in the French term "la décroissance" and the Italian term "la decrescita," both of which eloquently evoke the image of a river slowly and steadily retracting to its customary water levels after experiencing a prolonged period of inundation. The evolution and development of the Environmental Movement in the 1970s can be traced back to the emergence of a comprehensive and in-depth analysis that served as a fundamental and critical assessment of the relentless and unrelenting pursuit of continuous and never-ending economic growth. This analysis brought to the forefront a wide range and diverse array of environmental and social consequences that were intricately linked and interconnected with this pursuit. During the initial years within the first ten years of the twenty-first century, the notion of degrowth started to acquire considerable traction as a complex and diverse social and scholarly phenomenon [1].

[1] **Como citar:** Martinez Gutierrez, R. (2026). Introduction to sustainable development and conceptual aspects. En *Systemic development for sustainability: Case studies of QHS methodology and 2030 agenda in voluntary local reports (VLRs)* (pp. 14–18). Atena. https://doi.org/10.22533/at.ed.727261102

Conceptual and referential approach

This significant surge in interest was largely fueled by mounting apprehensions and concerns regarding the escalating challenges posed by climate change, as well as the depletion of essential natural resources that are crucial for sustaining life on our planet. For a more complete and deeper understanding, we will delve into the conceptual framework of the three terms: Degrowth, Green Growth and Sustainable Innovation:

1. Degrowth: Sustainable Degrowth promotes a systematic and intentional contraction of economic size as a crucial approach to successfully tackle the environmental, social, and economic challenges confronting contemporary civilization. It underscores the need of substantially reducing the consumption and production of commodities and services to maintain life within the ecological boundaries of Earth. This novel approach challenges the established belief that continuous economic development is essential for societal well-being, advocating for a shift towards more sustainable, fair, and equitable living patterns [2].
2. Green Growth: The idea of "Green Growth," on the other hand, is an attempt to find a middle ground between the pursuit of economic growth and the preservation and protection of the environment with a sense of equilibrium. Its primary emphasis is on making investments in cutting-edge technology and putting into practice environmentally responsible methods that help to lessen the effect that human activities have on the environment while simultaneously fostering sustainable economic development. With the primary goal of decoupling economic growth from negative impacts on the environment, this strategic approach actively promotes research and development in key sectors such as clean energy, the optimization of energy consumption, and the promotion of environmentally friendly agricultural practices. This is the primary objective of this approach [3].
3. Sustainable Innovation: Both the promotion of economic degrowth and the promotion of green and sustainable growth over the long run need the deployment of environmentally friendly activities and the application of sustainable innovations and practices. It entails the ongoing production of innovative and environmentally friendly goods and services, as well as the development of disruptive business models that have a beneficial influence on the community as a whole and the environment. Some examples that are pertinent include significant advancements in renewable energy technologies, innovative circular economy practices that aim to effectively minimize waste generated, and the implementation of sustainable urban planning strategies that promote balanced and environmentally friendly development. These are just some of the examples that are relevant [4].

2. CONTEXT AND OPPORTUNITIES IN THE WORLD

The United Nations advocates for and facilitates the execution of sustainable innovation via various projects, programs, and frameworks for international cooperation. The United Nations (UN) does not explicitly endorse economic degrowth; nonetheless, it strongly emphasizes the need to foster long-term sustainable development and the necessity of reassessing traditional economic paradigms and institutions.

2030 Agenda and the SDGs

It is common practice to refer to SDGs as the Global Goals for Development. The UN created the SDGs in 2015 with the intention of putting an end to poverty, safeguarding the environment, and fostering peace and prosperity [5].

The SDGs address a wide range of issues and challenges facing humanity, providing a comprehensive and specific framework for the advancement of sustainability globally. These objectives encompass objectives that are associated with the promotion of responsible consumption and production, the mitigation of climate change through climate action, and the promotion of innovation in a variety of sectors to facilitate sustainable and equitable development [6].

Voluntary Nacional Review (VNRs)

VNRs, which stand for voluntary national reviews, are an essential component of the monitoring and evaluation procedures that are carried out in accordance with UN 2030 Agenda for Sustainable Development. The member states conduct these exhaustive assessments on a regular basis with the intention of evaluating, analyzing, and reporting in detail their progress and development toward attaining the ambitious Goals for Sustainable Development. These reviews aim to achieve SDGs.

The primary goals of virtual network relationships (VNRs) are to support and encourage the exchange of experiences that are enriching and meaningful amongst people who come from a variety of backgrounds and circumstances. This is done with the intention of facilitating reciprocal learning and the development of strong collaborative networks. During the process of putting the Sustainable Development Goals into action, many nations discuss with one another their successes, difficulties, and experiences that they have gained. Strengthening and improving public policies and government institutions: National Voluntary Reports contribute significantly to strengthening and improving national policies and institutional frameworks with the aim of more effectively supporting sustainable development [7].

For any endeavor to be successful, it is essential to successfully mobilize the support of a wide variety of varied stakeholders. To achieve outcomes that are sustainable over the long term, it is necessary to include a diverse group of players and to encourage cooperation between those entities. During this process, it is essential to take into consideration the establishment of strategic alliances and the encouragement of active community engagement. They actively promote the engagement of a broad variety of stakeholders, including members of civil society, members of the commercial sector, and academics, in the process of putting the Sustainable Development Goals (SDGs) into action [8].

VNRs, which are also known as optional National Reports, are processes that are optional and are directed and organized by the nations themselves. This ensures that each review is produced separately and is tailored to the particularities and special needs of the country that is responsible for carrying it out. Every year, the various nations of the world get together in a systematic manner at the International Political Forum on Sustainable Development at the Highest Level. This forum serves as an extremely important global platform for a variety of nations to discuss their progress and challenges in a comprehensive and in-depth manner, as well as to work closely together in the pursuit of exploring possible innovative solutions and joint strategies that are beneficial to humanity [9].

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CHAPTER 2

QHS METHODOLOGY FOR THE DEVELOPMENT OF SOCIETY[1]

Rodolfo Martinez Gutierrez
Instituto Tecnológico de Tijuana

ABSTRACT: The expectation of growth and personal development in society is one of the different stereotypes and paradigms for different generations. From educational training, the individual learns that they must develop skills to succeed in life and, for this, they must prepare, interact socially, and achieve outstanding professional performance. The Fifth Systemic Helix (Quinta Hélice Sistémica [QHS] in Spanish) approach discussed in this chapter raises the activities developed in the different phases of the population, involving the phases of skills empowerment; Knowledge, skills, and attitudes. Which are developed at different levels of educational training, later the exercise of a profession, professional leadership in trade unions, associations, and business chambers. Until finally the process of sharing the experience of professional life with the new generations in the academic sector as a professor, as well as activities to advise public and private sector organizations, through systemic intervention models.

Keywords: QHS methodology, DCS methodology, job skills, knowledge attitudes, happiness

1. INTRODUCTION

The purpose of this article focuses on describing the virtuous circle of an idea, giving meaning to the principle "knowledge, generates knowledge", and "we cannot give, what we do not have", under this premise describes the phases of the gestation of an idea, its development, dissemination until putting it into practice as a model of articulation in daily life in society. This is the case of the QHS Methodology that is oriented to generate actions of articulation and integration of all sectors of society as a strategy to find solutions and eclectic proposal of multidisciplinary methods, which converge in the sum of specialized talent, the QHS Methodology; convenes

[1] **Como citar:** Martinez Gutierrez, R. (2026). QHS methodology for the development of society. En *Systemic development for sustainability: Case studies of QHS methodology and 2030 agenda in voluntary local reports (VLRs)* (pp. 19–44). Atena. https://doi.org/10.22533/at.ed.727261102

the voice of experts from the Academy, Companies, Associations, Consultants and Government, to jointly develop analysis of initiatives of the topics of interest in the ecosystem of society for its sustainable development.

The conception of the idea to develop the proposal of the QHS methodology was born when taking a doctoral class in global development studies in 2008, listening carefully to the Professor the theories of global development and international systemic competitiveness; this context, adds the characteristics of Generation X, work, and study as a challenge of the culture of effort to achieve goals to progress. Figure 1 presents the chronology of work and professional development as x-ray of the resume, occupational transitions, and systemic growth in society. theories of global development and international systemic competitiveness.

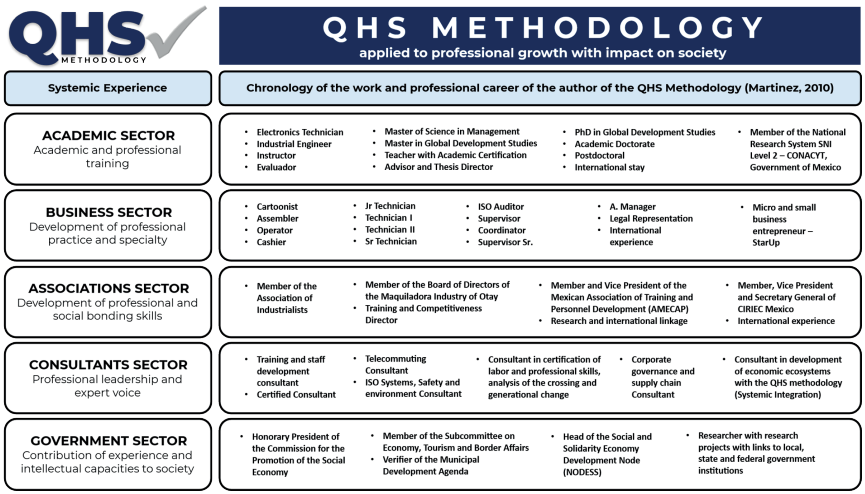


Figure 1. QHS Methodology applied to professional growth with impact on society.

The construction of a resume traditionally begins with academic training, from the early stages of educational training; when defining vocational guidance, type of professional career, the identification of the competences to be developed and their effects generated when carrying them out; the competence of knowing how to know; It is knowledge that develops understanding through theories and principles of the sciences. The competence of know-how; They are the development of skills that generate passion for identifying and recognizing the ability to have talent and their way of exercising them. The competences of knowing how to be; They are the behaviors, attitudes and universal values exercised during the professional exercise and finally the competence of knowing how to be happy; It is the identification of those activities that generate excitement, satisfaction, and pleasure to develop them.

There are 8 levels of competencies according to UNESCO raises the International Classification of Education Levels (ISCED), which generates a reference framework for complementary preparation through certifications through standards of work, professional and research skills, a strategy of updating through continuing education. For the formation and development of systemic competences in the professional career, there are certifications of competences in the academic sector, for the exercise as Professor and his different functions of specialization, for the professional practice in the companies, for members of business and social associations, for consultants in functions of different specialties and for employees of the public administration in the government. A certified person represents efficiency, effectiveness, productivity, and competitiveness.

The academic life of a professor and researcher is linked to the practice of creating research projects, developing articles, and publishing them in prestigious indexed journals with international ranking, participation in congresses, forums, and seminars to achieve positioning in the processes of evaluation of academic performance and research career of national and international competition, generating indicators of productivity and traceability of scientific bibliometric.

Figure 2 presents events and interviews of QHS Methodology, within the framework of bibliometric studies of original, recognized, appreciable and consistent research, for which it traces publications, theses, disclosures and all the evidence of the methodological contribution in society.

Figure 2. QHS Methodology Dissemination experiences in conferences and interviews

Section 2 referring to methods and materials addresses the phases of the systematic analysis of the key components that make up the QHS methodology, starting with the Academy Sector, analysis of the impact of academic training. Secondly, the Business Sector is addressed, The analysis of the impact of the work and professional trajectory. In the third place, the Associations Sector is addressed; Analysis of the impact on the development of collaborative networks. The fourth place is for the Consulting Sector; systematic analysis of the development of professional practice as a consultant. And finally, the fifth component is addressed, Government Sector, where the management and linkage with government institutions are addressed.

The great expectation of the citizenship with respect to their representatives in the government, is that these public employees are aware of the vote of confidence that was deposited in them, between the campaign discourse vs. the results of public management, therefore the motivational skills, promotion of dialogue, serenity, knowing how to delegate and the focus on results, They are factors of success as an employee and public servant, since the efficiency of government, is reflected in indicators of confidence in the performance of institutions, authority and public management, revealing the management competencies in the public administration of the public employee who represents his country.

2. METHODS AND MATERIALS

For the investigation of the bibliometrics on the academic, scientific and research productivity of the QHS Methodology, a chronological analysis of several means of publication and diffusion was carried out, achieving a complete vision of contributions in research, citations, references, and methodological applications in the different systemic sectors of society, considering the national and international context. In this order of ideas; the first articles in journals, congresses are registered between 2010 and 2012, evidence of 5 articles on the original topic where the contribution of the QHS Methodology was applied and generated; "Factors that determine the competitiveness of the maquiladora industry of the electronic sector in Tijuana, Baja California", subject of doctoral thesis, to obtain the degree of Doctor in studies of global development, at the Universidad Autonoma de Baja California Campus Tijuana, Baja California, Mexico (UABC-CONACYT), Graduate program at national level with international recognition, with guest professors from national and international universities.

In this sense, the proposed QHS methodology; reflected the different systemic skills that are developed in an innovative ecosystem with characteristics that distinguish the city of Tijuana, Baja California, Mexico. Known as the door to Latin America and where the Mexican homeland begins.

The dynamics of the border between the cities of Tijuana and San Diego, makes the city of Tijuana very attractive for transnational companies and with global operations that are established in industrial parks under the concept of foreign trade of assembly plants and factories called maquiladoras, taking advantage of the benefits of the Free Trade Agreement to export their products back to the United States.

At its historical peak, in 2001, there were about 820 of these maquiladoras in Tijuana. Generating worldwide fame in the industrial environment of Tijuana was called the World Capital of Televisions, by the world records of production of televisions and PC monitors that were manufactured. Currently, industry 4.0 has become the new parameter of development and installed capacity to the challenges demanded by international trade.

Likewise, the industrial vocation of the city of Tijuana is characterized by the great offer of industrial parks for the installation and foreign investment in the metropolitan areas of the cities of Tijuana, Tecate and Rosarito, Baja California. Contributing to the favorable conditions of the development of dynamic ecosystems of chains and formation of supply chains of the great value chain of foreign trade, customs and international logistics in the Cali-Baja mega region, which unites the States of California in the United States and Baja California, Mexico, generating clusters in Different sectors of industry, business associations, educational institutions of technical training specialized in training of human talent required in strategic sectors of companies, strategic training professional levels such as engineering, with soft skills for management in business leadership processes of local focus with global vision.

In the business world increasingly oriented to corporate governance practices, multiculturalism, electronic commerce, teleworking, business models under the scheme of Startup and Spinoff is increasingly common the total opening of transgenerational projects and initiatives with the purpose of achieving integration of all generations of society under one roof; from people in the Baby Boomer Generation (1945-1964), Generation X (1965-1981), Generation Y or Millennials (1981-1997) and Generation Z (1997-2010).

It is public knowledge that social networks are an efficient communication tool, feedback for businesses driven by generations that were born with the benefits of the internet in hand, or applications (Apps) that is increasingly common that represent new businesses of generational change in all senses of daily life in the world. Figure 3 alludes to the challenges of a systematic resume in academic training, forming a set of acquired knowledge, which are tools that help consolidate competencies in the discipline of professional practice. Academic training should not only be

the reception of data, information, and collection of degrees. It is a process of intellectual growth that allows us to develop analytical capacity and critical thinking or, for the resolution of challenges and problems in the trajectory of personal and professional life.

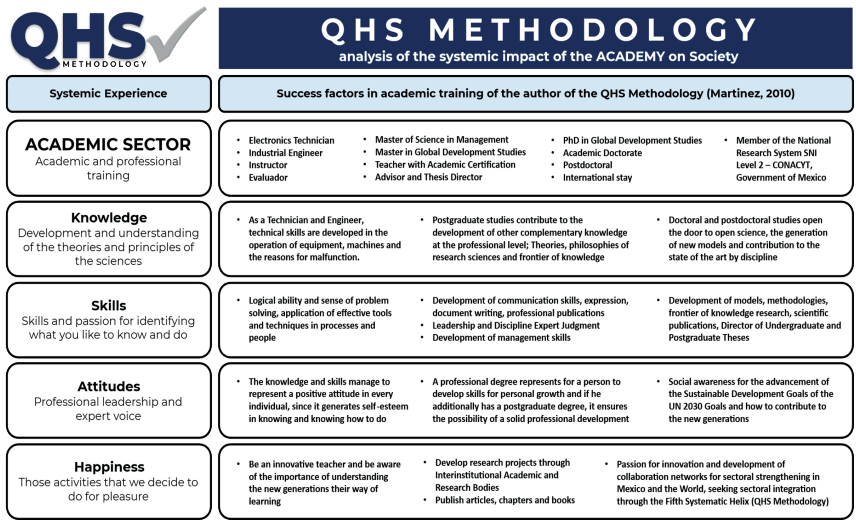


Figure 3. QHS Methodology analysis of the systemic impact of the Academy on Society

Researchers and decision makers in society in the world are between the transition of the Baby Boomers Generation and Generation X, precisely the author of the proposal of the QHS Methodology, is characterized with the profile of Generation X (1965-1981), in the year 2023 they represent 18.2% of humanity, They are generally conservative, faced economic difficulties, are a reflection of hard work, effort to achieve their goals in life, despite adversity, managed to mature at an early age, lived the digital revolution; cellular telephony, the evolution of the internet and computers. Believers in the culture of effort, desire for improvement and continuous improvement. Later and often in parallel it is common for young people to work in positions characterized for students, in companies that traditionally offer part-time, part-time, even for hours of service, in order to make flexible the learning opportunities of the new generations of professionals who require an opportunity to put into practice the knowledge acquired in the classrooms, Correlate theories vs the real world, apply tools for solving problems in organizations, there are extraordinary cases that vocation and natural skills exceed academic preparation, properly in issues of leadership, empathy, charisma, aspects of soft skills that are generally differentiating factors for a hiring and define personality types.

A question that every individual asks at some point in life is, how can I succeed in my work and professional development?

This question can have one or several answers according to the level of preparation we have vs our expectations of the position of responsibility or the hierarchical level we want to occupy, everything is related to capabilities, it is a matter of competitiveness, results, therefore, companies will evaluate the level, profile, experience, competencies vs. position, its objectives, and responsibilities in the short, medium, and long term. For this, it is important to evaluate job competencies to allow employers to better know the potential of potential employees; objectively determining the level of knowledge, skills, abilities, and attitudes to perform in the appropriate position. Is it the right person for the right position?

That is why identify and recognize the training needs vs. the positions and levels in which you want to move in the medium and long term, properly define a life plan and professional career, in Figure 4 an example of work and professional trajectory of the author of the QHS methodology, trajectory associated with sustained growth, is presented. characterized by the development of multiskills product study and work in parallel, although later as the professional career was consolidated was a context vice versa of working and studying as a strategy of professional updating.

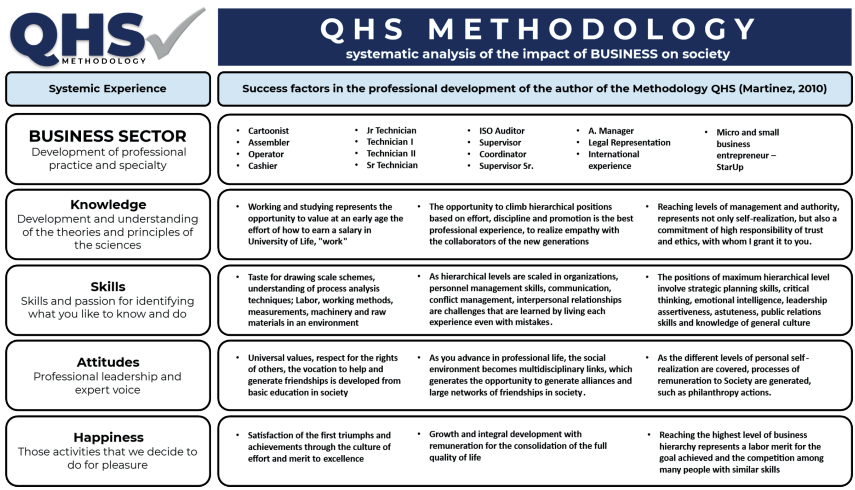


Figure 4. QHS Methodology analysis of the systemic impact of Business on Society

The trajectory of a person in his professional performance as consolidated in an organization where professional services are provided, according to his competences; knowledge, skills, attitudes, and places to develop what you are passionate about.

If, your performance results are successful, innovative, and outstanding in your area of specialty, you become a reference among your peers, being naturally proposed as a guest, member, and leader in Associations of the sector and specialty area of the profession you exercise, in such a way that it initiates another facet of professional development, becoming an opinion leader, expert criterion in good practices product of experience and professional career. The first experiences that are lived in the trajectory of professional development, are the collaboration networks, the associations of students or professionals, these social figures, represent the opportunities to learn and develop skills of public speaking, leadership, assertive communication, and the principles of political behavior, in order to achieve the planned ends, putting into practice the expression, The objective justifies the means. Figure 5 presents the trajectory of outreach activities, professional management, national and international leadership roles, product of experience and participation as a sector expert.

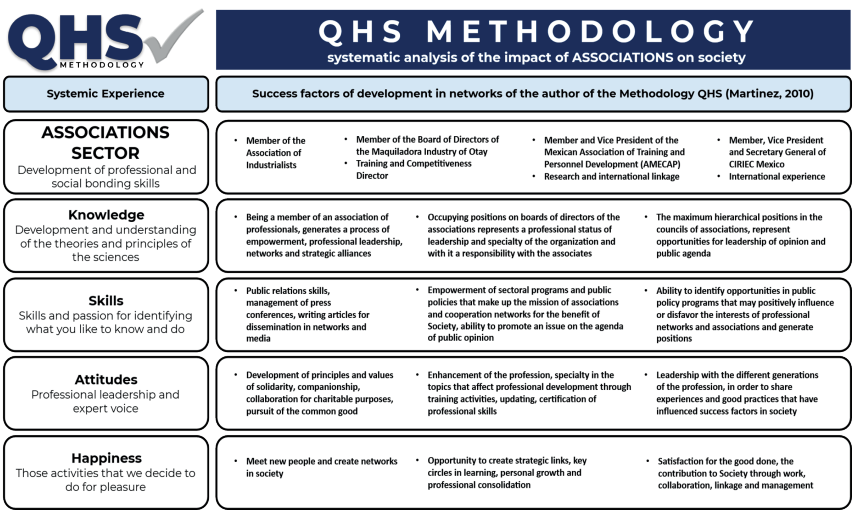


Figure 5. QHS Methodology analysis of the systemic impact of Associations on Society

The Associations, Business Chambers and Unions represent the interests of the registered Members, with the objective of developing programs and initiatives for the empowerment and improvement of the discipline and the profession; considering the development of strategic plans as a cross-cutting axis; for the development of linkage projects through mechanisms of articulation with the different sectors of society. The Associations are characterized by the formation of a Board of Directors with a structure managed by democratic elections of its members, typically a structure

of a Presidency, Vice Presidencies, Directors of Commissions or Committees, with periods of 1 or 2 years, which can be re-elected according to their statutes, generating a history of leaders of professionals who are distinguished by their leadership and ability to achieve results in their management.

By successfully and outstandingly developing the performance of responsibilities in professional practice, it is common the transition from exploring the alternatives of selling complementary professional services to a formal position in an organization in a subordinate manner, becoming an expert of specific topics, generates the reflection of valuing changing the role of employability; Offering business consulting services represents a parallel alternative or even the main source of professional performance, when prestige and credibility is the business card of the provision of professional services, problem solving in organizations.

Figure 6 describes the importance of a professional career to build and consolidate an image, style, and credibility, the voice of expert and facilitator of training processes, manager, and advisor of the management group, as an Organizational Consultant to give technical support and coaching to the staff group, as well as a management group.

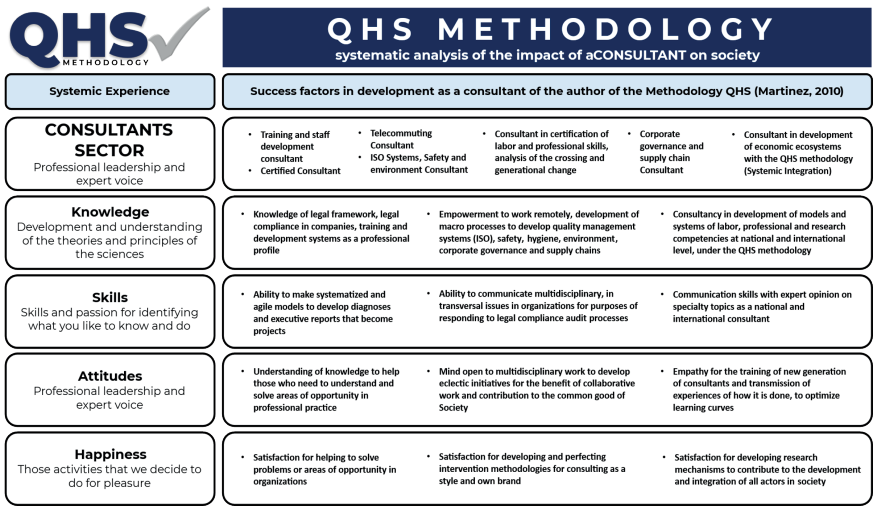


Figure 6. QHS Methodology analysis of the systemic impact of a Consultant on Society

The consulting sector is one of the most diverse labor markets in the business and professional services sector, there is great demand for professionals who have the main skills of a consultant that are essential to grow business and profitability.

Knowledge and skills to perform successfully in the different branches of consulting; technical knowledge, strategic research at the corporate level, specialists must know in depth the following aspects: government fiscal policies, corporate responsibility and governance, and functional and organizational strategies, Internal financial policies, a quantitative analysis regulatory application, Federal Labor Law, Payroll and income taxes (ISR), Professional training programs, Labor benefits and benefits, Vacations and vacation premium, Financial consulting, Promotion and marketing, Distribution and supply chain, Capital allocation, Risk management, Purchases and acquisitions, Investments and mergers, Productivity and profitability, IT Consulting, Computer networks, Migration to the cloud, Digital transformation, System Integration, Data Science, Forensic Technology, Protection against cyberattacks. In the environment of the most outstanding consulting services and firms and international prestige, the profiles of the consultants are supported by the following characteristic aspects in the resume and professional career:

1. Academic success

It is essential in specialized consulting roles. The academic record supports the ability to learn, the willingness to grow, two key attributes in a consultant. A strong record of school results, performance at different grade levels; Higher education levels, postgraduate or recognitions and distinctions, demonstrate the ideal profile to be a consultant.

2. Work experience

To work as a consultant, you must have a proven work and professional career, consulting companies select professionals who have successfully performed in companies with outstanding results and impacts. Therefore, work experience in data analysis, information presentation skills, teamwork, are impact factors.

3. Leadership

Leadership is an elementary characteristic of a consultant, consulting companies are looking for people who can thrive, lead a team and face challenges.

4. Attention to detail

A criterion of success in consulting demonstrates attention to detail and high standards of quality, continuous improvement, ease of structuring ideas, writing and explaining and listening.

5. Troubleshooting

To show aptitude for analysis and critical thinking, application of the scientific method to solve problems, develop team relationships and integrate high performance teams. Document cases and success stories as a curricular reference to train new generations of human talent in consulting services.

6. Commercial awareness

Consultants develop skills to efficiently understand the fundamentals of an industry and the requirements of legal compliance and with it the identification of gaps to create key consulting services, including anticipating in preparing for the challenges that will be part of the agenda of the future in society, such as sustainable development (SDG) and green energies.

7. Natural communication

The written and verbal communication skills are success factors of a consultant to effectively transmit and influence an innovative idea in different contexts in society.

8. Self-awareness

The capacity for self-reflection and availability to optimize areas of opportunity to constantly improve. A consultant never stops learning.

9. Teamwork

The skills of teamwork and autonomy are key, the consultant must know how to delegate to his team of consultant's activities and promote high performance results highlighting and recognizing individual performance, giving fair credit to each member of his work team, promotion of performance and productivity indicators.

10. Interpersonal relationships

Consultants must develop empathy and charisma skills to generate and develop the ability to build relationships at all levels of an organization and generate new networks.

Figure 7 describes an example of professional and academic trajectory, collaboration in associations and consulting with government institutions through linkage and collaboration in public program activities under the modality of research, training, advisory and evaluation projects of public programs with an impact on society.

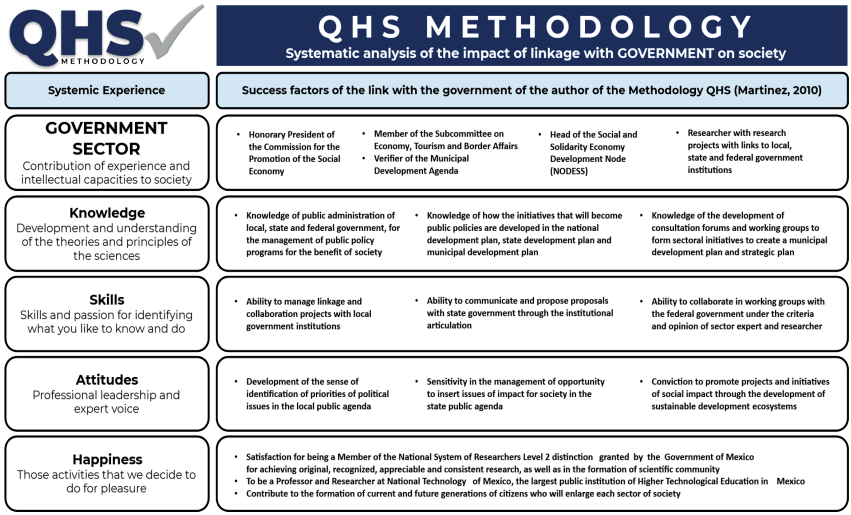


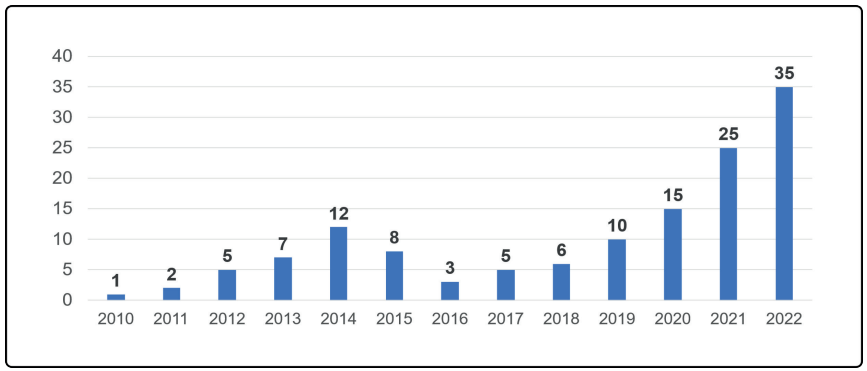
Figure 7. QHS Methodology analysis of the systemic impact of linkage with Government on Society

The main competencies characteristic of success in performing as an employee or public servant; is to be a Motivator; to ensure that institutional objectives are met on the scheduled date. Promoter of dialogue; In the public sector, it is necessary to reach consensus quickly and move projects forward. Capacity for Serenity; ability to remain calm and not transmit despair and intelligent decision making. Focus on results; ability to meet objectives and goals. Knows how to delegate; ability to empower the team of collaborators.

In the management of the public administration one of the most important challenges is the fulfillment of programs of impact on society, specifically medium and long-term programs, which require mechanisms of linkage and articulation with the different sectors of society, in this sense the QHS Methodology has represented a strategic tool to shape projects that affect initiatives of the global agenda as is the case of the 2030 Goals of the UN through the Sustainable Development Goals (SDGs), an issue that has generated various initiatives in government institutions, and require support to develop melting pots, development of ecosystems that combine talent, the experience of representatives of government institutions, academics and researchers from institutions of different educational levels, entrepreneurs, leaders of associations, business chambers, unions and specialized experts from consulting firms, all united through the QHS Methodology for the benefit of the development of program initiatives that integrate all the minds of the different generations in society, seeking harmony, happiness through the common good, united by the development of talent management in society.

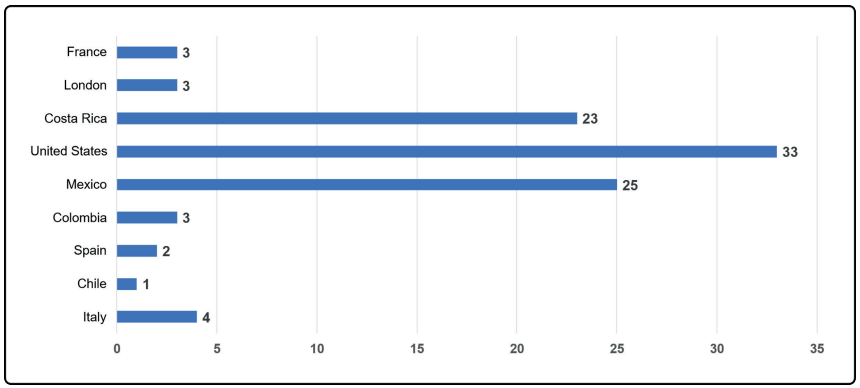
3. RESULTS

The findings of bibliographic traceability of actions developed since 2010 includes publications, articles, research projects, conferences, book chapters, as well as books are reflected in Graph 1, academic works and research, were developed product of the inspiration of the doctoral thesis work initiated in 2008, and presented in 2012, that was oriented to the study of the sectorial development and the factors that determine the systemic competitiveness in the electronic industry, specialized in the development of audio and video products, industry that characterizes the development of the border city of Tijuana, Baja California, Mexico. Doctoral research generated the bases of the proposal of the QHS Methodology, which focuses on the analysis of public policies that affect the success factors of an ecosystem of progress and development of a city, and replicable development model.



Graph 1. Report on publications on QHS Methodology

The bibliometric analysis of international publications presented in Graph 2 is linked to the challenges of publishing in prestigious journals and publishers, recognized by the authorities of the National System of Researchers in Mexico, to maintain high quality indicators in scientific research.



Graph 2. International publications on the QHS Methodology

In 2010, within the framework of the presentation of a preliminary advance of the results of the proposal of the QHS Methodology, we participated in a Congress of Public Policies, in the Benemerita Universidad Autonoma de Puebla (BUAP), in the Congress of the Network of Municipal Studies (Red-Mun), where the Authorities of the Center for Research and Training in Public Administration (CICAP) of the University of Costa Rica were known, generating an invitation for a Doctoral Stay, and later in 2012, a Postdoctoral Stay; with activities of linkage and international cooperation with universities in Mexico, Colombia, Panama, Peru, Brazil, Uruguay, Cuba, Chile, Argentina and Spain.

In 2011, the international link and cooperation with the University of Costa Rica continued, generating participation as Guest Professor of Mexico, in the Center for Research and Training in Public Administration (CICAP) and the School of Chemical Engineering, carrying out activities of Conferences on the QHS Methodology, to Students, Professors and Researchers. Likewise generating the bases of Institutional Cooperation between Universities of Mexico and Costa Rica.

The year 2012 [1-4] was the official beginning of the Postdoctoral Stay of six months that became more than six years, generating a great life experience and an excellent conviction of factors for the development of the laboratory ecosystem to replicate projects of the QHS Methodology in different sectors of Costa Rican Society, from the research area at the Center for Research and Training in Public Administration of the University of Costa Rica.

2013 [5] was a year of implementation of actions and research projects that would have the QHS Methodology as a key axis in the development of the bases of a strategic plan, called Project-Country "National System of Labor Competencies", a

Research Project aligned from the University of Costa Rica, to cement the foundations of a Seed Group, to be trained, evaluated and certified as an Instructor, Evaluator and Methodology of Competences, according to the requirements of the Organization for Economic Cooperation and Development (OECD), likewise under an international cooperation agreement with the Technological University of Tijuana (UTT and CECLUTT) and the National Council for Standardization and Certification (CONOCER) of the Government of Mexico. Creating the Project of the First Evaluation Center of Labor Competencies outside Mexico, and later the First Certification Entity of Competencies of the University of Costa Rica (CECLUCR).

In 2014 [6]; research, training and the development of focus groups of the QHS Methodology were replicated; oriented to the construction of the great Carpentry, in a figurative sense of the development of projects of Standards of Labor and Professional Competences necessary for each sector of Costa Rican society, from initiatives of final projects of graduation (TFG) of bachelor's, master's level and doctoral level ; projects aimed at Public and Private Sector Institutions and Organizations; the first draft of the Labor Competence Standard was oriented to the Customs sector, in the function of "Verification of goods in customs warehouses" which was carried out under a process of the QHS Methodology; involving specialists of government representatives Specialists of the Customs Sector, Professors of the Customs subject, Specialists of the College of Professionals and Consultants of the Customs subject, to determine the Knowledge, Skills and Attitudes for the functions of the design and proposal of the Standard of Labor Competition.

In parallel, to the development of research activities, linkage activities were developed with other universities to generate international projects of Competency Standards through the QHS Methodology, generating linkage initiatives between the Universities of Costa Rica (CICAP-UCR), University of Guadalajara, FUNDESCO of Argentina and CONOCER of Mexico, for the development of Competency Standards in Teleworking or remote work.

During the years 2012 to 2014; progress was made in the process of dissemination, training and the activities of the research project "National System of Competences of the Cultural Sector"; in this project I replicate the awareness efforts of the Seed Group involved in the empowerment of Architecture for the Development of Standards of Labor Competencies, venturing into the Development of the Standard of Competencies for the "Theater Management", later other topics were analyzed such as: Management in Museums, Management of the Social Promoter, Management of the Music Promoter, Standards of Competences for issues of formation and development of Young people in football teams, Standards for Teaching Sign Language, Communication Standards, involving specialists in Radio and Television communication. Initiatives of Standards of Competences for Traffic Officers, Standards of Competence for Activities of Psychologists, Standards of Competences for activities of Selection and Recruitment of Personnel in Institutions of the Public Service.

The research project called CECLUCR (Center for Evaluation of Labor Competence of the University of Costa Rica), generated linkage initiatives with the University of Panama, creating a preliminary project to replicate the CECLUCR Project in the School of Public Administration of Panama, as a product of linkage activities and international cooperation in the region of Central America and Panama.

As a strategy to cement the research advances developed through the QHS Methodology, a book chapter "Definition of labor competencies in the Public Administration through the QHS Methodology" was published with the Academic Body called: Research Group in Systems and Tourism of the National Polytechnic Institute (IPN) of Mexico City. Likewise, another chapter of the book "Veins for Future Research" of the QHS Methodology in the Cooperative Sector and Social and Solidarity Economy, published by the Institute of Studies of the Public Ministry (IEMP) of the Ministry of Labor of the Republic of Colombia, was published. Within the framework of the dissemination activities, articles were published in the Journal of the General Directorate of Civil Service of the Presidency of Costa Rica, reflecting the progress of the Research Project of a Plan of a National System of Labor Competencies and its strategic components as a roadmap to achieve cement a Project-Country towards competitiveness through the management of human talent trained at different educational levels and the recognition of knowledge, skills and attitudes in public and private sector personnel.

In 2014 [7] an article was published in a Journal Specialized in Competitiveness Studies in the United States of America, highlighting the key elements of the QHS Methodology to determine the key factors of success in sector development.

By 2015 [8] it had participated in dissemination and dissemination activities in universities in Costa Rica, Panama, Mexico, Chile, Spain, and the Dominican Republic, through the Telework Skills Standard Project, involving master's and doctoral students, through the QHS Methodology, generating publications of articles,

The Postdoctoral Stay at the Center for Research and Training in Public Administration of the University of Costa Rica, ended in 2016, generating a series of contributions documented in a final report, which recorded publications, research projects as principal investigator and collaborator, advisor and tutor of final graduation works (TFG) of undergraduate level, Master and doctorate, link with different educational institutions in Costa Rica, such as the Technological Institute of Costa Rica (ITCR), National Technological University (UTN), State Distance University (UNED), National University of Costa Rica (UNA) and the University of Costa Rica (UCR), where he obtained the Academic Doctorate and the Postdoctoral Stay, as well as a great link with Universities of Panama, Colombia, Peru, Cuba, Guatemala, Argentina, Uruguay, Puerto Rico, Dominican Republic and Spain.

Upon returning to Mexico, after the Postdoctoral Stay in Costa Rica, he participated during 2017 at the Technological University of Tijuana (UTT) as Coordinator of Academic Mobility and Situational Work Analysis (AST), developing the pertinence studies of each study program of engineering careers with the QHS Methodology, to identify the graduation competencies versus the requirements of the representatives of the sectors interested in hiring. of graduates.

He continued with the participation in international events and involvement in specialized research networks such as the International Network of Research in Competitiveness of the University of Guadalajara (RIICO), the collaboration in the Mexican Association of Training and Personnel Development (AMECAP) as Vice President of Research and International Liaison for projects of design, development, and certification of labor competencies.

Likewise, at the end of 2017 [9], the invitation was received from the Director of the Technological Institute of Tijuana, to participate as Graduate Coordinator, of the master's in administration of the Division of Graduate Studies and Research, within the Department of Economic and Administrative Sciences. Initiating in parallel the Project of Certification of Labor, Professional and Research Competencies for Logistics Engineers, as an initial part, to later move to other educational programs, from research projects, involving Social Service activities, Professional Residencies, equivalent to final graduation works (TFG) or bachelor's and master's thesis. Using the QHS Methodology.

For the year 2018 [10], the development of the accreditation of the Verification Unit of the Municipal Development Agenda (ADM) was promoted, for the Master's Program in Administration of the Technological Institute of Tijuana (ITT), generating initiatives of Standards of Competences with the QHS Methodology for the public sector. Parallel to the development of the verification processes of the progress of compliance with the programs of the Municipal Development Plan in the Municipalities of the State of Baja California, in coordination with the Government of the State of Baja California and the Liaison with the National Institute of Municipal Development (INAFED) of the Ministry of the Interior of the Federal Government of Mexico. This experience of evaluation in the Municipality generated the bases of Lines of Research and Application of Knowledge to form an Academic Body with official registration at the national level through the Ministry of Public Education and the National Technology of Mexico (TecNM).

During the year 2019 [11-19] he advanced with the activities of linkage and international cooperation, participating as Co-director of doctoral thesis at the State Distance University (UNED) applying in the thesis project the QHS Methodology, focused on the identification of success factors in companies in the health sector in

Costa Rica. In this same year 2019, the administrative management for the Recognition as a Full-Time Professor (PTC-PRODEP) distinction granted by the Ministry of Public Education was carried out to manage research projects and form Academic Bodies with lines of research related to the profiles of Professors and Researchers that make up a research group.

Already in 2020 [20-27], a curriculum had been consolidated as a Professor and Researcher with evidence, trajectory and specialty in research on issues of competitiveness, labor skills, professionals and research, teleworking, corporate governance, safety and hygiene, supply chains, quality, ISO9001, ISO14001, ISO19011, as well as Mexican Standards (NMX), and properly as Author of the QHS Methodology, the registration of the Academic Certification was processed before the National Association of Schools and Faculties of Accounting and Administration (ANFECA), achieving the Academic Certification (2020-2023).

In 2021 [20-25], the QHS methodology; was linked to the development of projects of linkage and sectoral articulation, in the framework of the activities of Scientific Research Projects registered and authorized by the National Technological of Mexico, the national impulse of the PRENODESS Project linked to the Thematic Line: FOOD SOVEREIGNTY of the National Strategic Programs (PRONACES) of CONACYT of the Federal Government of Mexico. For the formation of the Strategic Allies of the Social and Solidarity Economy Nodes (NODESS), the QHS Methodology was promoted, to encourage sectoral integration, convening representatives of all sectors of society; Social Sector, Cooperatives, Institutions of Upper and Higher Education, Association of Cooperatives, Consultants and Local Government Institutions. Project specialized in the sector of the Dough and Tortilla Industry in the city of Tijuana, Baja California. The programs of activities of Social Services developed in the Department of Administrative Economic Sciences, were designed with field activities with social economy companies for interview processes, development of surveys for the systematization and mapping of the information of the projects with a focus on the QHS Methodology, research projects registered nationally in National Technology of Mexico.

- Observatory of the Integration of Engineering to the Economic Development Ecosystem of the Baja California Peninsula
- Observatory of sustainable development in graduate programs in Baja California.

For the years of 2022 and 2023 [26-29], the QHS methodology was disseminated in national and international conferences, in research projects, theses, publications and methodological strategies of integration and sectoral articulation, as is the case of the NODESS Project (Development Nodes of Social and Solidarity Economy), first NODESS

in a border city in northern Mexico, to manage Social Service activities of students of the Careers of Engineering in Logistics, Engineering in business management, Bachelor of Administration, Bachelor of Accounting and Master in Administration programs for the benefit of society. In the postgraduate in administration of the Technological Institute of Tijuana, the house of the QHS Methodology, different applied research projects have been developed from the postgraduate students with the aim of creating and promoting initiatives of Mexican standards and standards of labor competencies to certify personnel; Some of the research projects linked to the service industry of the Supply Chain, Innovation and Sector Development with the QHS Methodology are:

- QHS methodology for strategic planning, KPIs and talent management in cross-border transport drivers
- Administration of Operations and Quality Systems with Social Responsibility in Customs Agency
- QHS methodology for Business Intelligence with CRM in Warehouse and Foreign Trade Logistics
- QHS methodology to develop competency standards for talent management in customs agency
- QHS methodology for management and finance models in Foreign Trade Supply Chain Business
- QHS Methodology to innovate the Value Chain in the Supply Chain

4. CONCLUSIONS AND REFLECTIONS

The account of the trajectory of a systemic life [30-42], is the purpose of the article entitled "QHS Methodology applied to professional growth with impact on society," work and study, be part of the Society that made up Generation X, which is characterized by the effort and pride of getting ahead despite the challenges and limitations. It makes us reflect on some principles; "In life we cannot give what we do not have", as well as "Knowledge, generates knowledge."

At present, after a professional exercise of more than twenty-five years in the industry and twenty years as a Professor and Researcher of Bachelor's, Master's and Doctoral level, with links in the public and private sectors, nationally and internationally, it is concluded that the benefits of the competences of human relations, communication, management of specialized talent, Public relations, inter-institutional linkage and cooperation, and constant professional updating in cutting-edge issues generate a competitive advantage for professional development, and with it conditions for the empowerment and achievement of the different goals and objectives set in life, including those that generate happiness and harmony,

because "We always end up doing what we like in life, Let's do it right and create a legacy in life." I thank the distinction granted by the Mexican Institute of Leaders of Excellence (IMLE), the Doctorate Honoris Causa, for the Professional, Academic and Research Trajectory, as well as the Students of the Generation of the Doctorate in Business Administration for granting me the distinction of being "Godfather of Generation" at the Escuela del Pacifico, Universidad de Negocios, in Tijuana, Baja California, Mexico.

At the end of 2022, the maximum distinction of the Government of Mexico as a Member of the National System of Researchers at Level 2 is achieved, for developing original, recognized, appreciable and consistent research, as well as for the training and contribution to the scientific community at national and international level.

During the year 2023, development of conferences on the impact of Public Policies of Sectoral integration, account of the actions carried out between the Technological Institute of Tijuana, campus of the National Technological of Mexico, with the three levels of government, in especial with the Municipal Government of Tijuana, the intervention Professors and Graduates. The need for articulation to achieve competitive processes with the QHS Methodology is evident. In international competition, Mexico occupies the 37th position, in the range of low competitiveness, so it is urgent to have greater and better dynamics of higher education institutions in coordination with the business and government sectors, to achieve real progress in the three Mexico's; the north, center and south.

Figure 8 exemplifies the adaptation of the QHS methodology in an applied research project to generate eclectic models, uniting the knowledge, skills and talent of the different sectors of society; as is this case study; Academic representatives and researchers from universities and innovation and research centers of universities, companies in the supply chain and foreign trade logistics, opinion leaders of customs agency associations and consultants specialized in specialized talent management, to create Mexican standards and standards of competencies to certify human talent.

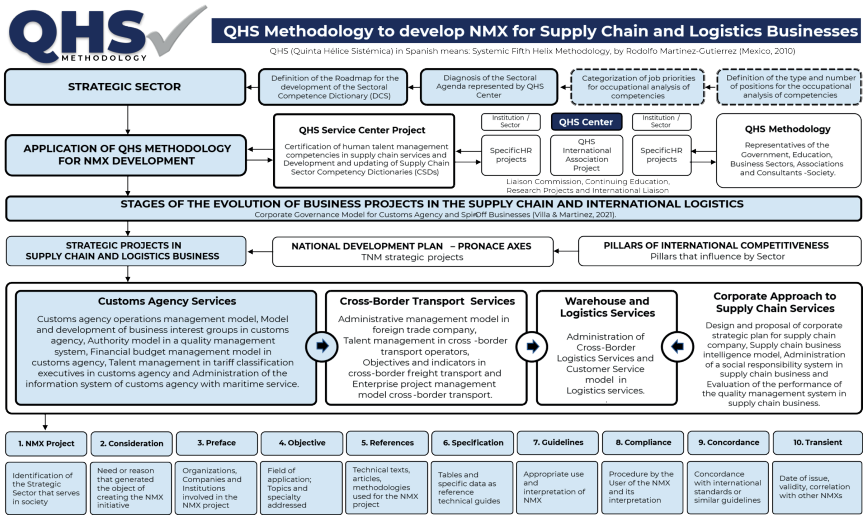


Figure 8. QHS Methodology to develop NMX for Supply Chain and Logistic Business

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CHAPTER 3

VOLUNTARY LOCAL REPORT (VLR), ROADMAP CASE TIJUANA CITY, MEXICO 2024[1]

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ABSTRACT: The development of the first Voluntary Local Report (LVR) of the city of Tijuana, Baja California, Mexico involved a glocal analysis of local activities, in accordance with the Global Agenda 2030 of the Sustainable Development Goals (SDG), the approach of the QHS Methodology that uses the systemic approach was applied; convening different sectors of society; Local Government, Academia, Companies, Associations and Consultants. The NODESS Tijuana program generated a role of awareness and involvement of sectors of society by specialized topics, strategically generating Social Service activities at different educational levels, training of Instructors with Professors and Undergraduate and Graduate Students. Likewise, the development of research projects in each SDG to identify initiatives from academia, with links to the public and private sectors. The first LVR of Tijuana 2024 was developed through the leadership of the Tijuana Institute of Technology and the RIESS TecNM Research Network, in coordination with the Municipal Institute for Citizen Participation of the Tijuana City Council. Currently, the First LVR of Tijuana 2024 is in the UN Databases, being the first city in Northern Mexico to develop and present its LVR to society and the world.

KEYWORDS: SGDs, VLRs, Degrowth, Green Growth, Sustainable Innovation

1. INTRODUCTION

The development of the Chapter on the analysis of the Sustainable Development Goals (SDGs) of the 2030 Agenda, with the purpose of developing a Voluntary Local Report (VLRs) in a city, starts from the approach of the Academy, in this case, the National Technological Institute of Mexico, which has developed from its New Educational Model, which integrates four dimensions; Philosophical, Academic, Organizational and Linkage. It integrates three principles: the Educational Model "Humanism for Social Justice"; Social Relevance, Equity and Excellence, and

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Continuous Improvement. With six transversal axes: Interculturality, Inclusion and Equity, interdisciplinarity, Social Responsibility, Innovation and Vanguard, and Environmental Awareness [1, 2].

This chapter of research perspective involves several topics of challenges for the integration of the different sectors of society, towards developing a Voluntary Local Report, which is why the topics and their conceptual description are addressed in the first stage of the chapter. Through systemic development and policy analysis for sustainable innovation, in turn, the revision of administrative and social economy initiatives for technological humanism, which focuses on the integration of ethical and humanistic principles, social economy seeks to promote social well-being and sustainable development [3, 4].

Key concepts of the Perspective Chapter

The conceptual approach aims to describe all the elements that intervened in the experience of the development of the first VLR of the City of Tijuana, theoretical and methodological empowerment. Voluntary Local Reports (VLR), according to UNESCO, bring benefits and raise awareness in society. This approach highlights the need for States and Cities to be able to inform their populations about the importance of the benefits of acting on the Sustainable Development Goals for the overall progress of society and quality of life to achieve economic growth, social development, and environmental awareness [5, 6]. Table 1 presents the systemic approach to the key concepts considered in this Perspective Chapter, in the specific case of the Development of the VLR Tijuana 2024.

	Key concepts for VLRs Case: Tijuana	**Systems Approach (QHS Methodology)**
1	17 SDGs of the 2030 Agenda	International Governance Agreements
2	Voluntary National Reports (VNRs)	National Government Initiatives
3	Voluntary Local Reports (VLRs)	Local Government and Academy Initiatives
4	VLRs Methodology	Academy Initiatives
5	NODESS for the Promotion of the 2030 Agenda	Government, Academia, and Society Initiatives
6	RIESS Research Network	Academy and Research Initiatives
7	National Technological Institute of Mexico (TecNM)	Higher Education Institutions
8	Academic Body for Applied Research – ITTIJ-CA-12	Initiatives of Specialized Researchers by Subject
9	QHS Methodology for Systemic Development and Integration (Evolution of the Triple Helix)	Academy, Local Government, Enterprises, Associations, Consultants and Society Initiatives
10	Tijuana Voluntary Local Report (Tijuana's first VLRs)	Local Government and Academia Initiative (TecNM)

Table 1. Analysis of factors for systemic development in society

17 SDGs of the 2030 Agenda

The 17 Sustainable Development Goals (SDGs) on this agenda aim to alleviate poverty, safeguard the environment, and guarantee prosperity for everyone. In 2023, a summit on the SDGs was held to assess progress and accelerate the actions needed to meet these goals. The summit brought together world leaders, governments, and representatives from various sectors to renew efforts and promote transformative actions [7]. These 17 SDGs include specific objectives,

Table 2 shows their description and impact of great relevance; the elimination of poverty, and equal rights for men and women, good employment, affordable, clean electricity, clean water and toilets, and economic expansion [8].

SGD	Goal	Description
1	No poverty	Companies have found business opportunities in adopting measures to help reduce poverty
2	Zero Hunger	Getting rid of hunger, making sure there is enough food for everyone, improving diet, and supporting healthy farming
3	Good health and well-being	Making sure everyone stays healthy and happy at all ages
4	Quality Education	Make sure everyone has access to a fair, high-quality education, and encourage people to keep learning throughout their lives.
5	Gender equality	Realizing gender equality and empowering all women and girls is a goal that we have
6	Clean water and sanitation	Getting everyone access to water and cleanliness and making sure they are managed in a way that lasts
7	Affordable and clean energy	Making sure everyone has access to current, safe, cheap, and long-lasting energy
8	Work that is decent and economic expansion	We should encourage economic development that is long-term, equitable, and inclusive; employment that is full and meaningful
9	Industry, innovation, and infrastructure	Developing infrastructure that is robust, while also encouraging industry that is inclusive and sustainable, and fostering innovation
10	Reduced inequalities	Reducing inequality within and between countries
11	Localities and communities that are sustainable	An environment that is sustainable, resilient, secure, and inclusive approach to the development of cities and human settlements
12	Responsible production and consumption	ensuring patterns of consumption and production that are economically sustainable
13	Climate Action	Take immediate action to counteract the impacts of climate change and fight against it.
14	Life below water	Conserve An inclusive, secure, resilient, and sustainable approach to the development of cities and human settlements sustainably

15	Life on land	Ensure that terrestrial ecosystems are used in a sustainable manner, fight against desertification, put a stop to and reverse the process of land degradation, and put an end to the loss of biodiversity.
16	Peace, Justice, and Strong Institutions	Promote peaceful, inclusive societies for sustainable development, provide access to justice, and construct effective, responsible, and inclusive institutions at all levels.
17	Partnerships to achieve the goals	Implementation mechanisms and the Global Partnership for Sustainable Development's revitalization
Reference: Own elaboration (2024) with information from the United Nations		

Table 2. 17 SDGs of 2030 Agenda

The relevant aspects of the content of the Voluntary National Report (VNR), as a reference framework for the development of the Voluntary Local Report (VLR) of the City of Tijuana, below are detailed the different VNRs developed in Mexico, including government initiatives and public dissemination policies [9].

Voluntary National Reports (VNR)

The Voluntary National Report (VNR) and the Voluntary Local Report (VLR) are key tools in the framework of the implementation and monitoring of the Sustainable Development Goals (SDGs) of the 2030 Agenda. Table 3 presents historical statistical data of Global Cities with their VNR and VLR, both processes aim to evaluate the progress of countries and regions in addressing the SDGs [10].

Mexico has presented the latest Voluntary National Report of the country, which shows the richness of the diversity that characterizes us as a country; as well as the multiple solutions that have been given at the Municipal, State and Federal levels to common problems in order to guarantee the end of poverty in the world, the eradication of hunger, food security, healthy living and quality education; achieve gender equality; ensure access to water and energy; promote sustained economic growth; take urgent measures against the climate crisis; promote peace and facilitate access to justice [11].

Year	Participating countries	VNRs and VLRs
2024	Finland, South Africa, Tunisia, Uruguay, Mexico, Sweden, Norway, Finland, Iceland, Denmark	22
2023	Moroccan, Argentine, and Australian soils. Japanese, Belgian, Danish, American, Finnish, Portuguese, Uruguayan, Brazilian, Mexican, and Malaysian citizens	14

2022	Tanzania, Malaysia, Netherlands, Spain, Australia, Mexico Japan, Ecuador, Bolivia, Guatemala, Brazil, Finland, China, Jordan, Argentina, Portugal, UK, Australia, Paraguay, Germany, Uruguay, Colombia	23
2021	South Africa, United States, China, Sweden, Japan, Spain, Argentina, Brazil, Germany, Malaysia, South Korea, Norway, Canada, Denmark Finland, Indonesia Mexico, Belgium, Peru, United Kingdom, Norway,	21
2020	Greek, Argentine, Brazilian, Chinese, South Korean, Mexican, Mozambique, Albanian, Spanish, German, Finnish, Belgian, Uruguayan, and American nations	14
2019	Argentina, Belgium, Bolivia, Brazil, Finland, Mexico, Japan, United States, United Kingdom, Portugal, South Korea, Germany, and Spain	14
2018	South Korea, Japan, Bolivia, the United States, and Spain	5
2017	Brazil, Germany, Belgium, Australia, and the Philippines	6
Reference: Own elaboration (2024) United Nations		

Table 3. World Cities that Have Submitted an Agenda 2030 Voluntary Local Report

The 2030 Agenda's relevance has been vigorously promoted since 2015, with various strategies and instruments being used to manage local planning at the city, regional, state, and national levels to carry out each SDG's implementation. The records of the nations that voluntarily submit reports each year, whether at the state, regional, or even local level, are shown in Table 4 of the Social and Economic Affairs Government report published by the UN [12].

Although there are many obstacles to overcome, cooperation among all facets of society can lead to unexpected results. Because of this, SDG 4's primary responsibility in the education sector is to act as a catalyst for change and a leader, integrating, inspiring, and articulating the various facets of society. Education level serves as a barometer of society's capacities. These reports on the implementation of the 2030 Agenda are voluntary, open, inclusive, participatory, and transparent for all and seek to identify areas where a favorable trajectory has been achieved and those where it is necessary to redouble efforts to achieve the SDGs [13].

VNRs and VLRs have become the cornerstone of monitoring the global implementation of the 2030 Agenda for Sustainable Development Goals (SGDs), as they help to fine-tune the implementation strategy [14].

First Mexico Voluntary National Report (VNR) 2016

This report marked an important milestone, as Mexico was one of the first countries to submit an VNR a reference to the High-Level Political Forum on Sustainable Development (HLPF) of the United Nations. The 2016 report focused

on preparatory measures to create an enabling environment for the implementation of the 2030 Agenda in the country [15].

The first Mexico VNR highlighted several key aspects:

1. Government Commitment: The Mexican government's initial actions to align its policies and programs with the Sustainable Development Goals (SDGs) were detailed.
2. Multisectoral participation: The inclusion of various sectors of society, including the private sector, academia, and civil society organizations, was promoted.
3. Identification of challenges: The main challenges that Mexico faced in the implementation of the 2030 Agenda were identified, as well as the opportunities to overcome them.

This report laid the groundwork for subsequent reports, which have continued to assess and report on the progress that has been made and the problems that have been encountered participating in Mexico's efforts to achieve the Sustainable Development Goals.

Second Mexico Voluntary National Report (VNR) 2018

Mexico's second Voluntary National Report (VNR) was presented in 2018. This report focused on reflecting on the progress, challenges and lessons learned during the first three years of implementation of the 2030 Agenda [16].

The second Mexico VNR highlighted several key aspects:

1. Progress on the SDGs: Progress on several Sustainable Development Goals (SDGs) was documented, highlighting flagship actions and specific challenges.
2. Multisectoral participation: Contributions from various social actors and levels of government were included, underscoring the importance of collaboration to face the challenges of the 2030 Agenda.
3. Diagnosis of opportunities and challenges: A detailed analysis of the possibilities and difficulties that are brought about by the execution of the 2030 Agenda in Mexico was presented.
4. This report was an important step in consolidating Mexico's commitment to sustainable development and laying the groundwork for subsequent reports.

Third Mexico Voluntary National Report (VNR) 2021

Mexico's third Voluntary National Report (VNRs) was presented in 2021. The assessment of the 2030 Agenda for Sustainable Development's implementation's advancements and obstacles was the main objective of this paper [17].

The third VNRs highlighted several key aspects:

1. Innovative methodology: A methodology was used that allowed the active participation of various sectors of society, including national and regional governing bodies, nonprofits, schools, businesses, and more.
2. Progress on the SDGs: Progress on several Sustainable Development Goals (SDGs) was documented, highlighting flagship actions and specific challenges.
3. Multisectoral participation: The inclusion of various social actors and levels of government was promoted, underlining the importance of collaboration to face the challenges of the 2030 Agenda.

This report was an important step in consolidating Mexico's commitment to sustainable development and laying the groundwork for future reporting.

Fourth Mexico Voluntary National Report (VNR) 2024

Mexico's Fourth Voluntary National Report (VNRs) was presented in July 2024. This report reaffirms Mexico's commitment to Vision 2030: Achieving Sustainable Development and demonstrates the advancements gained since a humanistic development model was put into practice [18].

The fourth VNRs highlighted several key aspects:

1. Poverty reduction: More than 5 million people were lifted out of poverty between 2018 and 2022, directly impacting SDG 12.
2. Decrease in economic inequality: The income gap between the richest and poorest declines was reduced.
3. Minimum wage increase: The minimum wage increased by 110% between 2018 and 2024.
4. Food security: More than 10 million people now have access to sufficient and nutritious food, contributing to the advancement of SDG 2.

The fourth report also highlights the importance of multisectoral collaboration, including input from state and federal agencies, businesses, and nonprofits in the area.

Voluntary Local Report (VLR)

The amount of Mexican Voluntary Local Report (VLR) has been rising steadily since 2019. Every year, efforts have been made in different regions of the country to

raise awareness of the importance of knowing and understanding the usefulness of the SDGs in cities and states. This has motivated Local and State Governments to incorporate the 2030 Agenda into their Municipal Development Plans and Urban Development Plans [19].

It is essential that all sectors of society participate in proposing innovative and creative initiatives to safeguard the planet, nature, the environment, and all natural resources, promoting green growth and reducing degrowth, to promote a culture of sustainable development in our communities. Mexico's Voluntary National Reports (VNRs) are key documents that assess progress and challenges in carrying out the 2030 Agenda's Sustainable Development Goals. Reports like this are often sent to regional forums including the UN High-Level Political Forum on Sustainable Development (HLPF).

The participation of local actors in the preparation of the Voluntary Local Report (VLR) is crucial. With 32 Federative Entities (States) and 2,475 Municipalities, Mexico (official name: United Mexican States) has 131.1 million inhabitants and is expanding at a growth rate of 0.9. This gives rise to the obstacles that Mexico must go through the stages of empowerment, awareness and taking specific actions according to the particularities of each locality. Furthermore, Mexico's Voluntary Local Reports (VLR) are included in the UN 2030 Agenda reports (Table 4) and cover 8 of the 32 state governments and 5 of the 2,475 municipal governments [20].

Year	State Government	Municipal Government
2024	State of Queretaro	Santa Maria del Oro, Veracruz, Zapopan, Tijuana
2023	Puebla, Chiapas, State of Mexico	Tizayuca, Cordoba, Kanasín, Queretaro, San Francisco del Rincon
2022	Oaxaca, Quintana Roo	Cordoba, Tekax
2021	Mexico City (Capital), Durango, Tabasco, Mexico	Guadalajara and Merida,
2020	Yucatan State	-
2019	Oaxaca and Mexico City	-

Reference: Own elaboration (2024)

Table 4. Voluntary Local Report (VLR) in Mexico

Voluntary Local Report (VLR) Methodology

The VLR is part of the follow-up mechanisms of the 2030 Agenda, this methodological proposal can be modified according to the needs of each subnational government. It is a process by which governments subnational, in collaboration with other relevant factors such as society civil society, academia and private initiative,

begin an evaluation of their progress around the implementation of the 2030 Agenda in their respective contexts [21].

As a result of the voluntary review process, which must be open, participatory, inclusive, transparent, and multi-actor, states and municipalities may prepare a document called "Voluntary Local Report", the which details the process and results achieved within the framework of these reviews, as well as the good practices, advances and challenges that are faced not only from the activities of the government, as well as from the functions of the numerous important sectors for the sustainable development. With the decision of a state and/or municipality to develop a review and subsequent Voluntary Report on the implementation of the 2030 Agenda in its territory, it is highly desirable to consider the following elements:

1. Designate a team in charge of the ISV development process.
2. Prepare a Work Plan that indicates, among others, the milestones, responsible parties, and dates for the fulfillment of each delivery.
3. Based on the State and Municipal Development Plan, an analysis of the policies, programs and actions implemented should be carried out.

At the state or municipal level, a methodological analysis of the SDGs in the territory is developed, to define quantitative and qualitative indicators and goals that show the progress of the SDGs. These indicators and goals will be adapted to subnational realities and priorities. In addition, strengths, gaps, and challenges in the regulatory framework will be identified. At the subnational level, a policy framework can be given to implement the Sustainable Development Goals.

1. Identify key local actors involved in the implementation of programs and policies linked to the 2030 Agenda. Consultation and participation spaces can be established in which these actors can share the relevant information they have.
2. Collect relevant data and carry out an analysis of the available information to evaluate the progress in the implementation of the SDGs at the subnational level. Statistical data, sectoral reports, surveys, public consultations, and other data collection methods may be combined, with the participation of entities such as INEGI (National Institute of Statistics, Geography, and Information) and other institutions with expertise in statistics and open data. It is highly desirable that, to the extent possible, the data included in the Report be disaggregated by gender, age, and ethnicity, with special attention to vulnerable groups, considering the principle of "leaving no one behind" [22].

Content of Voluntary Local Reports (VLR)

On the implementation of the 2030 Agenda, they imply an inclusive review process, aimed at generating tangible lessons and solutions to influence the fulfillment of the SDGs. In this context, the VLR should reflect the state of progress of the state or municipality concerning the execution of the 2030 Agenda from the perspective of a broad perspective, reviewing best practices in its institutionalization, lessons learned, challenges to be overcome and next steps. It is recommended that the following sections be considered as essential elements of the content of the Voluntary local Report:

1. Opening Statement: A message from a high-ranking authority of the government of the state or municipality expressing their enthusiasm to participate in the voluntary review and sharing the commitment of the state or municipal government to advance in the implementation of the 2030 Agenda.
2. Highlights of the VLR: context of the VLR, as well as its main findings and contents.
3. Introduction: presents the objectives of the Report, as well as the context in which it is inserted.
4. Methodology for the preparation of the Report (VLR): route of action implemented in the different stages of the voluntary review.
5. Architecture, policy and enabling environment presents in a disaggregated manner the initiatives that have been undertaken for the implementation of the Agenda for the Year 2030 within the framework of subnational public policy (programs, projects, and actions).
6. Progress on SDGs and targets: Overview of progress and status of the SDGs. This can be in a transversal way, prioritizing the SDGs that are considered relevant for the subnational government.
7. Next steps: outline of the subnational (State or Local) government's forward-looking roadmap for continued work on the implementation of the 2030 Agenda.
8. Conclusion.
9. Annexes.

Nodes for the Promotion of the 2030 Agenda (NODESS)

NODESS (Nodes for the Development of Social and Solidarity Economy) are voluntary integration alliances made up of at least three actors; Local Government, Academia and Social Sector, through which territorial solutions to collective needs

are proposed, designed, and implemented. Since 2019, INAES (National Institute of Social Economy) has been promoting the creation of this type of alliances to consolidate local ecosystems [23].

The National Network of NODESS is a network made up of networks for in support of a NODESS-style community and solidarity economy. According to the statistics for the year 2023, 443 NODESS are registered nationwide; with alliances between Universities, Technological, Ejidos, Cooperatives, Social Groups, Governments, Companies, Chambers of Commerce, and others. Of the 443; 183 are PreNODESS and 260 NODESS, the States with the highest number of NODESS are Tamaulipas 66, Oaxaca 30, Veracruz 29, Chiapas 26, and Michoacán with 23. The key allies of the NODESS Network in Mexico are the Ministry of Public Education (SEP), Mayan Train, Sowing Life; Sustainable Communities Program, German Cooperation Agency GIZ, International Labor Organization (ILO), United Nations (ECLAC), The National Council for Science, Technology, and the Humanities (CONAHCYT) [24].

On June 16, 2023, the National Institute of Social Economy (INAES) accredited 120 NODESS of the TecNM Solidarity Economy Network, generating a total of 251 nodes at the National Technological Institute of Mexico (TecNM). In the case of NODESS TIJUANA, it is made up of the Alliance of the Technological Institute of Tijuana, the Municipal Institute of Citizen Participation of the Tijuana City Council, and the Northern Border Cooperative Union. NODESS TIJUANA has been in operation since 2019, it was the first NODESS on the Northern Border of Mexico [25]. NODESS Tijuana has specialized in training and awareness processes of the SDGs, Culture, Education and Food Sovereignty.

RIESS Research Network

In 2023, NODESS Tijuana evolved into a TecNM RIESS Research Network (Social and Solidarity Economy Research Network) of TecNM, seeks to promote research and development in the field of social and solidarity economy, the Sustainable Development Goals (SDG) in Mexico, the RIESS Network has the participation of researchers from various regions of the country and internationally [26]. Some key points about the RIESS Network include:

1. Organization: The network is organized through a Board of Directors that integrates regional leaders from different educational and research institutions.
2. Objectives: The development of human resources, the establishment of professional residencies, and the provision of social assistance are among its goals, as well as the development of research projects and undergraduate and graduate theses.

3. Methodology: It uses methodological intervention tools such as the Fifth Systemic Helix (QHS), which includes collaboration between government, academia, companies, associations, and consultants.
4. Approach: It focuses on the analysis of sectoral ecosystems in different regions of the national territory, aligning with the National Strategic Plans (PRONACES) and SDGs as defined in the 2030 Agenda of the United Nations for Sustainable Development.

RIESS Network integrates researchers from North, Central and Southern Mexico, with approximately 97 teachers, researchers, and strategic allies from Higher Education Institutions and a Scientific and Technological Humanities Council of the Nation (CONAHCYT) Research Center).

National Technological Institute of Mexico (TecNM)

The National Institute of Technology which is in Mexico (TecNM) is a public institution of higher education that brings together 254 technological institutes distributed in the 32 states of the country. Wide coverage, with a presence throughout the country, TecNM serves more than 620,000 students. Founded in 2014, TecNM's mission is to offer quality technological education, promote research and development, and contribute to the social and economic progress of Mexico [27].

Academic Body for Applied Research – ITTIJ-CA-12

The ITTIJ-CA-12 Academic Body is registered with the title: "SECTORIAL COMPETITIVENESS, SOCIAL INNOVATION AND SUSTAINABLE DEVELOPMENT" and as the National Research Network of the TecNM, with 2 General Lines of Knowledge Application (LGAC) [28, 29].

1. QHS Systemic Development and Public Policies for Sustainable Innovation: The key characteristics of the QHS Methodology are multi-sector cooperation, collaboration between universities, companies, governments, civil society associations, researchers, and consultants, for the analysis of Public Policies for Sustainable Innovation providing systemic indicators of efficiency, efficacy, effectiveness, productivity and competitiveness of labor, professional and research skills.
2. Administration and Social Economy for Technological Humanism: It focuses on the integration of ethical and humanistic principles, Social Economy; it seeks social well-being and sustainable development. Management focuses on the management of resources and processes for organizational objectives with social responsibility in the community. Technological Humanism promotes critical thinking to put technology at the service of the human condition and its continuous improvement of being and organizations.

QHS Methodology for Systemic Development and Integration (Evolution of the Triple Helix)

The Fifth Systemic Helix (QHS) is a methodology that evolved from the Triple Helix Model, integrating a systemic approach to assess competitiveness and foster innovation and development in various sectors. This methodology includes five key actors: academia, industry, government, associations, and specialized consultants [30].

Key Features of QHS:

1. Systemic Approach: Unlike the Triple Helix, the QHS incorporates a more holistic analysis, considering the interaction between the different actors and their impact on the environment.
2. Diverse Applications: It has been used in different sectors of society, both public and private.
3. Innovation and Development: It promotes collaboration between actors to promote innovation and sustainable development.

Using Fifth Helix Methodology (QHS) as a focal point, the value, and advantages of collaborating with public and private sector representatives are demonstrated. These stakeholders include government, businesses, academic institutions, associations, business chambers, and consultants. Regular small-scale initiatives starting at the local level in a city can have an impact on public awareness campaigns. In addition, the relationship of the Society with each SDG, its sense of belonging there, as well as the degree to which it entails social accountability should be considered. The National Institute for Federalism and Local Development (INAFED) is working with the academic community to educate the public, in City Halls, about the SDGs of the 2030 Agenda using mass media such as social media and giant screens to disseminate information about the goals. Local governments are also participating in this effort through their Municipal Development Plans. It is estimated that Tijuana has a population of 2.1 million inhabitants, which places it among the cities with the highest population in the country and among the first 6 most populated metropolitan areas in the Mexican Republic.

Additionally, attempts have been made to provide the resources required for the city of Tijuana, Baja California; for example, on the most well-known avenue in the city, Avenida Revolución, there is a giant screen that can display information to more than 85,000 people every day. Several initiatives have been developed at the Tijuana Institute of Technology of TecNM. One of them is the Research Project, supported through the RIESS Research Network and the Municipal Institute for Citizen Participation of Tijuana, collaborating with more than 100 academics from all over the country and internationally. With strategic allies such as the CIATEJ - CONAHCYT Research Center and the University of Guadalajara, it has also participated in the

first Voluntary Local Report (VLR) of the City of Tijuana within the framework of the Fourth Voluntary National Report (VNR) of Mexico 2024 [31].

Tijuana Voluntary Local Report (Tijuana's first VLRs)

After a description of each key conceptual aspect, Figure 1 describes the methodological strategy for preparing the Voluntary Local Report (VLR) for Tijuana 2024, and the eventual action of replicating the model in other cities through the TecNM RIESS Research Network.

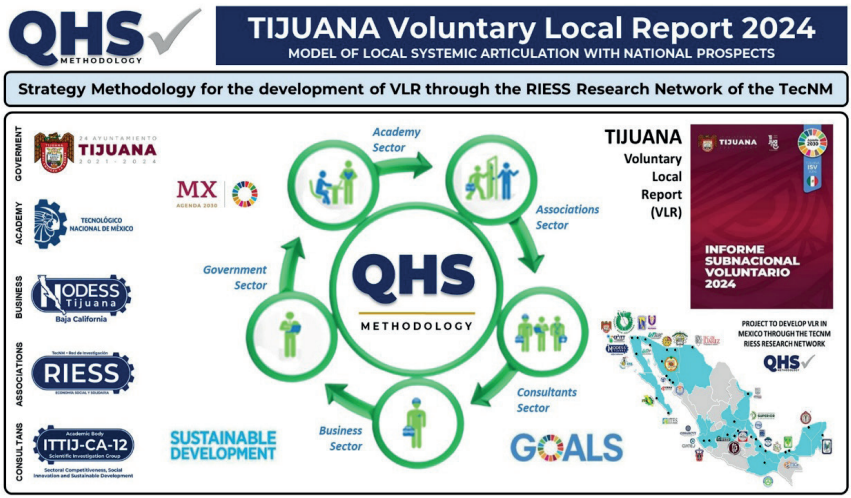


Figure 1. Methodological Strategy to develop the Tijuana 2024 VLR.

2. METHODOLOGY

This Voluntary Local Review (VLR) is the first review of progress toward the 17 Sustainable Development Goals (SDGs) by the City of Tijuana. It is based on the first VLR of Tijuana in 2024, sharing the sum of efforts of the different sectors of society, under the academic leadership of the Technological Institute of Tijuana (ITT) of the National Technological Institute of Mexico (TecNM), under its systemic methodological mechanisms of strategic articulation to join forces. Coordinating the collaboration of Academia, Government, Companies, Associations and Consultants (application of the QHS Methodology), through the ITTIJ-CA-12 Academic Body, NODESS Tijuana and the RIESS Research Network of the TecNM. Below are the results of the activities

developed to achieve the First VLR of Tijuana 2024. The VLR archive is currently in the UN Databases; SDG Localization and the Voluntary Local Reviews [32].

Tijuana 2024 Voluntary Local Review (VLR)

Within the framework of the program of activities of the 4th. Voluntary National Report (VNR) of Mexico, on July 10, 2024 in Mexico City prior to the High-Level presentation at the United Nations in New York, the First Voluntary Local Report (VLR) of the 2030 Agenda of the City of Tijuana was presented by Juan Manuel Gastelum Rivera, private secretary of the Presidency of the City of Tijuana, chaired by Mayor Montserrat Caballero Ramírez.

The VLR 2024 integrates the experience and good practices carried out in Tijuana, a strategic municipality on Mexico's northern border. Tijuana is the city where the homeland begins, it is the gateway to Latin America and the most populous municipality in Mexico, with more than two million inhabitants, which makes the City of Tijuana a Metropolis. The first VLR of Tijuana 2024 had the Technical and Methodological Advice of Professor and Researcher, Dr. Rodolfo Martínez Gutiérrez of the Technological Institute of Tijuana.

The Municipal Development Plan of the City of Tijuana has strategic axes that are aligned with the 2030 Agenda: (see Table 5)

a) Safety Axis; SDG 16.

b) Infrastructure Axis; SDG 6, SDG 7, SDG 11, SDG 13, SDG 14, SDG 15.

c) Economy Axis; SDG 1, SDG 8, SDG 9, SDG 10, SDG 12. SDG 3, SDG 4.

d) Welfare Axis; SDG 3, SDG 4.

e) Honesty Axis; SDG 2, SDG 5, SDG 17.

The strategic alignment of the Sustainable Development Goals (SDGs) of the United Nations Organization was implemented in the initial phase of the design and development of the Municipal Administration, through the public call for the organization of consultation forums in the different sectors of society, through the Municipal Institute of Citizen Participation of the City of Tijuana [33].

The Technological Institute of Tijuana actively participates as a Vocal Owner of the Sectoral Subcommittee of Economic Development, Tourism and Border Affairs. With the aim of collaborating in projecting Tijuana as a central, metropolitan, and binational city of global character, attractive for investment and tourism, where entrepreneurship and economic growth are promoted by institutions with high links

and competition with the different sectors of society. That generates a development ecosystem, with well-qualified and paid work for citizens and entrepreneurs, where they find a space for dialogue, convenience, and negotiation that, added to its geographical and comparative advantage, make it a benchmark for economic prosperity.

ALIGNMENT	**Guiding Principles of the Municipal Development Plan of Tijuana 2022-2024**				
UN 2030 Agenda	Safety	Structure	Economy	Welfare	Honesty
SDG 1: No poverty			**o**		
SDG 2: Zero hunger					**o**
SDG 3: Good Health and Well-Being				**o**	
SDG 4: Quality education				**o**	
SDG 5: Gender equality					**o**
SDG 6: Clean water and sanitation		**o**			
SDG 7: Affordable and clean energy		**o**			
SDG 8: Decent work and economic growth			**o**		
SDG 9: Industry, innovation, and infrastructure			**o**		
SDG 10: Reduced inequalities			**o**		
SDG 11: Sustainable cities and communities		**o**			
SDG 12: Responsible consumption and production			**o**		
SDG 13: Climate action		**o**			
SDG 14: Life below water		**o**			
SDG 15: Life on land		**o**			
SDG 16: Peace, justice, and strong institutions	**o**				
SDG 17: Partnerships for the goals					**o**

Table 5. SDGs in Tijuana's Municipal Development Plan (2021-2024)

The actions promoted by the Municipal Institute of Citizen Participation, and the Metropolitan Institute of Planning, both City of Tijuana, favored the work developed by NODESS TIJUANA, RIESS Research Network (Social and Solidarity Economy Research Network), as well as the ITTIJ-CA-12 Academic Body, of the Tijuana

Institute of Technology. They represented a key piece for the development of the First Local Voluntary Report of Tijuana 2024 (see Figure 2). The work developed involved the alignment and empowerment of all participants for such an important project of social impact in the city. That is why NODESS TIJUANA is assigned credit for complying with one of its main thematic axes as a program of the federal government, addressing issues of social order, social economy and environment, this last thematic axis, was aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda, as well as influencing the National Strategic Programs of the Government of Baja California [34], and National Development Plan of Mexico [35].

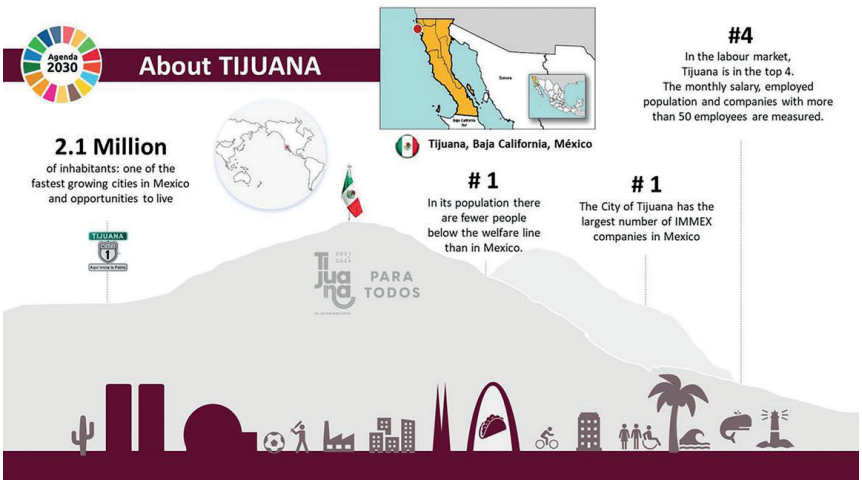


Figure 2. Geographical location of the Municipality of Tijuana (2024)

The city of Tijuana, located in the State of Baja California, is recognized for its slogan "Here the Homeland Begins", for being in the most geographically northwestern part of Mexico. Likewise, Tijuana is known worldwide for being the border with the largest binational crossing of people, the city of opportunities for development and social progress.

Tijuana currently has more than two million inhabitants, ranks first in welfare statistics at the national level, ranks first in installation of foreign investment companies, ranks fourth in the labor market and with it the cities with the lowest unemployment rate. The activities developed to promote empowerment and understanding of the importance of the Sustainable Development Goals (SDGs) of the UN 2030 Agenda in the City of Tijuana have evolved over the years, something similar happened in different parts of the world, because it is a process of empowerment

and awareness. The academic sector being a key piece; with the roles of promoter, manager, and articulator under a systemic integration approach.

The formation of the NODESS TIJUANA previously explained (see Figure 3), was key to the process of raising awareness and generating a public agenda of the SDGs in the different sectors of society in the city of Tijuana, which has evolved and has added to other cities in Mexico and internationally through academic outreach activities.

In 2015, the unanimous adoption of the 2030 Agenda (2015-2030) established by more than 193 UN member countries was promoted. In that international agreement, Mexico developed public policies and programs aligned to inform the different public and private sectors of the importance of the Sustainable Development Goals (SDGs), a continuation of the Millennium Goals (2000-2015). For example; in the academic sector, it was established that Professors should explain the SDGs in classes, in projects and generate environmental awareness, on the other hand, the Federal Government, established that the Municipal Governments include the SDGs in the Municipal Development Plans, as a strategy for the development of local public policies that guide efforts so that the public administration, society and academic training will generate aligned actions to influence the indicators of the goals of the 17 SDGs.

For the year 2020, a Social Service program was started at the Technological Institute of Tijuana to raise awareness among students of different educational levels. In 2021, the SDGs were included in the Municipal Development Plan of the City of Tijuana. In 2022, NODESS TIJUANA was formed, an alliance of the academic sector, local government and social sector, the main promoter of the 2030 Agenda in Tijuana. In 2023, a historic goal of training 10,250 students was achieved through NODESS TIJUANA. And finally in 2024 NODESS TIJUANA managed to promote and take the lead in the City of Tijuana, the LVR Tijuana 2024 was promoted by the Commission for the Promotion of the Social and Solidarity Economy of Tijuana, to development of the First Local Voluntary Report, currently registered in the UN Database [36].

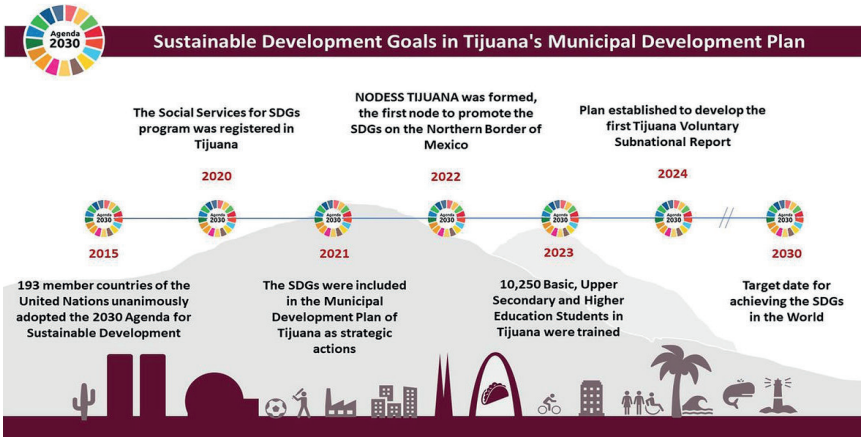


Figure 3. Chronology of actions of the 2030 Agenda in Tijuana (2024)

3. KEY RESULTS

The First Voluntary Local Report 2024 of Tijuana (LVR) of the 2030 Agenda places the city of Tijuana as the first city in northwestern Mexico to present it. The City of Tijuana is located at the national level with a leading role, for promoting actions of a global agenda, such as 17 UN SDGs. Figure 4 presents in detail the current results of the SDGs in the national comparison of the Sustainable Cities Index report generated by the Citibanamex Group [37].

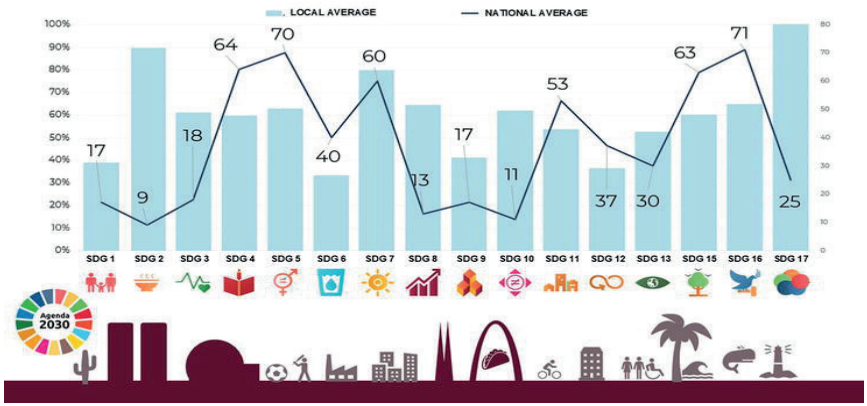


Figure 4. Progress on the SDGs in Tijuana (2024)

The learning curve generated in the development of the First LVR of Tijuana 2024, it is planned to replicate the intervention and systemic articulation model in other cities in Mexico (see Figure 5) through Members of the RIESS Research Network.

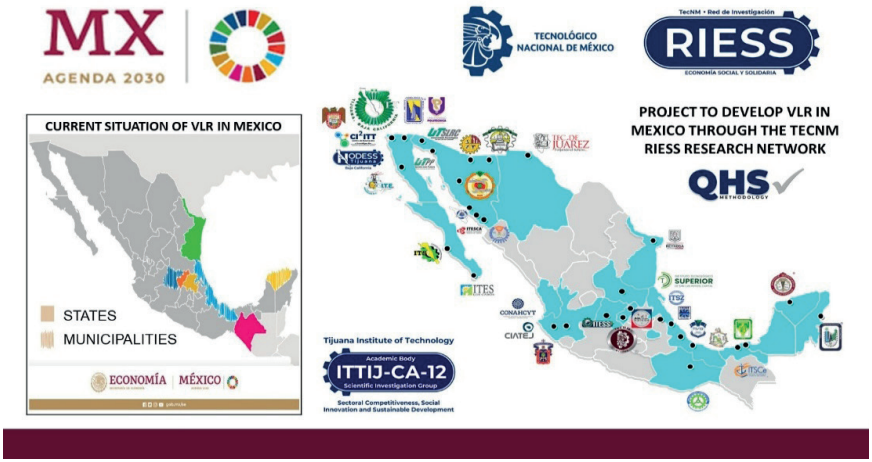


Figure 5. LVR project in Mexico with the RIESS Network (2024)

Outstanding actions of the Voluntary Local Report (LVR) Tijuana 2024

During the planning process of the LVR, a program of various activities was developed between the City of Tijuana and the Technological Institute of Tijuana with the initial objective of disseminating the 17 SDGs of the 2030 Agenda in the population, a Social Service program was generated so that Undergraduate and Graduate Students could collaborate with Professors in other Basic Education Institutions. Upper and High School, including at the Graduate level, from these activities it was possible to train and sensitize approximately 10,500 students, including deaf and mute children, who were given an explanation through a Mexican Sign Language Instructor, the children interacted and were motivated by the importance of knowing the importance of the 17 SDGs.

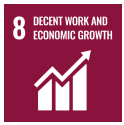
Table 6 shows the dynamics of the various activities generated within the framework of the Voluntary Local Report (VLR) Tijuana 2024 development project; Consultation forums in Schools, Seminars and Colloquiums on the importance of the 2030 Agenda and the 17 SDGs, development of Collaboration Agreements between Academic Bodies and Research Groups specialized by Lines of Generation and Application of Knowledge, in this sense the leadership of the activities that promoted the LVR Tijuana 2024 was the Academic Body with ITTIJ-CA-12 registration of the

Technological Institute of Tijuana. The inter-institutional team for the development and presentation of the first Voluntary Local Report (VLR) Tijuana 2024 was formed, contact was made with the liaison offices of the 2030 Agenda in Mexico for the presentation at the UN in New York, and registration of the document in the UN Database for global consultation. The VNR of Mexico 2024 was presented in four languages (see Figure 6); Spanish [38], English [39], Mayan [40] Nahuatl [41].

Figure 6. VNR of Mexico in Four Languages; English, Spanish, Mayan, and Nahuatl (2024)

SDG	Actions developed to achieve the goals
1 NO POVERTY	Lines of action focused on SDG 1 were created: ▌To benefit the low-income population with economic support, carrying out the social assistance program for the elderly. ▌Implement the "Comprehensive Plan for the Care of Children in Street Situations". ▌Benefiting more than 6,000 people.
2 ZERO HUNGER	Lines of action focused on SDG 2 were created: ▌More than 28,000 pantries have been delivered to different communities. ▌In addition, 31,981 pantries were delivered to vulnerable people in neighborhoods of the 9 delegations. ▌Likewise, 27,084 pantries were delivered to the elderly, people with disabilities and indigenous communities. ▌Our municipality also has a school breakfast program that ensures that children have nutritional elements throughout the school year.

	49 lines of action focused on SDG 3 were created: ▌Provide psychological support. ▌Deliver the DARE program in educational facilities. ▌Establish agreements linked to organizations in the social, public, private, and academic sectors in the field of addiction prevention and care. ▌Vaccination days for vulnerable groups ▌Artistic, sports and nutritional activities ▌Programs for social reintegration
	29 lines of action focused on SDG 4 were created: ▌Strengthen the English program in elementary schools. ▌Promote refresher and professional training programs for teachers. ▌Hold events in municipal libraries to promote literary and scenic activities. ▌Promote a book donation program. ▌Strengthening academic linkages to support the development of young people. ▌Provide incentives for young people not to drop out of school. ▌Provide care for children with disabilities in public schools. ▌Benefiting more than 23,000 students in the city.
	8 lines of action focused on SDG 5 were created: ▌The implementation of the mobile application “Purple Button” ▌Carrying out campaigns commemorating the “International ▌Day for the Elimination of Violence Against Women” ▌Creation of agreements with organizations to strengthen women’s entrepreneurship ▌Provide protection to women victims of family violence.
	Lines of action focused on SDG 6 were created: ▌Ensure sustainable water and sanitation management for everybody. Currently in Tijuana, 98% of the homes in the city have piped water service and 99% have electricity and drainage. ▌To raise that remaining 2%, a line of action was implemented which consists of establishing the efficient service of drinking water and sanitary sewerage for our citizens, a collaboration agreement between our City Council and the ▌State Commission of Public Services of Tijuana, with which various dynamics were promoted for the benefit of the network and its service capacity.
	5 lines of action focused on SDG 7 were created: ▌Transition to LED energy, 10,000 luminaires were replaced. ▌Environmental education workshops ▌Regulation 373 businesses enrolled in the “Green Business” program. ▌Municipal Air Quality Monitoring Program, a total of 50 sensors donated by the Air Resources Board.

	33 lines of action focused on SDG 8 were created: ▌Job fairs were implemented and granting of credits. ▌Promotion and dissemination of the job bank program ▌Training for women in the acquisition of work tools ▌Facilitating and promoting the development of new businesses ▌Boosting investment in equipment and technology in companies ▌Generation of employment for the elderly ▌Implementation of the labor inclusion program for people with disabilities. ▌More than 5,000 grants have been awarded to entrepreneurs. 58,090 vacancies have been offered through the job fairs
	6 lines of action focused on SDG 9 were created: ▌Encourage robust infrastructure, sustainable industry, and innovation. Green Business Certification Program ▌Implement digital tools for urban development procedures! ▌Provide technological education for the use of the internet.
	19 lines of action focused on SDG 10 were created: ▌The creation of campaigns for the dissemination of culture and indigenous languages of the different ethnic groups. ▌Creation of a network for the care of migrants. Implementation of an awareness campaign on respect for places intended for the elderly and disabled. ▌Generation of the awareness program on the culture of disability, such as the first and second binational forum on accessibility criteria “Tijuana Access”.
	56 lines of action focused on SDG 11 were created: ▌Implement road safety education programs. ▌Carry out a technical study for the reorganization of cargo or heavy transport. ▌Design actions for traffic reengineering in conflict areas. ▌Implement “Kilometers of Light” and “Put a Finger on the Garbage Dump” programs
	2 lines of action focused on SDG 12 were created: ▌Establish an area to deposit waste and materials from construction sites. ▌Implement the program of improvement and optimization in domestic garbage collection.
	2 lines of action focused on SDG 13 were created: ▌Solar lamps were installed for parks and green areas. ▌The “Improvement of the Environmental Quality of Tijuana” program was consolidated through afforestation days. ▌The planting of trees in different parts of the city was promoted. ▌Training and workshops were given to promote awareness of environmental care.

	Lines of action focused on SDG 15 were created: ▌Manage forests sustainably, battle desertification, reverse land degradation, and prevent biodiversity loss. ▌We have two lines of action. ▌Promote the Unit for the Conservation, Management and Use of Wildlife (UMA) of Parque Morelos. ▌Establish the program "Rehabilitation and Conservation of Municipal Parks"
	102 lines of action focused on SDG 16 were created: ▌Implement the "Community Watch per Person" program. ▌Addressing high-impact crimes and drug dealing ▌Implement panic buttons for emergency response. ▌Create Criminal Intelligence Units (UIC) ▌Creation of a system of social and economic indicators ▌Community Care Campaigns ▌Establish the Municipal System of Comprehensive Protection for Children and Adolescents ▌To train public servants in transparency issues, ▌Promote a transparent government that is close to the people. ▌Strengthening citizen participation in the work of the public administration through citizen councilors organized into 18 Sectoral Subcommittees through which compliance with the Municipal Development Plan is evaluated and monitored.
	Lines of action focused on SDG 17 were created: ▌To be the first Binational World Design Capital by 2024, alongside San Diego ▌Join "GCoM," which stands for the Global Covenant of Mayors on Climate and Energy in Mexico, making a commitment to implement climate action policies and be one of the 18 pilot municipalities of the 2023 National Strategy, to revitalize the Global Partnership for Sustainable Development.
Reference: Own elaboration (2024) with information from the First VLR of Tijuana	

Table 6. VLR Tijuana 2024 Executive Summary of Results

4. CONCLUSIONS AND REFLECTIONS

According to the Sustainable Cities Index 2023 generated by Citibanamex in collaboration with the Mexican Institute for Competitiveness A.C. (IMCO), Foundation Mexico and Mario Molina Center, it is necessary to highlight the progress made in SDG 13 Climate Action, due to the existence and operation of an Urban Planning Institute, work on the climate action plan or cooperation with the State Action Plan on Climate Change; in the same way, SDG 17 Alliances to achieve the goals stands out, due to the good management of financial debt, the excellent functioning of the City Council's Transparency office or the wide access to the internet existing in homes; in the same sense, the achievements in Particularly relevant to Baja California

is SDG 6, which focuses on clean water and sanitation. It is state-run, but for its operation it requires the collaboration of CONAGUA (National Water Commission) and the Secretariat of Territorial, Urban and Environmental Development. Tijuana ranks 35th out of 81 cities, obtaining an overall result of 64.95, with an increase of 1.3 percentage points compared to the results obtained in 2015 [42].

Degrowth is an intentional tactic that challenges the prevailing economic model based on constant expansion. It defends the search for balance in economies, while achieving social and environmental purposes. It involves reducing areas Examples of things that harm the environment include fossil fuels, factory-farmed meat and dairy products, fast fashion, marketing, transportation, and air travel (including personal jets). It is essential to put an end to the planning of obsolescence of products and extend their durability. Improve public services essentially to ensure that Everyone, regardless of their background or circumstances, should have equal and unrestricted access to essential services such as healthcare, education, housing, transportation, internet connectivity, renewable sources of energy, and nutritious, high-quality food options [43].

Sustainable development is a different way of approaching conventional economic progress. It seeks to revitalize capitalism by merging technological advances, green investments, and responsible consumption to make it more sustainable. Key elements include technological advances, such as investment in and integration of technologies that minimize the impact on the environment (e.g., renewable energy, infrastructure to improve energy efficiency). Green investments to direct the flow of capital towards initiatives that care for the environment, such as renewable energy and sustainable agriculture. Similarly, Ecological Consumerism aims to motivate buyers to opt for choices that take care of the planet, supporting items and services that are sustainable. Consequently, sustainable innovation is defined as a strategy that fuses technological creativity with the preservation of the environment, with the purpose of generating beneficial effects for both people and nature. Its attributes include ecological commitment, the use of renewable energies, social influence, clean technologies, economic viability, innovative business models, shared transport, and the offer of products as a service [44].

The search for a balance between technological progress, social well-being and environmental preservation is the objective of sustainable innovation, with an eye on present and future generations. The main objective of this chapter of the book is to thoroughly examine and delve into the intricate concept of degrowth and sustainable growth from a multitude of perspectives, meticulously scrutinizing the diverse ways in which the various sectors of society exert their influence on the advancement and progression of the Voluntary Local Review (VLR) initiative in the City of Tijuana, Baja California, Mexico. This analysis is conducted within the framework of the RIESS Network, which aims to disseminate and replicate research

endeavors in numerous urban centers, facilitated by the synergistic collaboration between academic institutions and local governmental bodies [45].

For a project such as the SDGs to have an impact on society, will, synergies and teamwork are required, with leadership that inspire the new generations, generational renewal is a natural phenomenon that all nations must consider preparing awareness actions, and take advantage of the generational crossover, information technologies, social networks. They represent a very powerful means to have a positive impact through education and culture for sustainable development. The glocal approach aims to value or consider things or ideas from a global point of view, but without losing the local essence that characterizes them [46].

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A very special thanks to all the students of the NODESS TIJUANA Social Service Program for collaborating in the preparation of educational material for students at the Basic Education levels (Primary and Secondary).

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Figure 7. Activities to train 1 million students in SDGs in Mexico (2024)

Figure 8. Mexico 2024 Voluntary National Report (VNR) and Tijuana 2024 Voluntary Local Report (VLR) 2024.

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CHAPTER 4

ENVIRONMENTAL AWARENESS FOR SUSTAINABLE DEVELOPMENT WITH MEANINGFUL LEARNING[1]

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ABSTRACT: The education sector at the local level around the world has great challenges regarding global awareness actions in the student population, to creatively convey the importance of environmental protection as an action of social responsibility toward future generations. That is why SGD 4 of the 2030 goals represents a key link to encourage students at different educational levels to develop initiatives to take care of natural resources and empathy for well-being, health, and sport as key factors for better living conditions in the population. Beyond conceptual understanding, academic practices and research are required to manage knowledge of sustainable development.

KEYWORDS: 2030 goals, social innovation, sustainable development, SDG 4, sectoral competitiveness.

1. INTRODUCTION

The great global challenges to raise awareness among the population about the importance of actions for sustainable development reflect local, regional, and national efforts, with systemic initiatives promoted by different sectors of society, especially the 2030 Agenda for Sustainable Development Goals (SDGs) established by the United Nations (UN), have become an international benchmark for setting commitments, targets, and indicators in each of the 17 SDGs [1]. SDG 4: Quality Education is the objective of the analysis in this document as a contribution to the State of the Art of Development from the Higher-Level Education Sector in the City of Tijuana, Baja California, Mexico, with national and international linkage actions. The methodological emphasis of the research is the awareness of Social Innovation for Sustainable Development [2]. The research begins with the analysis of the regulations of the Mexican Government for the training and updating of

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teachers, which includes the focus on empowerment and management of academic activities, linkage, social service, and development of projects through the SDGs in the classes of different educational programs. Methodologically, social innovation is influenced by improving sustainable development, and thus, sectoral competitiveness. Analysis was carried out on the social impact of progress in the implementation of SDGs. Follow-up was carried out on Educational Social Service Activities to support the development of Node Programs to develop the Social and Solidarity Economy [3]. Initiatives are taken to develop TecNM Scientific Research Projects to promote sectoral linkages through scientific dissemination activities. Likewise, the activities of national and international linkage through the productivity of the Academic Body (ITTIJ-CA-12) and the National Network for Research in Social and Solidarity Economy (RIESS) of the National Technological Institute of Mexico [4]. The research addresses the following topics, from the conceptual approach, and the evidence focused on SDG4, quality education, is the main objective of research:

1. Guidelines of the Program for the Professional Development of Teachers (PRODEP)
2. Fifth Systemic Helix Methodology (QHS) and Dictionaries of Sectoral Competencies (DCS) for Sectoral Development and Social Innovation
3. Municipal Development Agenda (MDA)
4. Center for Research and Documentation of the Public, Social, and Cooperative Economy—Mexico (CIRIEC)
5. TecNM Scientific Research Projects
6. TecNM's NODESS Tijuana Project
7. Commission for the Promotion of the Social and Solidarity Economy
8. Training Program in Social and Solidarity Economy (SSE) (Diploma, Master's, and Doctorate)
9. TecNM Academic Body ITTIJ-CA-12
10. Voluntary Report on Progress on the SDGs in Cities
11. TecNM Social and Solidarity Economy (SSE) Research Network

2. METHODS AND MATERIALS

According to the State of the Art of Bibliometrics of Scopus Article Databases, Web of Science on the topic of SDG 4, and Quality Education, there are great challenges and critical roles that depend on the teaching practices of teachers [5], to influence motivation and awareness of the elements and actions that make up the quality of life from the student phase to the professional phase [6], being the teacher who plays a key role as a mentor of good practices, tasks, projects, social service, professional practices, essays, theses, publications, and the development of

critical thinking through the development of scientific research and development initiatives [7–9].

The great expectation of a professor and researcher in the development of an article, or research report, is to disseminate the findings, product of teaching, and research activities, as well as the link with the different sectors of society as part of the efforts of full-time professors and researchers with national accreditation.

This chapter presents the efforts of good practices to develop a roadmap that can be replicated in a local, national, and international systemic context, as a framework of reference for activities from academia and applied research.

In Mexico, full-time professors must accredit by regulation a certification named PRODEP (Desirable Profile), which includes the need to empower the 2030 Agenda and develop actions within their classes on the understanding and awareness of each SDG [10].

With the focus of the Fifth Helix Methodology (QHS in Spanish), the importance and benefits of linking with the representatives of the society are illustrated by government, companies, academia, associations—business chambers, and consultants, to influence actions to raise awareness among the population from the local level in a city, with small efforts and constant actions and seek the relevance and belonging of the society with each SDG, as well as the affinity in the sense of social responsibility.

In the case of INAFED (National Institute for Federalism and Municipal Development), the 2030 Agenda is promoted in public policy actions in the municipalities in the Municipal Development Plans, in coordination with the academic sector to train society in public spaces and civic squares, as well as through mass media such as social networks and giant screens for public dissemination of information on the SDGs. In the specific case of the city of Tijuana, Baja California, efforts have been made to provide the necessary resources.

For example, in Avenida Revolución, the most famous street in the city, there is a mega screen with the capacity to view information from more than 85,000 people daily. From the Tijuana Institute of Technology of TecNM, different efforts have been developed, as is the case of the research project developed between the TecNM Campus Tijuana and the Municipal Institute of Citizen Participation of Tijuana (Table 1) with the support of the National Research Network in Social and Solidarity Economy (RIESS).

The project is made up of more than 100 national and international researchers including the University of Guadalajara [11] and CIATEJ Research Center—CONAHCYT [12]. The research project has the support and methodological backing of the Executive Secretariat of the National Council of the 2030 Agenda for Sustainable Development of the Global Economic Intelligence Unit of the Ministry of Economy of

the Government of Mexico as a strategy to contribute to the achievement of priority projects for the country, through collaboration with the Government and Academia.

	Objectives	Feedback/goals
1	Diagnosis and municipal training in the necessary competencies of higher education students on the Sustainable Development Goals (SDGs) of the 2030 Agenda	TecNM, at the national level, has more than 600,000 students throughout Mexico, with social service activities, dissemination through digital media, social networks (TikTok, YouTube, and Facebook), in squares and public spaces, the goal of 1,000,000 people empowered and aware of the importance of the SDGs can be achieve.
2	Diagnosis and development of workshops for methodological competencies, to encourage the design of research projects for higher education students on the SDGs.	There is low participation of students in TecNM Research Project Calls, so it is necessary to train and motivate them to develop the scientific research profile, emphasis on the 2030 Agenda, priority issues for the country, and regional and local development.
3	Evaluation and design of a methodological proposal to encourage the development of subnational voluntary reports in cities on the progress of the SDGs.	Currently, Mexico has only presented national reports with statistical averages of the progress made in the Sustainable Development Goals (SDGs); there are no municipal subnational reports (ISNM). Tijuana is in the process of completing the First Municipal Subnational Report, and the learning curve could be replicated in other cities.

Table 1. Project: municipal observatory of competencies for sustainable development goals (SDGs) Mexico 2030 agenda.

Program for the professional development of teachers (PRODEP)

According to the Rules of Operation of the Program for the Professional Development of Teachers, issued by the Ministry of Public Education of the Government of Mexico in 2021, the guidelines are linked with the purpose of having a reference framework that allows identifying the actions that contribute to the fulfillment of the Sustainable Development Goals of the 2030 Agenda in the classroom through the educational programs. To this end, the PRODEP Program includes the 2030 Agenda for Sustainable Development as an Institutional Objective, contributing to action plan initiatives for people, planet, and prosperity. It also aims to strengthen universal peace within a larger concept of freedom. The importance of eradicating poverty in all its forms and dimensions, including extreme poverty, is recognized as the greatest challenge facing the world and is a prerequisite for sustainable development. The 2030 Agenda includes 17 SDGs; in the context of the education sector, it establishes SDG4, quality education, aimed at guaranteeing inclusive and equitable quality education, to promote lifelong learning opportunities for all, the great challenge of society on the planet [13].

The history of the PRODEP Program dates to 1996, when the Program for the Professional Development of Teachers began at the university level for higher level, called PROMEP (Teacher Improvement Program), whose purpose was to invigorate the work of teachers working at the higher level. In normal education, it was later instituted, in 2009, within the PROMEP (Program to Strengthen Normal Schools), in which it was included as a new need in the field of knowledge generation in collegiate groups. Teachers would carry out research in addition to teaching, but reality shows scenarios different from those desired by several factors with the Priority Objective of revaluing teachers as fundamental agents of the educational process, with full respect for their rights, based on their professional development, continuous improvement, and vocation for service.

UNESCO states that the achievement of education for all was boosted in terms of coverage at the time. For the 2030 Agenda, education expands its scope beyond access, promoting learning achievements, different ways of accessing knowledge, safe and healthy educational environments, innovative methodologies, and the approach to lifelong education. In addition to educational achievement, quality education promotes skills for the promotion of peace, conflict resolution, mutual understanding, and sustainability; therefore, as far as young people are concerned, education must be related to their needs and interests, in which they incorporate significant learning and enable their adequate inclusion in the labor markets and the achievement of their projects of life [14].

Methodology QHS and DCS for sectoral development

Initiatives have been developed from academia, and the areas of postgraduate research, such as the Fifth Systemic Helix Methodologies (QHS) Methodology in Spanish, aimed at sectoral integration processes to analyze, evaluate, and promote projects where the different representatives of society interact, such as the government sector, education, companies, business chambers—unions, and specialized consultants [15]. In the case of the Sectoral Competency Dictionary Methodology (DCS Methodology in Spanish), this methodology strategy proposes the design of labor, professional, and research competencies for the design of Competency Standards [16] and thus respond effectively to the relevance and validity of knowledge skills, and attitudes necessary at each occupational level and position.

Municipal development agenda (MDA)

The Technological Institute of Tijuana of the TecNM, through the postgraduate program of master's in administration as a Verification Unit, is the headquarters of the training work for the Public Servants of the State of Baja California. The training

modules focus on delivery-reception of the Municipal Public Administration and Consultative Guide of Municipal Performance, which contemplates sustainable objectives according to the Global Agendas as is the case of the 2030 Goals of the UN [17]. The municipal development verification program is promoted by the National

Institute for Federalism and Municipal Development (INAFED), which depends on the Ministry of the Interior (SEGOB) and is coordinated by the state governments to promote the improvement of Municipal Management. Currently, the five municipalities of the State of Baja California have implemented the INAFED program as a strategy for identifying and monitoring areas of opportunity generated through the verification processes developed by higher education institutions (HEIs) in Mexico [18].

In Baja California, the HEIs that develop the activity of social and academic responsibility of contributing with highly prepared professors for the application of the Instruments of the Municipal Development Agenda (ADM), now called the Municipal Development Guide (GDM), are the Technological Institute of Tijuana, through its Master's program in administration, and the Technological University of Tijuana. According to INAFED's national verification results, the municipalities that achieve the best results receive an Annual Recognition and Distinction at the Ministry of the Interior in Mexico City. Each year, the results generate opportunities for the development of action plans according to the gaps identified because of the surveys that are applied to the society as a complementary action to the annual verification of municipal performance and management, as a strategy to promote the strengthening and recognition of the talent management of public servants in Mexico.

Public and social economics research

Since the founding in May 2019 of CIRIEC Mexico (International Centre of Research and Information on the Public, Social, and Cooperative Economy), the Tijuana Institute of Technology of the TecNM has been part of the structure of the organization, occupying the Vice Presidency in the Northern region of Mexico. CIRIEC Mexico is a nonprofit association and national chapter linked to CIRIEC International, which is based in Belgium.

CIRIEC Mexico was born as a promise and a hope to contribute to another way of doing things in the economy. In the research and the very close accompaniment with the entities of the Social and Solidarity Economy (EESS) in their territory, under their cultural and socioeconomic contexts, with their resources (most of the time incredibly scarce), we hope that CIRIEC Mexico, little by little, achieves the cohesion and professional coherence required to face the social requirements of the countryside and the city [19].

TecNM scientific research projects

Strategies to influence Sustainable Development through Teaching and Research have generated initiatives to contribute to SDG 4: Quality Education. Observatory of the Integration of Engineering in the Economic Development Ecosystem of the Baja California Peninsula. The research focused on two areas of interest: the relevance of the study program for engineering careers at the TecNM in the region.

First, identification of the professional competencies of the engineers who intervene in the supply chain within the companies and manage local supply as a competitive strategy in the regional economic development ecosystem.

The second focus is the factors that intervene in entrepreneurship as MSMEs in the strategic services sector as a key strategy for the promotion of local supply as a professional development of engineers graduated from TecNM in the Baja California Peninsula [20].

Observatory of Sustainable Development in Graduate Study Programs in Baja California: the scientific research project focused on carrying out a systemic analysis in higher education institutions that incorporate the dimension of sustainability in their graduate level curricula in the State of Baja California through teaching, research, and university management. To cement the variables to develop an Observatory of Sustainable Development of Graduate Study Plans in Baja California [21] as a tool for the analysis of the culture of sustainability and inclusion in the current university model, the project integrated three specific objectives:

1. To determine the level of culture of Sustainable Development in the Graduate Study Plans in Baja California.
2. To evaluate the implementation of the Sustainable Development Goals in the Graduate Study Plans in Baja California.
3. To design the perspective of the variables for an Observatory of Sustainable Development of Graduate Study Plans. The Project of the Observatory of Sustainable Development in Graduate Study Programs in Baja California is a continuation of the project Observatory of the Integration of Engineering in the Economic Development Ecosystem of the Baja California Peninsula.

The entry into force of the United Nations 2030 Agenda in 2015 makes it possible to promote sustainable development in its social, economic, and environmental dimensions. SDG 4 of the 2030 Agenda obliges the actors involved to carry out a series of actions in this area, guaranteeing inclusive and equitable quality education and promoting lifelong learning opportunities for all.

Among the benefits and impacts of the research project is the alignment with UNESCO's Medium-Term Strategy 2008–2013, which highlighted that development and economic prosperity require the capacity of states to teach their citizens and

provide them with a culture and awareness about learning about sustainable development and the benefits for quality of life and integral development in society. It would provide local professional development for engineers who graduated from TecNM in the Baja California Peninsula.

TecNM's NODESS Tijuana project

The actions are derived from the TecNM Institutional Development Plan since 2019 to promote a NODESS Project (Nodes for the Development of Social and Solidarity Economy) of the City of Tijuana, integrated strategic allies; the Municipal Institute of Citizen Participation of the Municipality of Tijuana and the Confederation of Cooperatives of the Northern Border of Mexico, to promote the UN 2030 Goals, oriented to the thematic line of food sovereignty, with specific objectives to map the needs of the supply chain and areas of opportunity in social innovation. This is in accordance with the National Strategic Programs (PRONACES) of CONAHCYT (National Council of Humanities, Science and Technology), focusing efforts on the Supply Chain of the Dough and Tortilla Industry [22].

The project undertaken in 2019 as NODESS TIJUANA, crystallized, achieving the TecNM Tijuana, the national registry as the FIRST NODESS in the Northern Border Region of Mexico, occupying the leadership in the Border Municipalities of Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas. The main objective of the NODESS TIJUANA Model presented at the national level by the TecNM Tijuana campus is the multiplier development of NODESS projects with a systemic approach (Fifth Systemic Helix) for the institutional link with the different sectors of society and with the aim of empowering the learning curve generated in the principles of the Social and Solidarity Economy.

TecNM Tijuana contributes to academic linkage and strategic research actions to the collaborative work with the Municipal Institute of Citizen Participation of the City of Tijuana as a Member of the Sectoral Subcommittees for the monitoring of the progress of objectives and goals of the Municipal Development Plan 2022–2024 and the Strategic Plan for Municipal Development 2022–2036, all under the focus of alignment of competencies from undergraduate and graduate educational programs to the National Strategic Programs of CONAHCYT, so that altogether, we can contribute to the challenges of the National Plan in each region of Mexico [23].

Commission for the promotion of the social and solidarity economy

Nowadays, communities in Mexico, whether urban or rural, must be thought of from a sustainability approach, this new approach to sustainable development.

involves three main spheres in perfect balance: economic, social, and environmental aspects. Social development cannot be generated without economic development and care for the environment, always bearing in mind that the goal of action must be for the benefit of the development of people in an inclusive way and their communities.

The installation of the "Commission for the Promotion of the Social Economy" aims to identify the needs of the business exercise of the representatives of the Social and Solidarity Economy through the systematization of social innovations, aligned with the objectives of the national development plan to reduce the gaps of social inequality, as well as the instrumentalization of a social economy observatory of the goals for sustainable development of the 2030 Agenda, in the ecosystem of economic development of the City of Tijuana, to combat poverty and hunger. It requires the will to work in a coordinated manner the government, academia, social sector, representatives of civil society, as well as the citizens of Tijuana, with a systemic development approach [24].

TecNM training program in social and solidarity economy

At the national level, the initiative of the National Technological Institute of Mexico (TecNM) has been generated to offer a Training Program in Social and Solidarity Economy, which integrates diplomas, master's, and doctorates aimed at all people interested in the development, management, organization, and implementation of social and community development projects with a focus on Social and Solidarity Economy. The modality is face-to-face and mixed, and the doctorate is proposed to be virtual in an asynchronous way, thus seeking an offer of national and international scope based in TecNM Tijuana [25]. The general contents of the training in Social and Solidarity Economy (SSE) integrate aspects such as:

a) Fundamentals of SSE: introduction to economics, introduction to SSE, dimensions and features that identify SSE, purposes of SSE, and values.

b) Context of SSE: currents of the SSE, the SSE, and other alternative economies in Mexico: challenges and perspectives.

c) Legal Framework, Ecosystems, Innovation, and Entrepreneurship in SSE: legal framework that regulates the social sector of the economy and its economic activity in Mexico, types of cooperative societies, SSE ecosystems and innovation, and social entrepreneurship.

d) SSE Preliminary Projects and SSE Case Studies: elements of an SSE draft project, participatory tools for the development of an SSE draft project, and international and national experiences of SSE projects: case studies and presentation of an SSE draft project.

TecNM academic body ITTIJ-CA-12

The PRODEP Academic Body is a modality of conducting research with groups of research professors and researchers from one or more lines of research. Academic bodies are groups of full-time professors who share one or more lines of generation or application of knowledge (research or study) in discipline or multidisciplinary topics and a set of academic objectives and goals. At the Tijuana Institute of Technology of the TecNM, the first multidisciplinary team was formed to attend the topic of Sustainable Development, aligned with the UN's 2030 Goals.

The name of the Academic Body: "Sectorial Competitiveness, Social Innovation and Sustainable Development." It obtained its registration at the national level in Mexico in 2023, after a trajectory since 2019, code: ITTIJ-CA-12, founded in the Department of Economic and Administrative Sciences with Professors and Researchers with PRODEP Accreditation (Program for the Professional Development of Teachers) and National Distinction before CONAHCYT (National Council of Humanities, Science and Technology) of the Government of Mexico, as Members of the National System of Researchers. In the area of Economic and Administrative Sciences with Lines of Generation and Application of Knowledge: (1) sectoral competitiveness and (2) social innovation and sustainable development [26].

Voluntary report on progress on the SDGs in cities

Mexico will present its Fourth Voluntary National Report on the 2030 Agenda for Sustainable Development in 2024. The Executive Secretariat of the National Council of the 2030 Agenda supports efforts at the national level to develop subnational reports, and such is the case of the City of Tijuana through the processes of specialized training and orientation to shape the information of actions developed from the local level and thus add to the national results. The Municipal Institute of Citizen Participation (IMPAC) and the National Technological Institute of Mexico (TecNM) Tijuana Campus work in coordination with the NODESS Tijuana Program in the advancement of awareness of the UN 2030 goals, with workshops, conferences, and seminars at the local, state, national, and international levels of the good practices developed in the City of Tijuana toward the awareness of youth in primary, secondary, high school, and universities, as well as the different sectors of society.

For a greater context of the challenges that Mexico (United Mexican States, official name) must address the phases of awareness, empowerment, and specific actions

in each municipality, Mexico has 32 Federal Entities (states) and 2475 municipalities, according to the National Institute of Statistics and Geography (INEGI), with a population of 131.1 million people and with a growth of 0.9 [27]. According to the UN's 2030 Agenda reports, Mexico has the following Voluntary Subnational Reports presented in Table 2, which includes state governments 8 out of 32 and municipal governments 5 out of 2475 [28].

Since 2015, the importance of the 2030 Agenda has been actively promoted, man- aging through different actions and tools planning at the local level, in cities, regions, state governments, and country governments, to implement actions in each SDG. According to the United Nations report of the Department of Economic and Social Affairs, Table 3 presents the records of the countries that annually submit voluntary reports of a state, regions, or even at the city level [29].

The challenges are great, but the unity of all sectors of society can generate surprising actions. That is why the key role of SDG 4, from the education sector, as an agent of change and leader, is to integrate, motivate, and articulate the different sectors of society; the reflection of the capabilities of society is its level of education.

Year	State government	Municipal government
2023	Puebla, State of Mexico	Tizayuca
2022	Oaxaca	-
2021	Tabasco, Durango, Mexico City (Capital), State of Mexico	Merida, Guadalajara
2020	Yucatan	-
2019	Mexico City (Capital), Oaxaca	-

Table 2. Mexico's 2030 agenda voluntary subnational reports.

TecNM social and solidarity economy (SSE) research network

TecNM Research Networks are the voluntary association of researchers or people interested in collaborating to address a problem of regional, national, or international magnitude from a multidimensional perspective and in an articulated way between national and international actors from academia, government, companies, and civil society. Networks can be understood as incubators of cooperation, where interactions, collaborations, and transfers between partners contribute to generating a multitude of outputs and results, both tangible and intangible [30]. Since 2023, TecNM Campus Tijuana has been the national leader of the research network in social and solidarity economy, with the purpose of developing research projects for three years of validity of accreditation as a nationwide network. The network is made up of committees for the training of human resources, professional practices, social service, certification of competencies, and development of initiatives to update the relevance of curricula and programs at different educational levels.

Year	Participating countries	Number of countries
2023	Morocco, Australia, and Argentina. Belgium, Denmark, United States, Finland, Portugal, Uruguay, Brazil, Mexico, Malaysia, Japan, Netherlands	14
2022	Malaysia, Jordan, Netherlands, Spain, Brazil, Germany, Argentina, Portugal, United Kingdom, Uruguay, Bolivia, Paraguay, Belgium, Denmark, Italy, Australia, Guatemala, Tanzania, Mexico, Colombia, Finland, Japan, China	23
2021	Malaysia, Brazil, Norway, Finland, Mexico, Belgium, Peru, United States, Denmark, Japan, Spain, Argentina, South Africa, United Kingdom, Indonesia, Germany, South Korea, Norway, Canada, Sweden, China	21
	Spain, Germany, Finland, Belgium, Uruguay, United States, Brazil, Greece, Argentina, China, South Korea, Mexico, Mozambique, Albania	14
2020	Brazil, Spain, United States, United Kingdom, Finland, Mexico, Portugal, Argentina, Japan, Bolivia, South Korea, Philippines, Germany, Belgium	14
2019	Spain, Japan, Bolivia, United States, South Korea	5
2018	Philippines, Belgium, Australia, Spain, Brazil, Germany	6

Table 3. Cities of the world with a voluntary local report of agenda 2030.

The focus of the research network is to support undergraduate and graduate students in projects that impact the different sectors of society, develop projects to analyze the capacities of supply, supply chain, productive ecosystems and productive vocations in the north, center and south of Mexico. The linkage activities promoted by the research groups and the Nodes for the Promotion of the Social and Solidarity Economy, known as NODESS, aim to promote different methodological strategies of intervention in organizations, for the analysis of the factors that encourage sectoral development, the application of the QHS Methodology; it integrates representatives of academia, government, companies, associations and consultants.

The UN 2030 Agenda is a central point of the research network's work axes with an impact on the development and well-being of society, toward a sustainable approach, as well as the axes of the national development plan and the reference of local and state development plans. The vision of the academy is to seek dialogue and synergies between the different sectors of society, to know the needs and to develop solid solutions.

3. RESULTS

Under the systemic analysis of information generated in Mexico, the last decade has been oriented to the contributions in favor of quality education for the awareness of sustainable development and the empowerment of the 17 Sustainable Development Goals (SDGs) of the UN 2030 Agenda. The statistics of the Ministry of Public Education in Mexico indicate that there is a gap between the goals and the indicators established to raise awareness among the population.

That is why, the Mexican regulations for the training and updating of full-time teachers with accreditation of the Program for the Professional Development of Teachers for the Higher Type (PRODEP) have generated actions to bring the information of the SDGs to the classrooms, but before transmitting the knowledge to the students, teachers must be trained at different educational levels to ensure that they are prepared to transmit the importance of each SDG in an effective and dynamic way. From the context of its evolution of the SDGs, Millennium Goals, it is for this reason that the national statistics on full-time teachers reflect a starting point of the need for greater efforts, programs that encourage the preparation of teachers and personnel who update educational programs to insert in each subject the necessary points toward critical thinking of Sustainable Development—concern for environmental conditions and the impact on future generations.

Table 4 presents the statistics of the universe of full-time professors. The statistic invites us to reflect that full-time professors are only 15% accredited in programs that include empowerment on the SDGs, but full-time professors in most educational institutions only represent 30% of total professors. As 70% of professors have a contractual and employment relationship of part-time or by subject hours, this generates great concern for achieving the mechanisms for training and updating teachers [31].

At TecNM 5 out of 10 engineers graduate nationwide, according to PRODEP statistics it has 8,286 full-time professors and 3,650 professors are accredited in PRODEP, a challenge of 66% of professors must prepare and be accredited with the Desirable Profile. The development of academic productivity mechanisms is a key to promoting that teachers are accredited with a desirable profile, for these skills and experience are required for research, project development and publication of articles and book chapters, as well as the training of human resources through theses.

That is why Table 5 presents the list of articles published by the Academic Body with registration ITTIJ-CA-12 of the Technological Institute of Tijuana of the TecNM with the lines of Research: a) Sectoral Competitiveness and b) Social Innovation and Sustainability.

Mexico Universe		Accredited		TecNM Universe		Accredited	
276.000	100%	42,508	15%	8286	100%	3650	44%

Table 4. Number of full-time professors with PRODEP accreditation

Total articles	Citation	Index h	Index i10
114	198	7	5

Table 5. Published articles on the QHS and DCS methodology.

Development, with a multidisciplinary team of researchers, with Collaboration Agreements at the national and international level [32]. The publications and citations obtained are products of research projects developed within the framework of national calls for scientific research projects for full-time professors and researchers and sectoral linkage activities. Table 6 shows the relationship between the number of full-time professors of the TecNM and the composition of academic bodies for research. The contractual situation of the professors limits the development of the desirable profile (PRODEP) and, with it, the comprehensive training to develop activities of academic management, linkage, research, and not only teaching. Part-time professors, or hourly professors, represent more than 70% of professors.

Year	2016	2017	2018	2019	2020	2021
Full-time teacher	1750	2174	2930	3285	3478	3509
Academic bodies	559	682	682	817	848	868
% PRODEP	32	31	23	25	24	25

Table 6. Evolution of the PRODEP indicators in TecNM

The Technological Institute of Tijuana received the Recognition of the Ministry of the Interior through the National Institute for Federalism and Municipal Development (INAFED) for the activities of Linkage and Advisory as an accredited VERIFICATION UNIT (UV) to develop the methodological application of the Municipal Development Agenda in the Municipalities of the State of Baja California as part of the objectives and social responsibility of linkage and applied research. The Ministry of the Interior, through the National Institute for Federalism and Municipal Development, INAFED, seeks to strengthen the capacities of municipal governments in the fulfillment of the SDGs. For this reason, on July 7, it will present a strategy so that, together, we achieve the objectives set out in the 2030 Agenda, considering the different realities, capacities, and levels of development of each municipal space, with full respect for its autonomy.

To achieve the goals of the SDGs, it is necessary for all of us, the three levels of government, the private sector, and civil society, to join and channel actions to transform our country and the world into a better place. Figure 1 shows images of the activities to train public employees of the municipalities of the cities of Mexicali, Ensenada, Tecate, Playas de Rosarito, and Tijuana, Baja California, Mexico.

Figure 1. 1,000,000 student project trained in SDGs UN 2030 goals.

The National Institute for Federalism and Municipal Development (INAFED) of the Ministry of the Interior of the Government of Mexico states that the 2030 Agenda is an innovative development framework. Due to its scope, as well as the comprehensiveness of its policies, in compliance with its 17 Sustainable Development Goals (SDGs) and its 169 targets, it requires the broad involvement of all actors in all orders and levels of government. INAFED points out that "it is a commitment of the state" to implement the SDGs in all the municipalities of Mexico, but it requires the participation of the states, municipalities, the productive and social sectors, and citizens in general. Pointing out that "we are all actors responsible for its compliance and beneficiaries of its results." For this reason, it is a priority to promote the articulation of collaboration schemes and synergies between these actors. In the case of the National Technological Institute of Mexico, Tijuana Campus, it has become a Verification Unit of the Municipal Development Agenda, which contemplates the evaluation of actions aimed at the SDGs in the Cities.

Under the traffic light evaluation scheme: (a) green refers to evidence of sufficient compliance, (b) yellow there is evidence of attempts, partial evidence, but they reflect actions to initiate projects that are oriented toward the objectives of the SDG targets, and (c) red is the evaluation corresponding to the actions not developed and proposed in the municipal development plan; it is a reflection that no action was initiated; there is no minimum evidence of efforts to influence the SDGs [33].

Figure 2. Social services activities with students for SDGs UN 2030 goals.

Figure 2 shows images of the evaluation processes carried out in each municipality of the State of Baja California, Mexico. Through professors and researchers who develop the verification processes of the Municipal Development Agenda, the principle of impartiality in the process of evaluation of municipal management is fulfilled. Once the evaluation processes have been carried out by the members of the Verification Unit of the Municipal Development Agenda (ADM), the results are sent to the national offices of INAFED in Mexico City. Once the results of the 2469 municipalities have been analyzed, a national ceremony will be held, and the best municipal compliance results will be announced. In 2019, the City of Tijuana had the best compliance result [34].

The Municipal Development Agenda (ADM) has evolved since 2022 and has changed its name to the Municipal Performance Advisory Guide (GDM). It is made up of eight modules that cover areas of responsibility of all municipal governments: Organization, Finance, Territorial Management, Public Services, Environment, Social Development, Economic Development, and Open Government. These are broken down into 31 themes and 115 indicators, of which 80 are management and establishing the substantive documents for the municipal administration, and 30 are performance indicators that quantitatively measure the results achieved.

The participation of the municipalities is voluntary and will be formalized through an Act of the City Council and the registration application where the liaison is designated by the Municipal President. The new GDM contemplates mechanisms to carry out remote implementation, where the use of information technologies is essential when supporting the strengthening of municipalities, giving guidance so that higher education institutions can continue to collaborate with the same rigor as in person [35].

The GDM contemplates a specific item for the theme of education and aims to contribute to the strengthening of infrastructure, equipment, coverage, and provision of educational services in the municipality. Emphasizing three key aspects: education is a means to acquire, update, complete, and expand your knowledge, skills, abilities, and aptitudes that allow you to achieve your personal and professional development. Consequently, they contribute to their well-being and the transformation and improvement of the society they are a part of.

Basic education: it is made up of the initial, preschool, primary, and secondary levels. The services included in this type of education, among others, are (I) initial schooling and nonschooling; (II) general, indigenous, and community preschool; (III) general, indigenous, and community primary; (IV) secondary, including general, technical, community, or regional modalities authorized by the Secretariat; (V) secondary for workers, and; (VI) telesecondary. Figure 3 presents the activities of the team of researchers that make up the Scientific Council of CIRIEC Mexico (International Center for Research and Information on the Public, Social, and Cooperative Economy).

The Board of Directors of CIRIEC Mexico was founded in 2018 in Acapulco, Guerrero, because of linkage and cooperation efforts between researchers from Mexico with representatives of CIRIEC Colombia, Brazil, Costa Rica, and Spain. CIRIEC Mexico was founded with four Vice Presidencies: TecNM Tijuana Institute of Technology; Indigenous Cooperative of Guerrero; Pascual Cooperative; and Autonomous University of Chapingo. Partner institutions were such as Universidad del Valle de México, Universidad Nacional Autónoma de México, Meritorious Autonomous University of Puebla. CIRIEC Mexico has been characterized by advancing in the analysis of the government's public policies, in the Social and Solidarity Economy, the promotion of cooperativism and sustainable development.

Figure 3. Liaison activities between CIRIEC Mexico and TecNM Tijuana.

There is generation of intervention mechanisms in organizations for the analysis of productive chain ecosystems for the well-being of the most marginalized society. In this sense, various activities of an intellectual nature and linkage with the different sectors of society have been organized, seeking systemic actions of collaboration and management with the authorities of the federal, state, and local levels of government. With the development of systemic initiatives generated through the identification of good practices in society, the competencies of specialized talent are strengthened, encouraging the application of the Fifth Systemic Helix Methodology (QHS in Spanish), for the integration of the different sectors of society and with it the map- ping of productive vocations, supply chains, cementing the structure of regional development ecosystem models and a national benchmark [36].

TecNM SDG progress mapping report

The advances made by academia to influence quality education (SDG 4) have involved the development of scientific research projects to methodologically influence the analysis of the success factors or inhibitors of the lacing of the competencies of Sustainable Development.

The project called Observatory of Sustainable Development in Graduate Study Programs in Baja California was promoted with the purpose of contributing to the lines of research of the postgraduate of the Master's Degree in Administration and Academic Body of the Technological Institute of Tijuana of the TecNM. In Figure 4, the presentation of results of the Research Project to the Society is presented. The entry into force of the United Nations 2030 Agenda in 2015 has made it possible to promote sustainable development in its social, economic, and environmental dimensions.

The agenda promotes the integration of the Education for Development (ED) and Education for Sustainability agendas. Goal 4: Quality Education of the 2030 Agenda obliges the actors involved to carry out a series of actions in this area, guaranteeing inclusive and equitable quality education and promoting lifelong learning opportunities for all. Among the benefits and impacts of the research project is the alignment with UNESCO's Medium-Term Strategy 2008–2013, which has highlighted that development and economic prosperity require the capacity of States to teach and provide their citizens with a culture and awareness about learning sustainable development and the benefits for quality of life and integral development in the society [37].

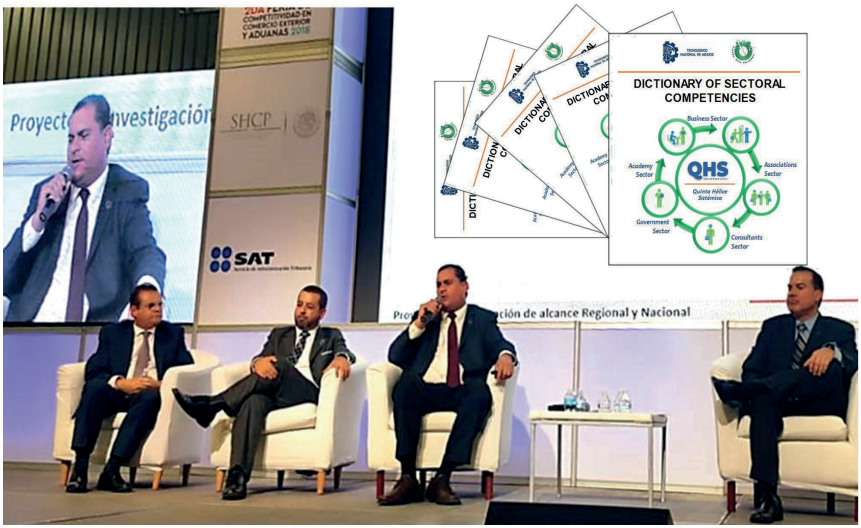

Figure 4. TecNM scientific projects with QHS methodology.

The Research Project Observatory of Sustainable Development in Graduate Study Programs in Baja California allowed a systemic analysis to be carried out on the problems raised in the scientific research project based on the limited information on the level of progress in the relevance and impact of the Sustainable Development Goals (SDGs) for the progress in the 2030 Goals of the UN (United Nations Organization) and the Programs National Strategic Programs (PRONACES) promoted by the National Council of Science and Technology (CONAHCYT) for the strengthening of sectoral sustainable development in the national territory, through the Study Plans of Graduate Programs in Mexico [38, 39].

The research project had three specific objectives:

1. Determine the level of culture of Sustainable Development in the Graduate Study Plans in Baja California,
2. Evaluate the implementation of the Sustainable Development Goals in the Graduate Study Plans in Baja California,
3. Design the prospective of the variables for an Observatory of Sustainable Development of Postgraduate Study Plans.

The results of the research project Observatory of Sustainable Development in Graduate Study Programs in Baja California propose the following approaches to the level of culture on the Sustainable Development Goals (SDGs) [40]. It is estimated on average that the level of culture is 53%, and the specific scope of SDGs is as follows:

a) SDG 1: no poverty = 16% visible in graduate curricula in Baja California

b) SDG 2: zero Hunger =16% visible in graduate curricula in Baja California

c) SDG 3: good health and well-being = 83% visible in graduate curricula in Baja California

d) SDG 4: quality education = 83% visible in graduate curricula in Baja California

e) SDG 5: gender equality = 48% visible in graduate curricula in Baja California

f) SDG 6: clean water and sanitation = 32% visible in graduate curricula in Baja California

g) SDG 7: affordable and clean energy = 48% visible in graduate curricula in Baja California

h) SDG 8: decent work and economic growth = 32% visible in graduate curricula in Baja California

i) SDG 9: industry, innovation, and infrastructure = 48% visible in graduate curricula in Baja California

j) SDG 10: reduced inequalities = 48% visible in graduate curricula in Baja California

k) SDG 11: sustainable cities and communities = 64% visible in graduate curricula in Baja California

l) SDG 12: responsible production and consumption = 80% visible in graduate curricula in Baja California

m) SDG 13: climate action = 48% visible in graduate curricula in Baja California

n) SDG 14: life below water = 32% visible in graduate curricula in Baja California

o) SDG 15: life on land = 80% visible in graduate curricula in Baja California

p) SDG 16: peace, justice, and strong institutions = 64% visible in graduate curricula in Baja California

q) SDG 17: partnerships to achieve the goals = 80% visible in graduate curricula in Baja California

TecNM NODESS Tijuana project

The purpose of the formation of NODESS projects is to generate alliances between institutions of higher education, local government, and organizations of the social sector of the population to promote development, well-being, and build ecosystems. That is why Figure 5 presents the profile of NODESS Tijuana,

which specializes in three strategic issues: (1) food sovereignty, (2) culture, and (3) education. With a metropolitan field of action and strategies for liaison and academic management, the goal was to train and raise awareness among more than 100,000 people throughout the State of Baja California, adding the efforts of professors, researchers, and representatives of the Society [41].

The training and awareness activities managed by NODESS Tijuana have been managed through the design of Social Service programs, which is a requirement for a degree in high school and higher education in Mexico. Social service refers to a voluntary activity that students do in a school or community. This activity is carried out to help others, raise awareness of education, and learn from life. Social services are carried out by some students who commit to dedicating their time and effort to doing something useful, allowing them to acquire experience, skills, and knowledge to be better people and better professionals. That is why students are trained as instructors, after receiving specialized training in the training of people and the content of the 17 SDGs, to develop talks, workshops, and seminars with students of different educational levels. The students who have participated as instructors also develop complementary activities such as videos and activities on social networks to promote the understanding of each SDG and generating awareness in children. Figure 6 shows the activities of workshops to train students, teachers, employees of business associations, trade unions, companies, and anyone interested in learning about the UN's 2030 Agenda [42].

Figure 5. TecNM's NODESS Tijuana program.

As part of the results of the exercises in seminars, vodcasts, workshops, courses, and conferences on the SDGs with students from different educational levels, see Figure 7, surveys are carried out with the mentimeter tool, to develop word cloud, see Figure 8, to know what are the necessary actions to be developed by all to achieve progress in the implementation that affect the objectives and targets of each Sustainable Development Goal of the 2030 Agenda; the results are interesting. Words with greater emphasis are Solidarity, Commitment, Responsibility, Love, Empathy, Respect, Innovation, Collaboration, Partnerships, Equality, Development, Teamwork, Leadership, Effort, Well-being, Goals, Recycling, Support, Knowledge, Learning, Volunteers, Discipline, Motivation, Awareness, Organization, Tolerance, Work, Equity, and Equality. Empathy, Respect, Innovation, Collaboration, Partnerships, Equality, Development, Teamwork, Leadership, Effort, Well-being, Goals, Recycling, Support, Knowledge, Learning, Volunteers, Discipline, Motivation, Awareness, Organization, Tolerance, Work, Equity, and Equality.

Figure 6. Dissemination of the SDGs of the UN 2030 goals.

Figure 7. Project 100,000 students trained with NODESS Tijuana program.

Figure 8. Exercise word cloud in SDG seminars with students.

TecNM social economy and solidarity training program

The Tecnológico Nacional de México, as a Public Education institution aligned with the needs of the Federal Government, has designed a Continuing and Postgraduate Education program on Social and Solidarity Economy (SSE), which includes a special focus on sustainable development through the strengthening of the ecosystems of communities and the national territory [43].

The Social and Solidarity Economy Training Program (FESS) is integrated with the Development of Educational Programs for Diplomas, Master's, and Doctorates. Figure 9 presents the list of strategic allies, professors, researchers, and specialists of the TecNM at the national level who have participated in the design of the educational programs [44].

Figure 9. National researchers on social economy of the TecNM, UdeG, and Ciatej.

General objective

Academic training in social and solidarity economy issues represents in the human resources of social and productive organizations the opportunity to strengthen talent management in skills to identify, manage, implement, and evaluate innovative projects with social responsibility and sustainability, in accordance with the demands of the regional, national, and international environment.

Specific objectives

Develop critical thinking in the local, regional, national, and international context with the contributions of the Social and Solidarity Economy from a sustainable perspective in ecosystems and supply chains. Apply administrative, economic, and financial tools that contribute to the improvement of the management, operation, and development of Social and Solidarity Economy initiatives. Generate initiatives with imagination, innovation, and intuition, which promote social and economic awareness for development, with strategies that meet the needs of communities. Manage projects based on the principles and practices of the social, solidarity, and community economy with a collective social vision with sectoral competitiveness and sustainable development.

For the design of educational programs aimed at the Social and Solidarity Economy, as well as the efforts to comply with the UN 2030 Agenda, it is necessary to identify the state of the Art developed in the last decade in Mexico. Table 7

presents the actions carried out in different higher education institutions, as well as the initiatives of the law from the government to favor the development of the social economy, solidarity, and social innovation through cooperativism [45]. Figure 10 shows the regional event organized by the University of Guadalajara, Social Leader, a training program for community leaders with initiatives in the SDGs, methodologically oriented projects to generate social innovation and well-being actions in the com- munities, and this program has collaborated through the Collaboration Network of Academic Bodies of the Technological Institute of Tijuana and CIATEJ—CONAHCYT Research Center [46].

Figure 10. Award of the social leader program of the University of Guadalajara.

	Actions developed in Mexico on SSE	Year
1	Social and Solidarity Economy Law	2012
2	Social and Solidarity Economy Law (Reform)	2019
3	Universidad IBEROAMERICANA	2013
4	INAES and Universidad IBEROAMERICANA convened the Academy of Social and Solidarity Economy	2015
5	MASTER'S DEGREE IN SOCIAL AND SOLIDARITY ECONOMY Autonomous University of Guerrero (CONACYT)	2018
6	Presentation in the Chamber of Deputies in Mexico City CIRIEC Mexico Project (Founding Researchers) TecNM Tijuana (IES del Norte)	2018
7	CIRIEC Mexico Project	2019
8	CIRIEC Mexico (TecNM Tijuana–Vice-Presidency)	2020
9	Presidency of the Promotion of the Social Economy of the City of Tijuana—IMPAC—ODS	2021
10	Pre NODESS, NODESS, RED NODESS del TECNM	2022
11	Social Entrepreneurship Law Initiative	2023

12	Diploma and master's degree Project in Social and Solidarity Economy of the TecNM	2023
13	Project of the INTERNATIONAL NETWORK of Social and Solidarity Economy of the TecNM (RIESS)	2024
14	PhD in Social and Solidarity Economy of the TecNM	2024

Table 7. TecNM training program in social and solidarity Economy.

The social and solidarity economy (SSE) is a set of initiatives based on a paradigm shift based on the collaborative work of people and the collective production of goods for self-consumption. To meet the needs of their members and their communities where they are developed, SSE seeks to generate relationships of solidarity and trust, community spirit and participation by strengthening the processes of productive integration, supply chains, value chain, sustainable consumption, distribution of savings and loans, and models of social innovation and sustainable development.

PhD project in social and solidarity economy at TecNM

The Tijuana Institute of Technology TecNM has been characterized by training and updating the management team of companies and organizations for more than 50 years in the City of Tijuana and in the region of Baja California, where outstanding professionals and researchers who have made important contributions to different sectors of society have graduated locally, nationally, and internationally. The TecNM Campus Tijuana offers an online and asynchronous Doctorate in Social and Solidarity Economy with Professional Guidance with a high academic level to strengthen professional competencies, providing the opportunity to update knowledge, learning and skills, as well as competencies for applied research.

The Department of Economic and Administrative Sciences has maintained the traditional postgraduate master's degree in administration for more than 30 years. This new postgraduate degree has an impact both nationally and internationally. The structure of the curriculum of the Doctorate in Social and Solidarity Economy at TecNM is shown in Figure 11 and is adapted to the demand for highly qualified professionals in an increasingly competitive world, in a cross-border region characterized by the economic dynamism of the cities of Tijuana, Baja California and San Diego, California [47].

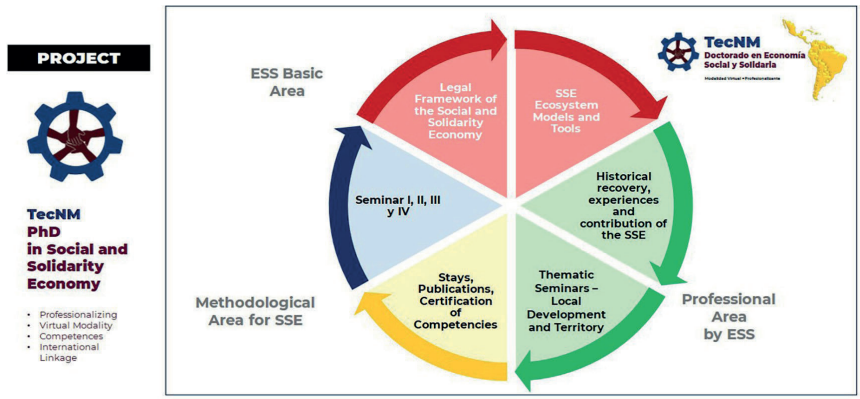

Figure 11. Structure of the curriculum of the PhD in SSE at TecNM.

The PhD in Social and Solidarity Economy generates an opportunity to meet the needs of the community of students and graduates of the sector of Higher Technological Education Institutions from different regions of the State of Baja California, nationally and even internationally. This is for a greater sectoral linkage under a sense of social responsibility and with the firm commitment of lines of knowledge generation oriented to the National Strategic Sectoral Programs

(PRONACE). To overcome the frontiers of knowledge in the ecosystem of economic, social, and solidarity development, the field of action of research in sectoral competitiveness, sustainable development, and social innovation is promoted.

Figure 12 shows the institutions that are part of the National Research Network (RIESS) in Social and Solidarity Economy of the TecNM. The Postgraduate Courses with a Professional Orientation train students for specialized professions, including stays of professionals and certification of competencies as a strategic part of the development of projects that mitigate, reduce, and improve the problematic situations that will arise as an applied research project by the Students of the PhD in Social and Solidarity Economy generating greater emphasis on practices and experience, for the strengthening of new knowledge, skills, and attitudes for the benefit of well-being and social progress.

Figure 12. TecNM social and solidarity economy (SSE) research network.

The National Research Network on Social and Solidarity Economy (RIESS) of the TecNM has members from the Technological Higher Education Institutions, Technological Institutes and Public Universities, and Research Centers in the States of Baja California, Baja California Sur, Sonora, Chihuahua, Jalisco, State of Mexico, Querétaro, San Luis Potosí, Tamaulipas, Veracruz, Oaxaca, Tabasco, Campeche, Yucatán, and Quinta Roo. The RIESS Network divides the national territory into three: Zone 1, Northern Mexico; Zone 2, Central Mexico; and Zone 3, Southern Mexico. Figure 13 shows the international links with researchers from countries such as El Salvador, Costa Rica, Panama, Colombia, Brazil, Argentina, and Chile [48].

Figure 13. International linkage of the social and solidarity economy network.

4. CONCLUSIONS AND REFLECTIONS

In the State of Baja California, Mexico, efforts have been made to integrate the Environmental Education Committee of regional scope, defining general agreements for periodic meetings to systematize the progress of the agreements defined in the State Environmental Education Committee; one of the key points of the Committee is to update the report on the progress of the UN 2030 Goals through the leadership of the Tijuana Institute of Technology, the National Network of Social and Solidarity Economy (RIESS) and the Researchers of the Academic Body: "Sectorial Competitiveness, Social Innovation and Sustainable Development" ITTIJ-CA-12 of the TecNM Tijuana Campus [49].

The city of Tijuana managed to obtain the registration of the First NODESS in a border city in Northern Mexico in 2022, and the objective is to achieve inter-institutional work with the different educational institutions in the State of Baja California and in Mexico to identify actions in favor of the 17 Sustainable Development Goals (SDGs), To define the gaps in each SDG and thus develop joint projects and initiatives, it is worth mentioning that the Technological Institute of Tijuana is promoting through a Social Service Program with the goal of training and sensitizing 10,000 students of different educational levels in Tijuana and raising awareness among 100,000 people throughout the State of Baja California.

The TecNM RIESS National Research Network aims to disseminate the importance of the 17 SDGs, PRONACES (National Strategic Programs of the Federal Government) and NODESS programs in other cities of the country through the sum of efforts of all sectors of society and inter-institutional linkage [50].

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CHAPTER 5

PROFESSIONAL SKILLS AND RESEARCH FOR SECTORAL DEVELOPMENT[1]

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ABSTRACT: According to the challenges of Technological Higher Education in Mexico, facing the requirements of graduation profiles that respond to educational competitiveness in the face of the challenges of Industry 4.0 and even towards Industry 5.0. This applied research initiative is oriented to the development of actions to strengthen sector competitiveness, considering the learning curve generated in the strategic sectors of Mexico, through the research work of experts in technological higher education of Mexico and specialists in labor, professional and research skills. The main objective is to present the model to develop Competency Dictionaries Sectoral (DCS) for each Study Program, through Methodology of the Fifth Helix Systemic (in Spanish: Quinta Helice Sistemica - QHS), as a strategic contribution to reduce the gap of the different knowledge of the competencies in the occupational functions in the regional strategic sectors of the North, Center and South of Mexico; under the frame of reference of the State of the Art and frontier research of international knowledge, the foregoing sustained from the scientific work initiative of the Academic Body project of the Department of Economic and Administrative Sciences entitled "Sectoral Competitiveness, Social Innovation and Sustainable Development" of the National Technological Institute of Mexico Campus Tijuana.

KEYWORDS: Fifth Helix Systemic (QHS Methodology), Competency Dictionaries Sectoral, Sustainable Education, Social Economy, Circular Economy.

1. INTRODUCTION

The recommendations of the 2019 Organization for Economic Cooperation and Development [1] report on competencies in Mexico, the current model of the Mexican competency system has an opportunity to rethink actions aimed at strengthening the model. For this reason, the proposal of this article is based on

[1] **Como citar:** Martinez Gutierrez, R. (2026). Professional skills and research for sectoral development. En *Systemic development for sustainability: Case studies of QHS methodology and 2030 agenda in voluntary local reports (VLRs)* (pp. 112–131). Atena. https://doi.org/10.22533/at.ed.727261102

the challenges indicated by the OECD to strengthen competitiveness, development and social progress, considering as a basis the impact that education represents at the eight levels indicated by CINE-UNESCO, which makes it necessary to reflect on the progress and current results in the use of labor competency standards in the sectors of society, as well as the national model and the effective methodology to move to the next stage of the development of the strategic economic sectors, facing the challenges of globalization and the needs of relevant and competitive occupational profiles in the face of the Industry 4.0 Revolution and the generational transition to Industry 5.0. Likewise, awareness of empowerment about the Sustainable Development Goals (SDG) of the UN 2030 Goals [2]. Which makes it imperative to build a model and an appropriate methodology for professional skills and research, making clear the differentiation of the eight levels and their requirements for training, alignment, evaluation and eventual certification of job skills, professional skills and applied research skills, with social impact and territorial development, encouraging local capacities with linkages that influence social innovation and with Startup and Spinoff-type ventures.

This article is based on the development of three scientific research projects registered at the national level in the National Technological Institute of Mexico:

1. Observatory for the Integration of Engineering to the Ecosystem of Economic Development of the Peninsula of Baja California [3],
2. Observatory of Sustainable Development in Graduate Programs in Baja California [4] and
3. Prospective of Dictionaries of Labor, Professional and Research Competences for the Sectoral Development of the Social and Solidarity Economy in Mexico.

All the above is intended to generate data on the relevance of the programs of study and the effectiveness of the competitions labor, professional and research, as well as evaluate the results of the graduates in the context of regional development and productive vocations relevant in northwestern Mexico. The purpose of the project is to examine the employability of students and graduates, as well as analyze the causes of student dropout rate engineering, which is about 40% during the first semester. The high dropout rate may be related to the socioeconomic factors affecting northern border" cities, which have experienced an influx of migrants arriving from southern Mexico. Until now, the research has focused on sectoral studies related to the postgraduate Master's Degree in Administration at the Technological Institute of Tijuana and the systematic development of projects related to various strategic sectors industry [5] in which initiatives have been created for applied research programs through Postgraduate Theses, Social Service Programs, Complementary Credits in Educational Programs and Professional Residences (Professional Practices).

This research focused on the development of an electronic survey that could systematically collect key information for the creation of an electronic empirical database for the development of a web page that will serve to assess employability and performance, as well as to track results. economic and strategic of students and graduates of engineering and economic-administrative sciences. The aim was to identify variables that could generate feedback on the causes of student dropout rates, as this can have a significant impact on students' families and futures, as well as their communities. In addition, the development of this survey can provide valuable information on the effectiveness of educational programs and learning tools, especially for students who work and study simultaneously. Also, an empirical database to monitor employability and career outcomes of graduates could be a strategic tool that could provide useful information for other technological institutes, such as those located in Tijuana, Mexicali, Ensenada and other Higher Education Institutions in Baja California and a national benchmark, and thereby strengthen strategies of relevance and social entrepreneurship seeking sectoral well-being through the social and solidarity economy [6].

2. THEORETICAL FRAMEWORK (STATE OF THE ART)

The present academic research is oriented to the development of actions to strengthen the competitiveness of the sector, considering the learning curve generated in the strategic sectors of Mexico, through the research work of experts in technological higher education at the National Technological Institute of Mexico Tijuana Campus. With the aim of developing the methodology of Dictionaries of Sectorial Competencies (DSC) through the QHS methodology, as a systematic contribution to reduce the gap of the different knowledge of professional competences in occupational functions in regional strategic sectors. And with this, strengthen the relevance of graduates of professional careers and the competitiveness of technological higher education.

This research employed a systematic approach with the QHS methodology developed [7, 8] to cover all aspects of society; therefore, sectoral experts were contacted such as government, educational, business, professional associations, chambers, as well as specialized consultants.

Figure 1 presents a chronological review of the state of the art on competencies for professional development. In 1973 the article was published "Measuring competencies and not intelligence" [9] as a result of research in which he searched for variables that would allow a better prediction of professional performance, identifying these variables as "competencies", which were those characteristics that differentiated the people who were successful from those who are not; the foregoing

came to revolutionize a large part of the concepts related to the management of human talent, being that in 1980 derived from various studies it was elaborated a list of general competencies that are characteristic of different categories of management positions, this list is called "competence model" and served as a reference framework for evaluating and training company managers; applying this Methodology for the selection and development of managerial capacity, the method used by management assessment centers when developing competency models to apply in organizations is created.

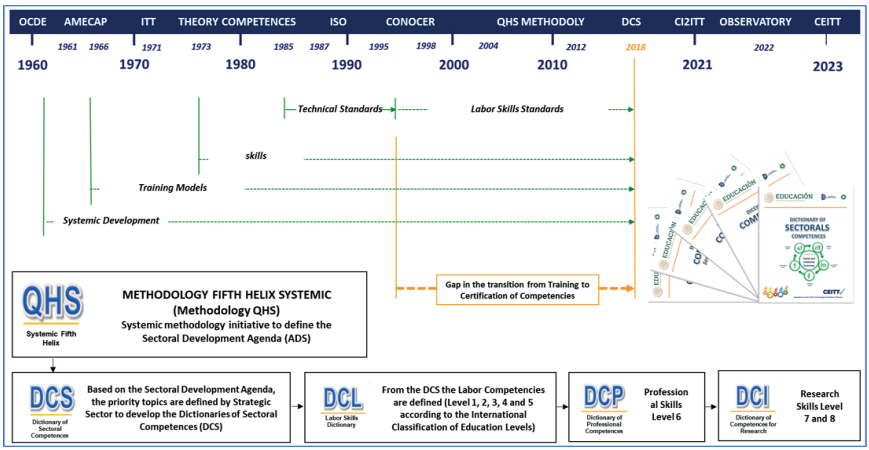

Figure 1. Timeline of the transition from training to competencies

Reference: Own elaboration (2022)

Goals and the implementation of the Circular Economy in SMEs in Baja California, as well as the Social Economy and Social Innovation undertakings and practices. That it can provide information on the detection and evaluation of the evolution of the SDGs to find opportunities, programs and actions to develop; evaluate the critical factors that promote social innovation and sectoral articulation for the benefit of society and the different levels of education; strengthening the skills of future generations.

The results will provide necessary information that may be useful for a program of actions aimed at the formation of Nodes for the Promotion of the Social and Solidarity Economy (NODESS) in Baja California.

In this line of development of human talent management, in 1985 the National Council for the Evaluation and Certification of Labor Competence [10] was created as a Federal Government entity under the Ministry of Public Education, with the aim of contributing to raising the level of economic competitiveness, educational

development and social progress of people in the country, through the National System of People Competences and defines the Labor Competence Standards in light of the challenges identified and indicated by the OECD. In the 90's and as a result of the international standards of the International Organization for Standardization, the competencies of human resources in organizations are defined based on 4 components: education, experience, training and skills, and with it generate Technical Standards for its definition. In 2011, the United Nations Educational, Scientific and Cultural Organization (UNESCO) approved the application of the International Standard Classification of Education (ISCED) [11], and it shows 9 levels from ISCED Level 0, which is the first instance education, to ISCED Level 8, which corresponds to the educational level of Doctorate.

Within the state of the art of the evolution of the concept of competencies, the most relevant definitions are observed in two large groups:

1. The first group is made up of by definitions based on their constituent elements (skills, behaviors and/or aptitudes, actions, knowledge and/or knowledge).
2. A second group made up of the conceptualizations related to the applicability and environment (application, set, capacity and result) [12] Management by competencies based in the applicability and context, they are a set of essential elements combined between the capacities of the individual and the context in which the work activity will be carried out, allowing said tasks to be developed to be clearly defined under the required work context and to be carried out successfully.

Competition is comprised of the result of accumulated experiences, expressed through knowing how to know, knowing how to be and knowing how to do within a context and an implicit knowledge of the individual. As part of their studies, defined that the characteristics of the competences are made up of a set of attributes (enumerated) of the individual, not limited to knowledge, but include skills, attitudes, communication and personality, in other words, it takes into consideration all work elements, not limited to just knowledge [13]. In turn, they suggest that knowledge and skills are the most observable characteristics of the competencies, which are easy to acquire and develop, these in turn are defined:

1. Skills. Capacities that an individual has to perform a task physically or mentally (critical and analytical thinking).
2. Knowledge. Information that an individual has on a specific subject, in order to be able to identify what he can do.
3. The classification of competencies generated the emergence of the labor competencies model has generated a set of nuances and differences between the different types of competencies, resulting in a large number of studies, which have allowed them to be classified according to different criteria and work environment.

In the year 1994 were described four classifications of professional competencies [14]:

1. Technique: Mastery at an expert level of the tasks, activities and contents necessary to carry out the work, including the skills and knowledge required to carry it out.
2. Professional: Understands the various response capabilities for each of the assigned tasks, including any alterations. The individual has the ability to independently find the necessary possible solutions, through the previous experiences acquired by the individual.
3. Social: Includes collaboration with other individuals in a constructive, communicative way, group behavior orientation and interpersonal understanding.
4. Participatory: Includes the participation of the individual's job within the organization and its environment, has the ability to decide and assume responsibilities.

The approaches and models of competencies until the eighties, a conceptualization of competency-based management was used in organizations in a simple way, this because competencies were understood as personal qualities isolated from individuals and with a cognitive nature. that were predetermined by successful professional performance, for which the competencies evolve towards a more complex definition that protects competencies as functional personality configurations made up of knowledge, skills, motives, and values. Table 1 describes the typology of competencies necessary for work, professional and research development, as well as soft skills and transversal competencies for managerial development. The professional competence approach and models consolidate the elements necessary to cover the needs of people, companies and society.

Objective of Agenda 2030	Action / Contribution
1. End of poverty	In progress
2. Zero Hunger	Product analysis project not in force in tortilla shops
3. Health and well-being	Nutritional impact of corn
4. Quality education	Through Academic and Research Bodies, offer training
5. Gender equality with equity and equality actions in the processes of orientation	With equity and equality actions in the processes of orientation
6. Clean water and sanitation	In progress
7. Affordable and clean energy	In progress
8. Decent work and growth economic	Analysis of typologies of trades and tasks in ESS of Tijuana

9. Industry, innovation and infrastructure	Development of productive projects with social innovation
10. Reduction of inequalities	Social inclusion and integration projects
11. Sustainable cities communities	Variables of an observatory of SSE in Tijuana
12. Responsible production and consumption	In progress
13. Climate action	In progress
14. Underwater Life	In progress
15. Life of terrestrial ecosystems	In progress
16. Peace, justice and strong institutions	In progress
17. Alliances to achieve the goals	Inter-institutional collaborative work

Table 1 Contribution to the SDGs by the NODESS Tijuana project

In the field of professional competencies, the research-based approach defines three main conceptions [15]:

1. Behaviorist: The competence approach is broad and therefore everything can be covered by it; it does not distinguish between effective and minimal competences.
2. Functional: Establishes comparisons between factors such as knowledge, skills, aptitudes and results of workers in organizations.
3. Constructivist: Conceives competence as collective construction and as the product of successive learning, as a result of the interaction between knowledge and previous experiences and personal contributions of the worker.

3. METHODOLOGICAL STRATEGY

Through sectoral comparison and the use of the Fifth Systemic Helix (QHS in Spanish) methodology [16], an evolution of the Triple Helix component of the economic growth model of the sixties of the 20th century, but contextualized to the reality of the new century and the global trends of economic development, a series of methodological alternatives and systemic variables are proposed according to the QHS Methodology for the Cooperative sector and the Social Solidarity Economy (ESS) for the exploration of research that approaches the determinants of the state of development and its competitiveness. The Table 2 presents a relationship of actions developed with the QHS Methodology, thereby generating indicators for the sectors: Cooperatives, Cooperative Education, Government (public management for Cooperatives), Cooperative Associations (including the perspectives and expectations of society on cooperatives and the social solidarity economy) and Cooperative

Consultants, representing a frame of reference for the systemic evaluation of the development of Cooperatives Local, Regional and International (models of good practices).

Methodology QHS	Bachelor's degree	Postgraduate and Research	Continuing Education and Professional Update
H1. Government	Municipal	UN Goals 2030	Social Economy and Solidarity, Cooperativism
H2. Education	Educational relevance	Entrepreneurship and Spin-off projects	Telecommuting, remote or work from home
H3. Business	Legal compliance and learning curve	tools for continuous improvement	Technological capabilities and innovation
H4. Associations	Legal compliance and Post-Covid Actions	Local and global competitiveness	Development and Training
H5. Consultants	Audit and Legal Regulations	Sustainable development	Professional Certifications

Table 2 Typology of skills necessary for professional development

The vein proposals for future research in the cooperative sector and social solidarity economy (ESS) are raised through a methodology called Fifth Systemic Helix (QHS). Table 3 conceptually describes the different types of skills. One of the great values of solidarity companies is the cooperative nature and their ability to manage organizational work, in education, training and awareness of associativity.

Competences	Conceptual description
Labor	Manual assembly of products, low level of technology in processes
Professionals	Teamwork, responsibility, initiative, interpersonal relationship, willingness to learn, punctuality, interpersonal communication, leadership, organization, analytical skills, knowledge of some software, skills for math or any other basic subject, good spelling and writing, creativity and inventiveness, acceptance of changes, active listening, communication effective from different means, tendency to solve problems and not create them, motivation, accept criticism and offer it appropriately
Research	Pose a problem, develop a contextual framework, review the state of the art, create and validate a data collection instrument, build and validate models, master data techniques, master scientific writing style, present research papers in conferences, languages, knowledge of art and culture. universal
Soft	Communication, Time management, Emotional intelligence, Adaptability, Creative thinking, Empathy, Organization, Teamwork, Resolution of problems, Leadership
Global and Managers	Global and intercultural knowledge, understanding of local issues, appreciation of worldviews, understanding of differences in communication, methods of interaction with different cultures, languages.

Table 3 Typology of skills necessary for professional development

The proposal of the QHS-ESS variables leads to the beginning of a multisectoral relationship with unity and synergies orientation towards the improvement of the conditions of the principles of Cooperatives and the Social Solidarity Economy, in the face of the challenges of an increasingly globalized economy. and with requirements of quality management systems and international competitiveness.

It is worth mentioning the context of the historical development of cooperative companies, it was born at the height of the Industrial Revolution, under two large branches and with a great diversity of activities, the first focused on consumer activities and the second on production or industrial activities. In the same way as a capitalist company, the cooperative company has the function of producing, however its objective or purpose is not to obtain maximum benefit or profit, but rather the development and well-being of its members, thereby covering the essence of the social solidarity economy companies.

Within the systemic approach to cooperativism, it is convenient to mention the seven Cooperative principles, which are:

a) Voluntary and open membership,

b) Democratic management by partners,

c) Economic participation of the partners,

d) Autonomy and independence,

e) Education, training and information,

f) Cooperation between cooperatives, and

g) Interest in the community. Cooperatives represent the most widespread form of social economy entity in the world.

The cooperative sector represents a fertile scenario for the development of the welfare of the social economy, through the combination of different forms and articulation of efforts of sectors and activities of inter-cooperatives, generating and consolidating the sustainability of the organizations, the approach of the variables of cooperativism, the perspective of the principles of research in cooperativism and social solidarity economy is addressed and that, through systemic research, opportunities are identified to strengthen through education and cooperative values a collective wealth, generating with it, a development of successful cooperative models. Prospective of Sectoral Competences for the design of Dictionaries of Professional Competences and Research, Cooperative Sector in Mexico, Research Topics:

1. National Competence System: Competency training gap.
2. Analysis of the results of the Municipal Development Agendas – INAFED/ SG (Articulation of Local Governments)

3. Requirements for the development of a world-class local supplier.
4. Gap between Higher Education and Cooperativism.
5. Competence of the Logistics Actor in the Strategic Sector of Logistics Services in Baja California.
6. Model and methodology for DCS for Cooperativism.

Within the framework of the project to form a NODESS program in the city of Tijuana, through the call of the National Institute of Social Economy (INAES) for the articulation sector through the leadership of Higher Education Institutions, the Technological Nacional de México Campus Tijuana has taken the initiative derived from the development and direction of educational programs for different sectors of society with impact in the social economy, the Research and Information Center for the Social Economy and Solidarity (CIRIEC Mexico North Region), with the objective of systematizing experiences and dissemination of social economy and solidarity models. Active participation in the Honorary Presidency of the Social Economy Commission of the Development Ecosystem Economic Department of the Tijuana City Council, in addition to international links.

Preliminary studies by observatory researchers [17] promoted the design of dictionaries that have been used to define the competencies of the sector as a strategy to improve and promote continuing education and professional updating. Figure 2 NODESS TIJUANA program operation model, necessary for professional development and issues concerning the Master's in Administration program [18].

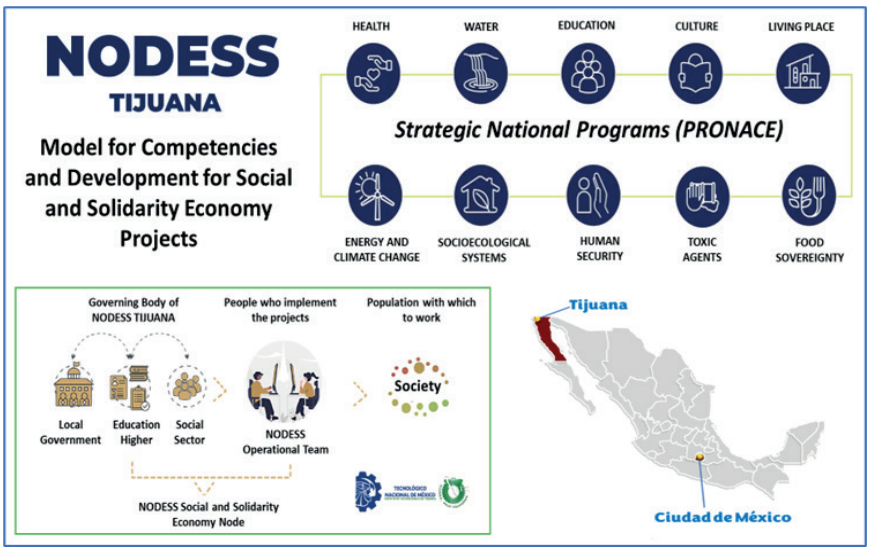

Figure 2 NODESS TIJUANA program operation model

That have been addressed by the academic body project called "Sectoral Competitiveness and Innovation", which included a multidisciplinary group of Professors and Researchers of the Department of Economic and Administrative Sciences, Division of Graduate Studies and Research, of the Tecnológico Nacional de México Tijuana Campus (TecNM). TecNM Tijuana currently leads the project of the Federal Government Secretariat of the Interior in Mexico to promote Nodes for the Promotion of the Social and Solidarity Economy (NODESS), it is a program that articulates the efforts of Municipal Institutions, Cooperatives and Higher Education Institutions.

Through the Master's in Administration program, applied research is developed to strengthen the capacities of sectors such as the medical tourism cluster, determining the training and educational skills of all sectors involved in the provision of labor, professional and research services [18, 19]. According to the UN [8] "The SDGs are appropriate mechanisms that will allow the population and its leaders to jointly participate in the search for social consensus and reduce the gaps." The 17 Sustainable Development Goals, and their 169 goals, affect the structural causes of poverty, combat inequalities and generate opportunities to improve the quality of life of the population within a framework of sustainable development. Table 1 presents the sustainable development objectives that integrate the NODESS TIJUANA Program. This important agenda serves as a launching pad for action by the international community, governments, as well as law enforcement agencies civil society, academia and the private sector, in order to address the three interconnected elements of sustainable development: economic growth, social inclusion and environmental sustainability.

4. RESULTS

The present investigation generated various strategies for the construction of the variables that would generate the elements, constructs and scaffolding necessary for the design of a model based on an Observatory for monitoring the results socioeconomic and employability of students, graduates and even students who failed to complete their professional or postgraduate studies.

For TecNM, it is a matter of concern, since it is national policy to promote professional training, since it affects the future development and social progress of the country. In addition, having an educated population reflects the country's competitiveness and innovation in the face of global challenges [20].

The first methodological approach of this research was based on a prospective study on the certification of competencies in Mexico. This study generated the current standards for study programs in technological higher education, specifically

those that lead to engineering careers in various economic regions of the nation. In Mexico, there are three regions, known as the North, the Center and the South, and each of these regions has specific needs for commercial vocations and ecosystems based on their natural environments and very different socioeconomic developments, supported by their business vocations associated with their strategic sectors that make up their economic development ecosystems.

This study generated the principles for the design of sectorial competence dictionaries (DSC) that propose competence standards in order to certify the knowledge, skills and understanding acquired according to the occupational profiles of engineering graduates in an effort to produce highly qualified and prepared personnel. to respond to the needs of business sectors [21]. That is why the National Technological Institute of Mexico Tijuana at the national level is the technological higher education institution that generates 50% of the enrollment of engineering graduates in Mexico since 1948, with currently more than 600,000 students with 254 campuses throughout the national territory. As a product of a systematically developed method, the structure of the empirical database was defined for the Observatory's approach to monitor the employability results of engineers trained by the National Technological Institute of Mexico Tijuana.

The results will be of a public nature and may be used to collect information and targeted feedback that will influence strategic decisions and actions in different sectors, not only for this study, but also for research and development programs in different sectors of the industry. Periodic reports from the Observatory will provide feedback on relevant needs and gaps in management education and development programs, including job and business acumen, research and soft skills, according to local, national and global challenges. Described below are the data mining elements that defined the electronic survey inquiries that will be circulated as a plan among students and graduates representing more than 35,000 graduates from the Tijuana campus alone.

The first preliminary results of the in-depth interviews carried out with engineering professionals who have successfully graduated from National Technological Institute of Mexico Tijuana raised central issues which will be considered pillars of the necessary skills for the employability of graduates of engineering study programs, as well as the knowledge and specializations required. Figure 2 describes the road map of the model to develop Dictionaries of Sectoral Competences. The present research work has the purpose of identifying which are the key elements within the municipal governments in Mexico, which could be considered as the most significant areas of opportunity whose strategic attention would be a better performance in the fulfillment of their constitutional attributions, in the promotion of public policies capable of integrating the realities of its inhabitants and their communities, but

also capable of incorporating into them actions and commitments derived from national and global agendas, also playing with the above, a more active role in the scene international contributing successful experiences in its institutional work.

The results will provide necessary information that may be useful for awareness-raising and technical assistance actions at the local level for the development of capacities of SMEs and competence laboratories in Technological Higher Education, Higher Secondary Education and Basic Education. Likewise, to society in general by means of linking and social service through the linking of different sectors such as the Government, Academia, Companies, Associations and sectoral specialists.

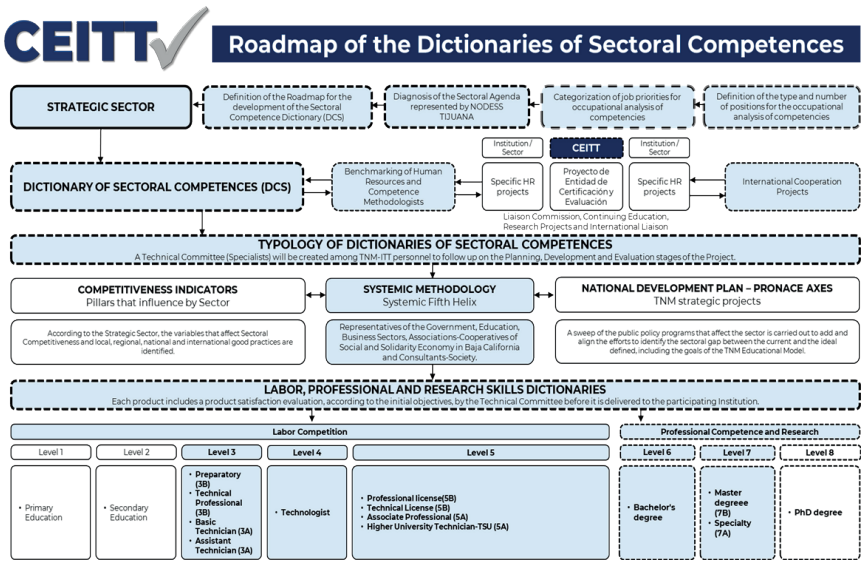

Figure 1 Model for the development of a dictionary of sectorial competences.

The following points detail the data collected by the electronic survey. These will be disseminated through the electronic survey and social networks to more than 35,000 TecNM graduates, as well as to the 12,000 students on average.

Respondent Data

Characteristics of the respondent

Academic training: participants will have 254 current technological institutions to choose and select for their survey.

- Enrollment Status, Student: Individual currently in a program of study (participants may select a professional or graduate option)
- Status of registration, graduate: person who completed a study program, either at the professional or postgraduate level (master's or doctorate) or exchange.
- Alumni enrollment status: natural person who suspended their studies temporarily or indefinitely.

Statistical data of the respondent

- Year of beginning of professional and/or postgraduate studies
- Year of completion of the study program
- Student, employee, entrepreneur, unemployed or researcher
- Thesis, title and professional license, or in the process of completion
- Personal information; marital status, age, place of birth
- Place of residence and employment (local, national or abroad)

Data of the Labor Sector of the Student or Graduate

Characteristics of employment sectors

a) Primary sector: livestock, fishing (river and sea), agriculture, mining (mines and rock complements), forestry

b) Secondary sector: industrial, energy, mining (also considered part of the secondary sector due to various products derived from mining), construction.

c) Third sector: transportation, communications, business, tourism, health, education, art, finance, administration

d) Fourth Sector: information and knowledge services, research and development, innovation.

e) Fifth Sector: health services, security, emergency services, education, culture, science, social, and domestic activities

Employment characteristics

- Sector: private, public, cooperative or social economy
- Type and level of position held in the organization or institution.

Typology of skills necessary for professional development

Research skills

The skills in the research process highlight the ability to theorize and build models and scientific writing skills, as well as the relational capacity of the researcher with the research subjects, data management and certain personality characteristics. of the investigator.

Soft, managerial and global skills

Global competence is a multidimensional and lifelong learning goal. Globally competent individuals can examine local, global and intercultural issues, understand and appreciate different perspectives and worldviews, interact successfully and respectfully with others and act responsibly towards sustainability and collective well-being.

According to the applied research developed on "Labor, professional and research skills for logistics engineers" at TecNM Tijuana, defined the principle of the correlation between competitiveness and education, it is essential to point out that a prepared society will have better and greater opportunities for growth, development and progress. Which makes it necessary to reflect from the Academy, specifically from the Technological Higher Education Sector, on the determinants that impact the innovation of human talent. By developing self-management capacities, the maximum participation of cooperative members is achieved so that the best decisions are strategically made for the benefit of the entire cooperative organization and the relationship with other entities that can contribute to the growth and sustained prosperity of the cooperative under the interaction with society. The development of cooperative companies is linked to the principles of alliances and strategies of sectoral interoperation and solidarity growth. This contribution is a benchmark for exploring the challenges of cooperativism from a systemic approach and that provides a benchmark for sectoral public policy initiatives of the social solidarity economy.

As a result of documentary research and the strategic application of the Fifth Systemic Helix methodology for the Social and Solidarity Economy sector, a consensus has been reached on the development of a Bank of Key Questions for the approximation of the identification and consideration of all comprehensive approaches to develop a Dictionary of Sectoral Competences, which integrates the Dictionary of Labor, Professional and Research Competences, to strengthen the sectoral development of the social and solidarity economy and thereby encourage development and social impact, implicitly considering the 17 objectives for the sustainable development of the 2030 goals of the United Nations Organization.

Focus QHS	Bank of questions by systemic sector
H1. Cooperative Companies	❙ What are the problems or challenges of the Cooperative Sector to strengthen its internal operations? ❙ What do Cooperatives need to integrate at the regional level? ❙ What are the barriers that Cooperatives face at the local and regional level? ❙ What do Cooperatives need to internationalize? ❙ Have cooperative consultants contributed to the success of the Cooperative sector? ❙ What do Cooperatives need to open up to Cooperative educational links? ❙ How can Cooperatives be linked to all sectors? ❙ What is the Cooperative perception of the other sectors? ❙ Do the Cooperatives consider that the profiles of the Professionals have labor, professional and research Competences on Cooperatives? ❙ What do local suppliers need to do to be chosen by Cooperative companies? ❙ What kind of help do Cooperatives need to develop local technology with support from the government and schools? ❙ What is the profile of a successful Cooperative?
H2. Cooperative Education	❙ What are the knowledge and skills (competences) that are provided in the Schools for the Cooperatives sector? ❙ How do the schools update their plans and study programs according to the advances and development of the Cooperatives / ESS? ❙ How are the Professors updated to teach the current issues of Cooperativism and Social and Solidarity Economy? ❙ How do you measure the effectiveness of your study programs, according to the development indicators of Cooperativism? ❙ How is the link between the education sector and the Cooperatives promoted? ❙ How is cooperative education promoted for the development of models and self-management? ❙ What are the main needs of the Cooperative education sector? ❙ What are the main lines of research in the Cooperative sector?
H3. Government – Public Management for Cooperatives	❙ What are the commitments to the health and education of the workers of the Cooperatives? ❙ How can the government be facilitated with actions that contribute to the development of local supply through local professionals, entrepreneurs, for the Cooperatives and Social Economy sector? ❙ What does the government need to develop public policies that encourage and protect cooperative companies? ❙ What initiatives is the government developing in preventive terms of public safety and that do not affect the development and investment of the Cooperatives? ❙ What strategic actions is the government developing in the short, medium and long term for Cooperative development? ❙ What failures does the government recognize that it has had and therefore the local supply for the Cooperative and Social Economy sector? ❙ Would the government be open to creating an agenda for Cooperative development, regardless of what changes exist at the political level?

H4. Cooperative Associations	❙ What are the strategies to help local and national suppliers to insert themselves and contribute to the Cooperative sector? ❙ What programs have generated and encouraged the development and consolidation of the Cooperative sector? ❙ What are the strategies to support Cooperative businesses and the benefits of being a member of a Cooperative Association? ❙ How is cooperative research promoted? ❙ How is communication promoted between Cooperatives? ❙ How is the development of Human Resources promoted in Cooperatives? ❙ How do you promote protection and support gender equality initiatives in Cooperatives? ❙ How is the certification of labor, professional and research skills promoted in Cooperatives?
H5. Cooperative Consultants	❙ What is missing in educational institutions so that their graduates are more entrepreneurial and consolidate the Cooperative sector? ❙ What actions do you recommend to the government sector to strengthen the Cooperative sector and the supply chain through local and national suppliers to promote the development of regional vocations? ❙ What initiatives are considered to be carried out by business organizations and chambers in order for them to be a key actor or agent of change in Cooperative development and the Social Economy? ❙ What are the professional services that Cooperative consultants must provide to help increase competitiveness?

Table 4 Contribution to the SDGs by the NODESS Tijuana project

The scientific research project "Prospective Dictionaries of Labor, Professional and Research Competences for the Sectoral Development of the Social and Solidarity Economy in Mexico" represents the applied research efforts developed during the period 2019-2023, under the framework of the NODESS TIJUANA [22] (Social and Solidarity Economy Node), which implies the best practices in the promotion of the Sustainable Social Economy that are aligned with the objectives of the national development plan to reduce the gaps of social inequality that currently exist in the city of Tijuana, Baja California, as well as the instrumentalization of a social economy observatory that is capable of to identify the goals for sustainable development of the 2030 agenda; Therefore, it is essential to know precisely the needs of the business exercise, of the representatives of the social, solidarity and inclusive economy that is capable of generating development opportunities. It is also essential to analyze the willingness to work as a team in a coordinated manner between the government, academia, the social sector, representatives of civil society, as well as the citizens of Tijuana, Baja California, under a systemic development approach, according to the SDG Agenda. According to INEGI (2020), the city of Tijuana has 57 thousand SMEs that require the implementation of projects that support them and promote their development and growth; It also has over 130 positive highlights, some global and some countrywide. It is a type of quantitative research with a descriptive scope through documentary analysis to support the theoretical framework, as well as

in-depth interviews with experts who have the best practices in the field of social economy; and the application of a questionnaire to a representative sample of SMEs to determine if there is a relationship between the critical factors that affect the degree of implementation of the sustainable social economy.

The city of Tijuana, due to its geographical location in the Baja California Peninsula, represents the opportunity for comprehensive systemic development for all sectors of society. The preliminary results in Phase 1 and Phase 2 show key variables to include in an electronic survey, which will be circulated among TecNM students and graduates, businessmen, graduates in their professional practice, with the data collected will support the development of a database through a web page, and the development of Dictionaries of Sectoral Competences, to strengthen the employability and follow-up at the local, national and international level of graduates and students. The conclusions of this research suggested that the information in the database should include factors that affect student dropout rates, such as business affiliation and sense of belonging, as well as those that affect comprehensive competencies for employability, professional development, continuing education and professional updating through postgraduate studies and research.

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CHAPTER 6

ANALYSIS OF THE INCLUSION OF SUSTAINABLE DEVELOPMENT IN POSTGRADUATE STUDIES IN MEXICO[1]

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ABSTRACT: The scientific research project to build an Observatory of Sustainable Development in Postgraduate Study Plans in Baja California, as an Initial Phase. It will allow a systemic analysis to be carried out in Higher Education Institutions that incorporate the dimension of sustainability in their Study Plans, through teaching, research and university management. To establish the variables for the development of an electronic survey that yields information as a tool for the analysis of the culture of sustainability and inclusion in the current university model. The project has three objectives: 1) Determine the level of culture of Sustainable Development, 2) Evaluate the implementation of Sustainable Development Goals in Postgraduate Study Plans, 3) Design the prospective variables for an Observatory of Sustainable Development. The United Nations 2030 Agenda promotes sustainable development: the social, economic and environmental dimensions. To promote in society a culture and awareness of learning about Sustainable Development and the benefits for quality of life and comprehensive development in society. Research based on the Systemic Fifth Helix Methodology [QHS in Spanish], involving sectors of Government, Academia, Companies, Organizations-Associations and specialized Consultants.

KEYWORDS: Sustainable Development, 2030 Goals, QHS Methodology, Sustainable Education, Social Economy, Circular Economy.

1. INTRODUCTION

The research work documented in this chapter represents the systematized efforts of researchers with multidisciplinary approaches and inter-institutional cooperation efforts. The National Technological Institute of Mexico (TecNM Campus Tijuana) through the efforts of the Department of Economic and Administrative Sciences, the Division of Postgraduate Studies and Research and the Coordination

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of the Doctorate Project in Administration have strategically defined a line of research on Sustainable Development of according to the guidelines of the National Strategic Programs (PRONACES) of the National Council of Science and Technology (CONACYT) as a requirement for the opening of new postgraduate programs at the national level in Institutions of Higher Education, to obtain the Recognition of the National Postgraduate Program of Quality (PNPC).

The strategic articulation generated with the Autonomous University of Baja California Tijuana Campus and its Faculty of Accounting and Administration was developed through a cooperation agreement and coordinated work with a research project oriented to the Circular Economy and the study of Sustainable Development for the Analysis in SMEs in the City of Tijuana.

The postgraduate program of Master in Administration of the National Technological Institute of Mexico Campus Tijuana, with a history of more than 25 years, has become the space and benchmark for applied research in Economic and Administrative Sciences, being the benchmark for intervention models, Unit of Verification of Municipal Development according to the Global Agendas such as the Sustainable Development Goals (SDG), for their respective evaluation and feedback to the representatives of the Municipalities of the State of the Government of Baja California.

The University of Guadalajara through the International Center for Social Innovation for Development has generated collaborative actions of experiences developed in the Municipalities of the State of Jalisco.

The academic link and applied research of the TecNM Campus Tijuana have been characterized by leadership and the convocation of Professors, Researchers, Specialists, Researchers and Representatives of the Social Sector. The objectives of collaborative work have generated academic and outreach productivity, as well as Social Economy Forums, Sustainable Development Seminars with interventions by Specialists at the local, national and international level. In order to lay the foundations and cultivate the research line of the future postgraduate program of Doctorate in Administration, a National Research Project is being developed, entitled: Observatory of Sustainable Development in Postgraduate Study Programs in Baja California. The scientific research project is registered in the call of the Technological National of Mexico. And the purpose is to eventually generate the model that can be replicated at the regional and even national and international levels according to the Global Agendas for raising awareness of Sustainable Development from the Higher Education Sector.

The circular economy as a term of reference and practice oriented towards a virtuous cycle of raw materials through recycling waste has its reference point chronologically since the 1980s. Associating the circular economy with creative

initiatives. Likewise, as a point of reflection of the impact of the growing demand for non-renewable raw materials and with an impact on the environment and the economy of society. Circular Economy (CE) is a new concept characterized by processes associated with research, development and innovation that challenges the linear economy model that several developing countries, towards paradigm changes in the production processes of waste management. raw materials, and actions to prolong the virtuous cycle of recycling, reuse and reduce raw materials in production processes. Seeking with it, models of culture and adaptation of good sustainable development practices in organizations, and properly in all stages of the supply chain; suppliers, producers and customers [1].

The development of the research note starts from the prospective of the objective of the scientific research project to lay the methodological bases that respond to the research question: ¿What are the variables to determine the level of culture on the Sustainable Development Goals (SDG)? to build an Observatory for the evolution of the SDGs [2] and Circular Economy under the local territorial approach in the municipalities, from an academic perspective. The documentary analysis of studies at the international level as a reference framework to identify best practices in business awareness and education in the new generations for the development of programs and initiatives to promote Sustainable Development, is connected with the structure of the NODESS [3] model (Development Nodes of Social and Solidarity Economy) that represents the articulation of Institutions of Higher Education, Local Government (Municipalities) [4] and the Organism of the Social Economy (Cooperatives and Cooperative Associations), generating experiences of coexistence and education for life, through the identification of needs , projects and innovation in the city of Tijuana and its metropolitan area; carrying out action strategies that comply with four strategies aimed at: 1. Research, 2. Dissemination, 3. Dissemination and 4. Publication.

The work team made up of academics, researchers, municipal officials and members of cooperatives develop responsibility and strategic leadership in matters of research, dissemination, entrepreneurship and capacity development, linkage, follow-up and monitoring. Through a training and orientation program in the Communities on the 17 SDGs and Circular Economy. This includes a program of meaningful learning practices to promote a culture of awareness of the sustainable development approach that involves three main spheres in perfect balance: 1. Economy, 2. Social aspect and 3. Environment. And under the methodological practices of systemic focus groups, an inventory of good practices and a catalog of projects that affect the circular economy are developed, as well as Sustainable Development under the analysis of the contents of Study Plans aligned to sustainable culture. With the results of the prospective research on the needs of culture and

education on circular economy, Dictionaries of Sectoral Competences (DSC) [5] will be designed that include labor, professional and research competences, as an empowerment strategy in the different levels of education from basic education up to postgraduate level. Having an emphasis on the importance of transmitting to future generations of citizens in the different sectors of society, from a Family Father, an Entrepreneur, a Professional, a government official or the population in general.

2. DESIGN AND METHOD

FHS systemic intervention model for SDGs and Circular Economy

The Fifth Systemic Helix (FHS) Methodology [6] for the analysis of Sustainable Development and Circular Economy has been developed on the approach of systemic competitiveness, emphasizing research, development and innovation; as a sectoral articulation factor. The QHS methodology generates a series of strategic actions and initiatives to achieve public policy [7, 8] initiatives and communication mechanisms that can give continuity to projects, with the aim of having a more developed society with a developing culture and education. sustainability and the impact of the SDGs, as well as sensitivity to the principles of the circular economy.

The project of a "Social Economy Observatory in Latin America" creates prospective reflection on the structural conditions necessary for indicators that are the formula to determine the gaps of reality vs. the ideal phase, which generate as a result the areas of opportunity for each sector of society through the QHS approach [9]. The systemic methodological proposal considers in-depth interviews of the opinion context on local projects and their impact on the Sustainable Development Goals (SDG) and the Circular Economy [10].

Table 1 presents a series of questions developed as a reflection strategy to create specific actions in the different sectors of society to generate culture and awareness of the importance of the objectives for sustainable development (SDG) and the circular economy [11].

Focus FHS	Bank of questions by systemic sector
H1. Companies	▌What are the problems or challenges of the business sector to develop projects and initiatives for SDGs and circular economy? ▌What are the barriers that companies face to implement circular economy projects? ▌Are companies aware of the best circular economy practices? ▌Have the consultants contributed to implementing circular economic initiatives? ▌What do companies need to open up to educational linkages for the circular economy? ▌How can companies be linked with the different sectors of society, to improve the conditions of the circular economy? ▌Do companies consider some type of occupational profile for job skills, professionals and research on circular economy? ▌How can service providers contribute to circular economic practices in companies? ▌What kind of help do companies need to develop local technology with support from the government and schools to implement circular economy projects? ▌What is the profile of a successful company, with circular economic practices?
H2. Universities	▌What are the knowledge and skills (competencies) provided in the Schools for SDGs and circular economy? ▌How do Universities update their study plans and programs in accordance with the advances and development of the SDGs and the circular economy? ▌How are teachers updated to teach the current issues of SDGs and circular economy? ▌How do you measure the effectiveness of your study programs, according to the SDG and circular economy development indicators? ▌How is the link between the education sector and companies promoted to develop SDG and circular economic projects?
H3. Government	▌What are the government programs to promote the development of SDGs and circular economy? ▌How does the government facilitate the development of suppliers with an SDG and circular economy approach? ▌What does the government need to develop public policies that encourage SDGs and circular economy? ▌What initiatives has the government developed to promote each SDG and circular economy? ▌What strategic actions is the government developing in the short, medium and long term for SDGs and the circular economy? ▌What failures does the government recognize that it has had to achieve the progress of the SDGs and the circular economy? ▌Is there a local or national agenda for the development of SDGs and circular economy?
H4. Associations	▌What are the strategies of business associations to help companies and suppliers develop and implement actions aimed at SDGs and the circular economy? ▌What programs have business associations generated and encouraged to promote SDGs and the circular economy? ▌How is research on SDGs and circular economy promoted? ▌How is communication between companies promoted to promote SDGs and the circular economy? ▌How is the certification of labor, professional and research skills promoted on awareness and culture on SDGs and circular economy?

H5. Consultants	❙ What is missing in educational institutions so that their graduates are more focused on the culture and principles of SDGs and circular economy? ❙ What actions are recommended to the government sector to strengthen the business sector and its supply chain, and develop circular economy programs? ❙ What initiatives are considered necessary for business organizations and chambers to be a key actor or agent of change in the development of SDGs and circular economy? ❙ What are the professional services that specialized consultants should provide to promote awareness and culture about the importance and benefit of developing projects on SDGs and circular economy?

Table 1 Bank of questions to determine the SDG and circular economy project.

The conceptual definition of sustainable development is argued from three perspectives on the relationship between the environment and economic and social development. The conceptual genesis of sustainable development is based on the principles of allowing the needs of present generations to be met without compromising the possibilities of those of the future, of meeting their own needs, and meeting an environmental protection agenda in countries with lower levels of developing. They need development of environmental policies and development strategies in their economic and social and environmental sectors.

The institucional framework for sustainable development and the green economy and the eradication of poverty, as an idea of a paradigm shift necessary to protect the environment, can also generate new opportunities for economic growth, an important issue at the time of international crisis [12]. ECLAC has focused this message from the equality trilogy, in particular on "Structural change for equality: an integrated vision of development" and "Pacts for equality: towards a sustainable future". Table 2 presents the opinion methodological approach of the role of interviewees under focus groups in five phases:

Phases	Systemic Analysis Approach
1	Public policy makers: Development of instruments to identify and develop models: incentives, cooperation structures, financing of research projects, aid to promote sustainable development and good circular economic practices, through the virtuous circle of waste recycling.
2	Experts; People with extensive knowledge and experience to achieve an impact on the objectives of sustainable development and circular economy.
3	Business leaders: University-company linkage programs that have professional practical goals, social service, thesis on SDG projects and initiatives and circular economy.
4	Universities: They play a fundamental role in the transfer of technology and knowledge, through research, development and innovation, articulated with all the needs of the sectors of society.
5	Representatives of Civil Society: Worktables with citizens, they are already the key piece of any city project, or of a country, through their needs, business vocations and the capacities of the talent trained in the various educational institutions.

Table 2 Methodological approach of the QHS for SDGs and Circular Economy

A circular economy, he added, extends the life of the product, with maintenance, repair, reuse and remanufacturing, and when it is no longer possible to do any of these things, recover parts that can be reused or, at least, rescue the materials or raw materials. The border dynamics of the region between the cities of Tijuana, Baja California and San Diego, California, generates a business dynamic called CALIBAJA, in which activities of recovery of parts and materials are developed, with initiatives of a circular economy law in the business activities of the metropolitan region and the international link will provide a regulation that facilitates second-hand trade, initiatives of technological circles, and not leave the responsibility of processing our waste, generated by society, to mother nature alone.

The international reference framework according in Chile there are innovative circular economy practices; such is the case of virtuous recycling of cigarette butts, recycling of glass bottles into glasses, development of glasses, using the plastic collected from fishing nets. Likewise, a review and construction of a theoretical reference framework on applied research in SDGs and Circular Economy as shown in Table 3, the advancement of good practices documented in academic studies [13].

Country	Best methodological practices	Ref.
Mexico	Systemic model QHS-DCS, QHS-NODESS, for the interaction of creators of government policies, business leaders, representatives of universities, associations and specialized experts from civil society, to determine the level of culture and sensitivity of actions to contribute to the scope of the SDGs and Circular Economy, identifying needs for labor, professional and research skills in the sectors of society.	[14]
Colombia	Initiatives aimed at promoting extended responsibility between producers, manufacturers and importers of goods and services.	[15]
Chile	Extended responsibility of the producer, until the end of the useful life of the product.	[16]
Japan	Exchange program between industries, promoting continuous improvement practices	[17]
European Union	Regulatory framework that allows the effective use of natural, human and economic resources for its transition to the Circular Economy model; waste can be recycled to transform waste from one industry into raw materials for another	[18]

Table 3 Actions aimed at achieving the SDGs and Circular Economy

International studies of advances in Implementing a circular economy at a global level is a complicated task, many rich countries do not want to give up their level and way of life. Poor countries seek to obtain a level similar to developed countries but do not have the resources. Some developed countries promote the Circular Economy through more artisanal jobs; activities of reuse, repair, remanufacturing, etc., including the substitution of non-renewable raw materials for recycled materials. But the concern is that the energy sources that are running out are very scarce. International statistics suggest that rich countries consume 10 times more resources

than poor countries. Which implies a culture and sensitivity to spread the principles of circularity.

Adaptation, reuse of used products, encourage recycling. Environmental management systems such as ISO 14001 have the task of demanding this type of change to ensure the sustainability of the resources we consume. Agreements, alliances, cooperation mechanisms are required to make possible the answer to the great unknown of how the less developed countries will face the implementation of these new infrastructures. Some developed countries have shown interest in supporting fewer wealthy nations; however, it is not enough if the aim is to implement a global circular economy. [19]

3. FIELD WORK AND DATA ANALYSIS

According to the UN the Sustainable Development Goals (SDGs) can only be achieved with strong global partnerships and cooperation. Inclusive partnerships need to be established at global, regional, national and local levels on sustainable principles, as well as on a shared vision and goals that put people and ecosystems first. Due to the global contingency of the COVID-19 pandemic [20], it is estimated that the world economy will contract by 3% in the coming years, representing the worst recession since the Great Depression. Cooperative actions are necessary to guarantee local recovery, under awareness and culture towards the Sustainable Development Goals (SDG). Highlighting its approach and way of addressing them from the different sectors of society: Goal 1: End poverty in all its forms throughout the world, Goal 2: End hunger, Goal 3: Guarantee a healthy life and promote well-being for all at all ages, Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, Goal 5: Achieve gender equality and empower all women and girls, Goal 6: Ensure availability and sustainable management of water and sanitation for all, Goal 7: Ensure access to affordable, secure, sustainable and modern energy, Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all, Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation, Goal 10: Reduce inequality within and among countries, Goal 11: Make cities more inclusive, safe, resilient and sustainable, Goal 12: Ensure sustainable consumption and production patterns, Goal 13: Take urgent action to combat climate change and its effects, Goal 14: Conserve and sustainably use the oceans, seas and marine resources, Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss, Goal 16: Promote just, peaceful and inclusive societies , Goal 17: Revitalize the Global Partnership for Sustainable Development.

The Sustainable Development Goals (SDGs) are the heart of the 2030 Agenda; they represent the vision of the future we want. And the need for local and international collaboration through awareness and sustainable culture. The 17 SDGs with their 169 goals and 231 indicators, the Member States of the United Nations have firmly expressed that this agenda is universal and with a transformative approach. The agenda has the principle of common responsibilities and generates mechanisms to build alliances for all participating countries. The SDGs are universal: they constitute a universal reference framework and will apply to all countries. All countries have pended tasks and all face both common and individual challenges.

The SDGs are transformative: the 2030 Agenda proposes a paradigm shift from the traditional development model towards sustainable development: The new approach integrates the economic, social and environmental dimensions, sustainable development centered on people and the planet, based on human rights and human dignity. The SDGs are civilizing: The 2030 Agenda is about leaving no one behind. It contemplates universal respect for equality and non-discrimination among countries, without distinction of any kind as to race, color, sex, language, religion, political or other opinion, national or social origin, property, birth, disability or any other condition. The SDGs are also a local and national planning tool, as a monitoring instrument in the countries. Contributing to sustainable development, inclusive of the environment, with public policies for planning, budgeting, monitoring and evaluation.

4. RESULTS

The visible inequalities around the world have been a cause for great concern, since today there are around 828 million people living in poverty in the world, a figure that, like the levels of energy consumption and pollution, continues to increasing, because although cities occupy only 3% of the earth's surface, they represent between 60% and 80% of energy consumption and 75% of carbon emissions, according to data from the United Nations Organization. From this perspective, the concept of sustainable development emerges as a complex conceptual proposal that articulates the economic, environmental, social, political and cultural dimensions, within which issues such as equity, employment opportunities, access to goods of production, environmental impacts, social spending, gender equality, good governance, an active civil society in terms of social participation, among others, considering both quantitative and qualitative aspects of development [21].

Preliminary findings on studies of Circular Economy and awareness of SDGs reflect a rise in actions and good practices of programs for environmental management at the documentary research level, as well as local initiatives such as the NODESS

Tijuana project of the city of Tijuana with strategic links with researchers from the University of Guadalajara, Autonomous University of Baja California and the National Technological Institute of Mexico Campus Tijuana, determining in Table 4, the results of the percentage of involvement and commitment of the different sectors of society.

SDGs	Variables - Indicators	QHS-NODESS-CIRIEC	%
10, 11, 12, 16	Fund for education on sustainable development	Companies, Associations	10%
10, 11, 12, 16	Comprehensive supply chain recycling programs	Companies, Universities	40%
8, 10, 11, 12, 16	Circular economy awareness programs	Companies, Consultants	30%
17	Strategic sector coordination programs for SDGs of the UN 2030 Goals	Government with other sectors	20%

Table 4 Analysis of SDGs actions, Circular Economy vs QHS-NODESS

5. DISCUSSION AND CONCLUSIONS

According to the findings of the documentary and field research, the greatest efforts in tangible facts embodied in agreements, and documented programs are found between the Universities and Companies relationship. Generating the reflection that Higher Education Institutions represent the Agent of Change in societies beyond political discourse and good business intentions. Education is the engine of the training of new generations and the impact on the culture of sustainable development.

The opinion of international organizations such as the International Cooperative Alliance (ICA) [22] that there is a relationship between the Plan for a Decade, the social balance and the Sustainable Development Goals. Preliminary findings of reflection, there are several aspects in the inkwell of necessary agreements in the different sectors of society to achieve the culture of practices to develop in a manner in tune with the Sustainable Development Goals and thereby generate well-being and mitigate inequality in society and contribute to the improvement of the environmental conditions of our ecosystems that we cohabit.

In Latin America, 50% of solid waste is organic matter, of which 90% is not used or goes to waste. According to the Economic Commission for Latin America and the Caribbean, improving the efficiency and useful life of materials in our region would lead to the creation of five million jobs. The circular economy has been raised on the local, national and global agendas of public policy and private activity. Countries of Latin America and the Caribbean, and other regions in the world. The link between the circular economy and international trade has been little explored. According to

the literature review, trade flows of waste, analysis of the circular economy as trade policy. Necessary knowledge and technology transfer, design and development of training models and practical awareness models of the circular economy and the SDGs, in all sectors of society. [23].

The business sector, business associations and the education sector represent a fertile setting for the development of projects that promote practices for the Sustainable Development Goals (SDGs) and initiatives to implement programs aimed at the culture of circular economy. Likewise, a key aspect is the role of the sector of consultants specialized in projects and applied research, and the government sector through policies and awareness programs from the local government, through the combination of forms of articulation of efforts of the different sectors. of society. Generating and consolidating the sustainability of organizations and society. Positively impacting the economy, social aspects and the environment. The initiatives and projects on circular economy, require international cooperation, alliances between public and private sectors to create knowledge and technology transfer, as a great project of interest not only of speech, but of harmonization of definitions and norms and leaderships of unity for the benefit of future generations and the legacy of caring for the environment.

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CHAPTER 7

SYSTEMIC DEVELOPMENT AND PUBLIC POLICIES FOR SUSTAINABILITY IN A DOCTORAL THESIS IN ADMINISTRATION AT TECNM MEXICO[1]

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ABSTRACT: The Doctorate in Administration (DA) trains people who are reflective, critical, oriented by responsibility and conscientious to meet the needs of the public and private sector environments in which they participate. In administrative intervention projects carried out during the program, the integration of expert teams is promoted with the aim of linking academia with the advances, conditions and needs in the fields of technology, society, culture, economy and the environment. The interdisciplinary and inter-institutional dialogues that are fostered through the reflective practice of intervention encourage graduates to lead social transformation projects.

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1. INTRODUCTION

The Tecnológico Nacional de México Campus Tijuana has been characterized by training and updating the management team of companies and organizations for more than 54 years in the City of Tijuana and in the Baja California region. Where outstanding professionals and researchers have graduated, who have made important contributions in different sectors of society; at the local, national and international levels.

For this reason, after 30 years of offering a postgraduate Master's degree in Administration within the area of the Department of Economic and Administrative Sciences, the Doctorate in Administration (DA) is offered, which responds to the needs of the sector, competitiveness, innovation and sustainable development, under a sense of responsibility and social impact [1]. With a focus on Systemic Development and Public Policies for Sustainable Innovation according to the global demand for highly qualified professionals in ecosystems in constant evolution for development and social welfare, such is the case of the region characterized by the economic dynamism of the mega border region of Tijuana, Baja California and the City of San Diego. California. The Postgraduate Degree in Mixed Modality is national and international in scope. The lines of research (LGAC) of the Doctorate in Administration [2] are two:

1. Public Policies for Sustainable Innovation: The analysis, evaluation and proposal of Public Policies involves the study of Fiscal and Financial Incentives, regulation and Governance, Public-Private Cooperation for sustainable projects, Education and Training for the training of professionals in green technology, Infrastructure and Innovation Networks for the formation of ecosystems and innovation clusters with alliances of research centers, as well as the promotion of the development of environmental standards that favor the circular economy [3].
2. Systemic Development QHS (Fifth Systemic Helix): Involves multisectoral cooperation; Universities, Companies, Government, Associations, Researchers and Consultants. For the analysis of the needs of sectoral development through the application of methodologies of integration and inclusion of society, impacting on the Administration, Social Economy and Technological Humanism, Business Management, and application of critical thinking [4].

2. METHODS AND MATERIALS

In this Chapter, three Case Studies of research topics of PhD Students in Administration of the Technological Institute of Tijuana of the First Generation 2025-2 are presented, with a focus on the Line of Generation and Application of Knowledge (LGAC): QHS Systemic Development (Fifth Systemic Helix), and Public Policies for Sustainable Development, see Table 1, as well as the Congruence Matrix of each Research Project Case (Table 2 to Table 6), and the illustrative representation of the sectors methodologically involved in Figure 1.

Student	Institution	Research thesis topic project
Concepción Cruz Ibarra	University of Sonora, Mexico	Design of a Sustainable University Management Model based on the Fifth Systemic Helix Methodology
Qi Boacang	Yutong Bus, China	Factors determining the transition from traditional to green transport
Antonio Alfonso Landero Mada	SENEAM Tijuana International Airport	Components that establish the Learning Curve of Air Traffic Controllers in Mexico. SENEAM Case
Irais Graciela Barreto Canales	Anti-Corruption and Good Governance Secretariat	Sustainable public procurement in Mexico: a development lever for social and solidarity sector organizations
Mario Díaz Obrajero	Executive Secretariat of the 2030 Agenda	Design of a Strategic Methodological Guide for the Alignment of Subnational Public Policies with the 2030 Agenda"

Table 1. Thesis Projects with a systemic approach and sustainability

How do I define a doctoral thesis research topic?

Defining the research topic for a doctoral thesis is one of the most strategic and transformative acts in the academic career. It is not just a matter of choosing an area of interest, but of identifying a relevant, original and viable question that contributes to knowledge and the solution of real problems. With a structured approach, it is especially useful for someone with your systemic profile and committed to sustainable development.

Define the purpose as a researcher.

1. What transformation do you want to generate in the academic, social or territorial environment?
2. What epistemological or methodological gaps have been detected?
3. How does research align with ethical values and vision of the future?

Detect the research problem.

a) What is not working as it should?

b) Which actors are excluded from the process?

c) What indicators do not reflect the reality of the territory?

Delimitation of the research problem

It is the process by which the researcher precisely establishes the thematic, spatial, temporal and population limits of the phenomenon he wishes to study. It is a key stage in ensuring that the problem is addressable, relevant and scientifically treatable.

What does it mean to define a problem?

Un problema significa responder a preguntas como:

1. What? → What is the specific object or phenomenon being studied?
2. How? → What methodology will be used to analyses it?
3. When? → In what period will the research be carried out?
4. Where? → What is the geographical or institutional space of study?
5. Who? → What population or actors are involved?
6. Why? → What are the reasons for studying?
7. For what? → What are the objectives?

Figure 1. Thesis Projects with a systemic approach and sustainability

3. RESULTS

Below are five case studies of the development of Congruence Matrix initiatives of PhD in Administration thesis topics. Research initiatives to venture into case studies on sectoral systemic development and public policies to encourage sustainability for national development. Below are the summaries of the research thesis projects.

SUMMARY OF RESEARCH PROJECT

Student Case Study: Cruz Ibarra, C. (First Generation 2025-2)

DESIGN OF A SUSTAINABLE UNIVERSITY MANAGEMENT MODEL

BASED ON THE FIFTH SYSTEMIC HELIX METHODOLOGY

Universities face the challenge of transforming themselves into sustainable institutions that integrate the 2030 Agenda into their substantive functions: teaching, research, extension and linkage. However, many lack a systemic management model that articulates internal and external actors, guaranteeing social, environmental and economic impact. The Fifth Systemic Helix (QHS) Methodology offers an innovative framework that integrates five dimensions, see Figure 2.

1. Academia; University and Research Centers
2. Government; Public Policy and Regulation
3. Productive sector; Companies, technological innovation
4. Civil society; organizations, citizenship, associations
5. Environment; environment, culture, territory, consultants

Problematic situation:

Mexican and Latin American universities lack an administrative model that: Integrates sustainability in all its functions, articulates actors in a systemic way, generates impact indicators aligned with the SDGs, and is replicable and adaptable to different contexts.

Universities, as knowledge-forming institutions and agents of social transformation, face the challenge of integrating sustainability into their substantive functions (teaching, research, extension and linkage). The UN 2030 Agenda establishes the need for education systems to actively contribute to the fulfillment of the Sustainable Development Goals (SDGs). However, in practice, many universities have limitations:

1. Institutional fragmentation: The academic, administrative, and liaison areas work in isolation, without a systemic model that articulates efforts.

2. Absence of clear indicators: There are no homogeneous metrics to evaluate the impact of university actions on sustainability.

Title: Design of a sustainable university management model based on the Fifth Systemic Helix methodology	
Problem definition	In the context of the 2030 Agenda, universities are called upon to play a strategic role as agents of social, environmental and economic transformation. However, most higher education institutions face structural fragmentation that makes it difficult to integrate sustainability into their substantive functions (teaching, research, liaison and management).
General objective	Design a sustainable university management model, based on the Fifth Systemic Helix Methodology (QHS), which allows for the articulation of internal and external actors, integration of the 2030 Agenda into the substantive functions of the university, and the establishment of impact indicators that can be replicated in different contexts.
Specific objectives	1. To analyze the current state of university management in terms of sustainability 2. Identify the key internal and external actors that make up the five helixes of the Design impact indicators to assess the integration of the SDGs. 3. Build a sustainable university management model, based on QHS. 4. Validate the proposed model by applying it in a university case study
Assumption generation	If a sustainable university management model is designed based on the Fifth Systemic Helix Methodology (QHS), then an effective articulation of actors, integration of the SDGs into the substantive university functions and generation of replicable impact indicators will be achieved.
Variables	DEPENDENT: Level of incorporation of the SDGs in teaching, research, liaison and institutional management. INDEPENDENT Sustainable university management model based on QHS. Academic, government, productive, civil society and Environment of the Sustainable University Ecosystem
Research instrument	Semi-structured interviews Objective: to identify perceptions, experiences and expectations about university sustainability. Focus groups. Objective: to collectively explore sustainability practices, barriers and opportunities.
Type of research	Applied: it seeks to solve a practical problem in sustainable university management. Descriptive and propositional: describes the current situation and proposes a systemic model. Mixed approach (qualitative and quantitative): integrates documentary analysis, interviews and surveys with measurable indicators.
Research method	Case study: Mixed (qualitative and quantitative): the exploration of perceptions and experiences is combined with the measurement of indicators. Systemic methodology: based on the Fifth Systemic Helix (QHS). Data triangulation:
Research Design	Integration of findings into a sustainable university management model based on QHS.
Hypothesis	If the key actors of the five helixes (academia, government, productive sector, civil society and environment) are identified and articulated, then university governance and the capacity for territorial advocacy will be strengthened.

Table 2. Congruence Matrix by Cruz Ibarra, C. (2025)

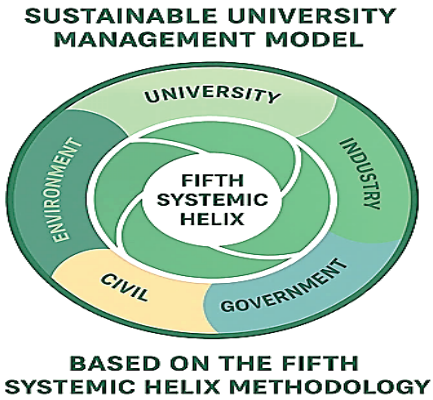

Figure 2. Sustainable University Management Model QHS Methodology

SUMMARY OF RESEARCH PROJECT

Student Case Study: Qi Baocang. (First Generation 2025-2)

FACTORS DETERMINING THE TRANSITION FROM TRADITIONAL TO GREEN TRANSPORT

The transformation from traditional transport to green transport is a systemic change. On the one hand, it reduces social dependence on oil, optimizes the energy structure and ensures the sustainable development of the environment, on the other hand, it boosts the development of emerging industries such as battery, electronic control and motor.

New energy buses are a platform for technological innovation and provide an ideal vehicle for intelligent driving and transportation. Not only do they improve the passenger experience, but they also become the engine of modern green transport and are a strategic measure to promote sustainable development.

The development of new energy buses in Latin America presents a picture of "coexistence of leadership and backwardness". Chile and Colombia are the regional leaders. Its capitals, Santiago and Bogota, have one of the largest fleets of pure electric buses in the world, thanks mainly to policy driving and urban emission reduction plans. Mexico and Brazil are actively pursuing renewable energy and developing photovoltaic generation and dual-source electric buses. Countries like Cuba have severely delayed development of new energy buses due to factors such as sanctions. See Figure 3.

Problematic situation

The development of new energy buses in Latin America presents a "leader and laggard" pattern, and some key cities have achieved certain results, but the overall development still faces challenges, such as the uncertainty of government policies, high initial investment, operators' lack of familiarity with technology and services, insufficient charging infrastructure and grid stability, which seriously affect the development of green public transport, thus hindering the development of green and environmentally friendly public services.

Title: Factors determining the transition from traditional to green transport	
Problem definition	Traditional transport, based mainly on fossil fuels, is one of the sectors with the greatest environmental impact due to its greenhouse gas emissions, air pollution and energy dependence. Despite technological advances and public policies aimed at sustainable mobility, the transition to green transport faces multiple obstacles: economic, social, cultural, technological and regulatory.
General objective	Analyze the economic, social, cultural, technological and regulatory factors that influence the transition from traditional transport to green transport, in order to identify the main barriers and opportunities that allow the design of effective strategies to promote sustainable mobility and contribute to the fulfilment of the sustainable development goals.
Specific objectives	1. Identify the economic factors (investment costs, tax incentives, financing) that influence the adoption of green transport. 2. Assess the regulatory and public policy factors that facilitate or limit the transition to sustainable transport.
Assumption generation	Identify barriers and opportunities for sustainable mobility. Generate evidence to design more effective public policies. Contribute to the reduction of emissions and the fulfilment of international commitments on climate change. Promote a cultural shift towards more responsible and ethical transportation practices.
Variables	DEPENDENT: Transition from traditional transport to green transport INDEPENDENT Economic, social and cultural, technological, regulatory and public policy factors
Research instrument	Qualitative procedure: Coding: open–axial–selective; use of deductive (economic, social, technological, regulatory) and emergent categories. Techniques: thematic analysis, grounded theory for patterns, and causal mapping (influence diagram).
Type of research	Type of study: Mixed sequential explanatory (quantitative → qualitative), with a correlational-explanatory approach.
Research method	Systemic framework: Fifth Systemic Helix (academia–government–business–civil society–environment) to map influences and feedback.
Research Design	Mixed documentary and systemic exploratory study. Size: Determined by formula for proportions, with 5% margin of error and 95% confidence; adjustment for finite population.
Hypothesis	The transition from traditional transport to green transport is significantly determined by economic, social, cultural, technological and regulatory factors, the interaction of which influences the degree of adoption of sustainable mobility practices.

Table 3. Qi Boacang Congruence Matrix (2025)

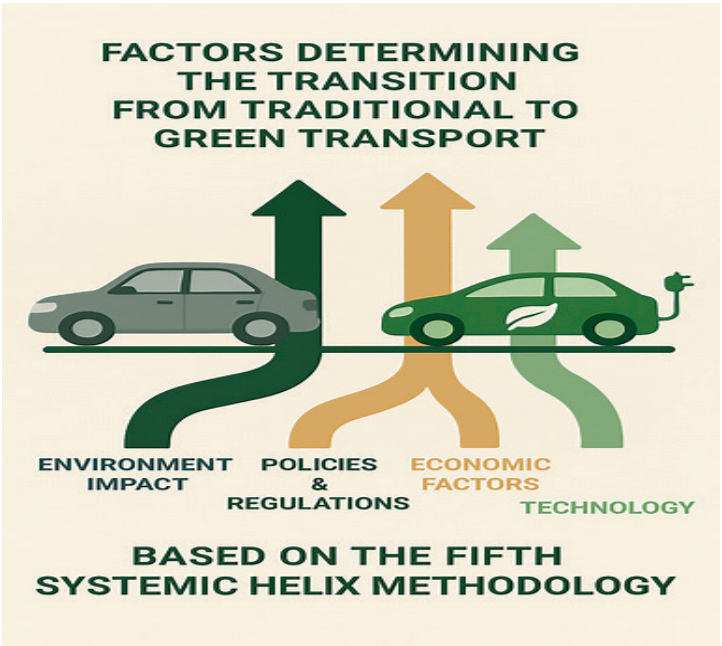

Figure 3. Factors determining the transition from traditional to green transport.

SUMMARY OF RESEARCH PROJECT

Student Case Study: Landero Mada, A. (First Generation 2025-2)

COMPONENTS THAT ESTABLISH THE LEARNING CURVE OF MEXICO'S AIR TRAFFIC CONTROLLERS. SENEAM CASE

This research seeks to establish the learning curve of air traffic controllers (ATCs) in SENEAM. The factors that affect the learning curve are analyzed according to the functions of the SINCO for CTA. The aim is to standardize sectoral competencies to improve performance. The study methods provide a mixed research style: explanatory, descriptive and exploratory. There are no hypotheses, only assumptions of the investigation. Questionnaires, interviews, observation, documentary analysis and congruence matrix are used. The expected impact and its relationship with the lines of knowledge generation and application (LGAC) in the 2030 agenda and SDG 9 on aviation's contributions are analyzed. Aviation supports several SDGs, such as: The contribution of the SDGs to aeronautics: against climate change aviation strives (SDG 13) to reduce pollutants with new technologies and better fuels. The ICAO has recognized that aircraft have significantly reduced aircraft pollution compared to 30 years ago.

The increase in jobs and the economy in the (SDGs 8 and SDG 9), and in the context of infrastructure and investments in this area, as well as in aeronautical innovation, which accelerate development and increase productivity. The thesis favors the learning curve in complex times and an increase in risks, such as aviation.

Problematic situation

Reckless management of the curve can generate risks in air safety, with accusations of untrained personnel that must be verified by the authority. Human factors, such as attention, concentration, decision-making ability and stress control, are decisive in the work. Not understanding how these elements affect the learning curve can result in inadequate training and performance difficulties. An unoptimized learning curve affects the safety of air operations. Delays in the professional maturity of CTAs can lead to incidents and risks at airports and national airspace.

Title: Components that set the learning curve for the air traffic from Mexico. SENEAM Case	
Problem definition	The learning curve of the functions of the air traffic controller (ATC) in SENEAM is unknown.
General objective	Formulate the learning curve through the functions of the air traffic controller in SENEAM.
Specific objectives	1. Determine the learning curve of the functions of air traffic controllers in SENEAM 2. Identify the sectoral competencies of the CTAs in SENEAM.
Assumption generation	How is the learning curve of air traffic controller functions determined? What are the competencies of the CTA position at SENEAM?
Variables	DEPENDENT: Air Traffic Controller Learning Curve INDEPENDENT: Functions to be performed according to the SINCO by the CTA in SENEAM. ASSOCIATION OF VARIABLES: They are measures with central tendency, median, mode, and standard deviation.
Research instrument	Data sources, Closed questionnaires (items), Interviews, Life Stories, Direct Observation, Congruence Matrix Documentary Research, Focus Group
Type of research	Qualitative (Case Study), STRUCTURE OF THE RESEARCH, Method: Epistemological hermeneutical (interpretive)
Research method	Exploratory, descriptive, correlational and explanatory
Research Design	Mixed: Explanatory, Descriptive and Applied
Hypothesis	It is exploratory because there is NO hypothesis, the assumption of the research is formulated

Table 4. Congruence Matrix by Landero Mada, A,. (2025)

The congruence matrix is critical, as it ensures the internal coherence of a research project by aligning the problem, objectives, hypotheses, variables, and methodology. Without their presence, the study might lack consistency and rigor. It allows the interrelationship of each component to be observed, ensuring that the

study design is coherent and logical. The congruence matrix is the foundation of the research project, since it ensures that all the elements are properly aligned and that the results obtained are valid, reliable and useful for the academic community.

SUMMARY OF RESEARCH PROJECT

Student Case Study: Barreto Canales, I.G. (First Generation 2025-2)

SUSTAINABLE PUBLIC PROCUREMENT IN MEXICO: A DEVELOPMENT LEVER FOR ORGANIZATIONS IN THE SOCIAL AND SOLIDARITY SECTOR.

This research analyzes how sustainable public procurement can become a development model for social and solidarity sector organizations in Mexico, in the context of the implementation of the 2025 Procurement Law, Plan Mexico, and the commitments of the 2030 Agenda, particularly SDG 12 on responsible production and consumption. In a country where public procurement represents about 5% of GDP – well below the OECD average (12.9%) – there is a transformative potential that is still underutilized to promote sustainability, productive inclusion and territorial cohesion. The central problem lies in the predominance of the traditional contracting model based on the lowest cost, which has limited the incorporation of environmental, social and public value criteria, as well as the participation of Social and Solidarity Sector Organizations (OSS). These organizations face administrative, technological, and regulatory barriers that exclude them from public markets, despite their ability to generate employment, social innovation, and regional dynamization. The recent regulatory reform and the federal sustainability agenda open a window of opportunity to reorient public spending towards inclusive development goals. See Figure 4.

Problematic situation

In Mexico, the public procurement system represents one of the main mechanisms for allocating State resources and constitutes a strategic instrument to promote economic, social and environmental development policies. Based on data from the ComprasMX Platform, in 2023 expenditure was 727,005,267,419 for the acquisition of goods, services, and work, that is, approximately 5% of GDP for that year. However, despite international progress towards sustainable procurement models and the recognition of the transformative power of public spending, a predominant approach based on criteria of lower immediate cost persists, leaving aside attributes such as social impact, environmental value, working conditions, productive strengthening and revitalization of local economies.

Title: Sustainable Public Procurement in Mexico: A Development Lever for Social and Solidarity Sector Organizations	
Problem definition	Despite the international progress towards sustainable procurement models and the recognition of the transformative power of public spending, a predominant approach based on criteria of lower immediate cost persists, leaving aside attributes such as social impact, environmental value, working conditions, productive strengthening and revitalization of local economies.
General objective	To analyze how the transition from the public procurement model based on the lowest cost to a sustainability approach, in the context of the 2030 Agenda, Plan Mexico and the implementation of the 2025 Procurement Law during the period 2025–2028, can be configured as a development model for organizations in the social and solidarity sector in Mexico, through the identification and evaluation of the normative, institutional and operational conditions that enable or limit such articulation.
Specific objectives	1. Identify and analyze regulatory changes in the 2025 Procurement Law, 2. Assess institutional, technical and operational capacities 3. Formalization of organizations in the social and solidarity sector with the potential or interest in participating in sustainable public procurement. 4. Analyze articulation between public agencies 5. Examining the potential of sustainable public procurement
Assumption generation	How can the adoption of sustainable public procurement in Mexico become a lever for development for organizations in the social and solidarity sector, considering the current institutional, regulatory and operational context?
Variables	DEPENDENT: Development of the social and solidarity sector, measured by: • Access to public markets. • Improvement in organizational and productive capacities. • Integration into value chains. • Diversification of the supplier base. • Generation of employment and territorial impact. INDEPENDENT Level of adoption of sustainable public procurement in Mexico
Research instrument	1. Review of the Procurement Law regulations 2. Analysis of Development Plans for the Social Sector. 3. Review of indicators and targets for monitoring the SDGs. 4. Interviews and meetings with specialists 5. Analysis of collegiate bodies in the field of public policies
Type of research	a) Exploratoria Porque las CPS vinculadas al sector social y solidario son un campo incipiente en México, con escasa evidencia empírica. b) Descriptiva Para caracterizar el estado actual de: Capacidades institucionales, Prácticas de compra sostenible, Barreras de participación del sector social y solidario.
Research method	The research is based on a systemic approach, complemented by a critical and ethical-territorial perspective. This approach conceives sustainable public procurement as a complex system where public actors, social organizations, regulatory frameworks, institutional capacities and territorial dynamics interact.
Hypothesis	The transition from traditional transport to green transport is significantly determined by economic, social, cultural, technological and regulatory factors, the interaction of which influences the degree of adoption of sustainable mobility practices.

Table 5. Matrix of Congruence by Barreto Canales, I.G (2025)

Figure 4. Sustainable Public Procurement in Mexico

SUMMARY OF RESEARCH PROJECT

Student Case Study: Diaz Obrajero, M. (First Generation 2025-2)

DESIGN OF A STRATEGIC METHODOLOGICAL GUIDE FOR THE ALIGNMENT OF SUBNATIONAL PUBLIC POLICIES WITH THE 2030 AGENDA

Public administration in Mexico's local governments faces a fundamental and priority task: the effective alignment of their management and development policies with the principles of the 2030 Agenda and its 17 Sustainable Development Goals (SDGs). This challenge promotes the transition towards sustainable development, which is compromised by a problematic structural situation: the absence of an updated, strategic and standardized methodology that guarantees systemic and operational coherence between global goals and local planning instruments, such as State and Municipal Development Plans.

This deficiency generates an institutional disarticulation that limits the effectiveness and real impact of public policies to achieve sustainability in the country. The General Objective of this doctoral thesis is to design and validate a Strategic Methodological Guide, based on a systemic approach, for the effective alignment of public policies of state and municipal governments in Mexico with the SDGs and the 2030 Agenda. The research is of high relevance for its practical contribution, by generating the Methodological Guide as a tangible and replicable tool that solves

an operational deficiency in local management, it aims to guide the understanding of how to apply integral models in public administration, overcoming fragmented visions of development.

Public administration in Mexico's local governments faces a fundamental and priority task: the effective alignment of their management and development policies with the principles of the 2030 Agenda and its 17 Sustainable Development Goals (SDGs). This challenge promotes the transition towards sustainable development, which is compromised by a problematic structural situation: the absence of an updated, strategic and standardized methodology that guarantees systemic and operational coherence between global goals and local planning instruments, such as State and Municipal Development Plans.

This deficiency generates an institutional disarticulation that limits the effectiveness and real impact of public policies to achieve sustainability in the country. The General Objective of this doctoral thesis is to design and validate a Strategic Methodological Guide, based on a systemic approach, for the effective alignment of public policies of state and municipal governments in Mexico with the SDGs and the 2030 Agenda. The research is of high relevance for its practical contribution, by generating the Methodological Guide as a tangible and replicable tool that solves an operational deficiency in local management, it aims to guide the understanding of how to apply integral models in public administration, overcoming fragmented visions of development.

The problematic situation that gives rise to this doctoral research is located in local public management in Mexico, specifically in state and municipal governments. The current context requires these actors to comply with actions implemented in their communities in response to the 2030 Agenda for Sustainable Development, which implies integrating the social, economic and environmental spheres in planning and decision-making.

The contradiction arises because, although the mandate is systemic and global, the officials in charge of designing public policies continue to use fragmented and sectoral planning methodologies. The result is an operational disarticulation; isolated policies are formulated that solve part of the problem. Development plans are filled with objectives of the 2030 Agenda only for compliance, but without a clear methodological process that guarantees their coherence and real traceability in budget programs.

Figure 5. Methodological Guide for the Alignment of 2030 Agenda

Title: Design of a Strategic Methodological Guide for the Alignment of Subnational Public Policies with the 2030 Agenda	
Problem definition	Operational disarticulation, isolated policies are formulated that solve part of the problem. Development plans are filled with objectives of the 2030 Agenda only for compliance, but without a clear methodological process that guarantees their coherence and real traceability in budget programs.
General objective	Design and validate a Strategic Methodological Guide, based on a systemic approach, for the effective alignment of public policies of state and municipal governments in Mexico with the 2030 Agenda
Specific objectives	1. Analizar los modelos y prácticas actuales de planeación local en México para identificar las brechas metodológicas 2. Desarrollar la estructura, los componentes, las matrices y las herramientas de gestión 3. Validar la pertinencia, coherencia interna y viabilidad de la Guía Metodológica Estratégica
Assumption generation	How can a strategic methodological guide, based on a systemic approach, be designed and validated that allows state and municipal governments in Mexico to align their planning instruments in a standardized way with the Sustainable Development Goals of the 2030 Agenda?
Variables	DEPENDENT: Effectiveness of the Alignment of Subnational Public Policies with the 2030 Agenda INDEPENDENT: Implementation of the Strategic Methodological Guide with a Systemic Approach

Research instrument	1. Review of current local and national regulations. 2. Analysis of local Development Plans. 3. Review of indicators and targets for monitoring the SDGs. 4. Interviews and meetings with local governments. 5. Analysis of collegiate bodies in the field of sustainable development.
Type of research	Step 1: Analytical-Synthetic (Review) Step 2: Engineering Design (Methodological): Step 3: Inductive-Deductive (Validation)
Hypothesis	The transition from traditional transport to green transport is significantly determined by economic, social, cultural, technological and regulatory factors, the interaction of which influences the degree of adoption of sustainable mobility practices.

Table 6. Matrix of Congruence by Díaz Obrajero, M. (2025)

The congruence matrix is critical, as it ensures the internal coherence of a research project by aligning the problem, objectives, hypotheses, variables, and methodology. Without their presence, the study might lack consistency and rigor. It allows the interrelationship of each component to be observed, ensuring that the study design is coherent and logical. The congruence matrix is the foundation of the research project, since it ensures that all the elements are properly aligned and that the results obtained are valid, reliable and useful for the academic community.

Importance of the Congruence Matrix in a Doctoral Thesis

1. Ensure internal consistency

The congruence matrix ensures that all components of the thesis are aligned with each other. For example, that the objectives respond to the problem posed, that the hypotheses are consistent with the objectives, and that the methodology allows answering the research questions. This avoids inconsistencies and ensures that the work has a logical and solid structure.

2. Facilitates planning and development

By visualising all the elements of the project in a structured way, the doctoral student can identify possible gaps, redundancies or inconsistencies before moving forward with the development of the research. This allows for early adjustments and saves time and resources.

3. Improves quality and scientific rigor

A doctoral thesis must be an original and rigorous contribution to knowledge. The congruence matrix helps to comply with these standards, since it forces the researcher to justify each methodological decision and to demonstrate that each part of the work contributes to the achievement of the objectives set.

4. It facilitates evaluation by the synod

Thesis committees and evaluators often review the congruence matrix to ensure that the work is solid and well-founded. A well-crafted matrix conveys clarity, professionalism, and mastery of the subject.

3. CONCLUSIONS AND REFLECTIONS

The development of the preliminary projects of doctoral thesis topics consolidates the development of the skills of the Profile of the Doctoral Graduate in Administration. This will allow you to develop the following cutting-edge competencies in the field of Economic-Administrative Sciences.

1. Capable of producing and transmitting knowledge and skills.
2. Identify problems and how to address them systemically, with scientific, ethical rigor and critical thinking.
3. Substantiate the research carried out by public or private.
4. Transmit research in the publication of printed and digital documents in journals of high scientific impact.
5. Possess comprehensive competencies to test the results of their projects, models and research in the State of the Art.
6. Knowledge, tools and instruments to adequately support their frontier science research.
7. Intervene in organizations in a competent and creative way.
8. Competencies to offer Social Innovation Consultancy, Sustainable Development

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CHAPTER 8

SOCIAL POLICIES IN THE IMPLEMENTATION OF SDGS IN THE CITIES OF TIJUANA AND GUADALAJARA, MEXICO[1]

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ABSTRACT: The subnational localization of the Sustainable Development Goals (SDGs) is usually presented in two ways: (i) as a report of actions and population served, useful for operational accountability, and (ii) as planning based on indicators, with baselines and targets, more appropriate for monitoring results. This article proposes an SDG Operational Localization Matrix (MOL-SDGs) and a minimum traceability traffic light that allow us to assess, in a simple and replicable way, whether a social policy instrument verifiably connects what it declares (SDGs and targets) with what it manages (results, indicators, temporary and responsible targets), with emphasis on SDG 1 (poverty) and SDG 4 (education). The tool is illustrated by a comparison between the Tijuana 2024 Voluntary Subnational Report, focused on lines of action and beneficiary population, and sectoral instruments in Jalisco, where results and indicators are reported with a baseline and goals (for example, Gini coefficient and extreme poverty). The findings show that the action-based approach tends to privilege coverage without consistently capturing changes in well-being, while the indicator-based approach can remain programmatic if there is no institutional monitoring mechanism. Based on this, governance implications are discussed – responsibility, coordination and use of evidence – and a minimum package for decision-makers is presented, aimed at strengthening the SDG traceability in public management.

KEYWORDS: social policy; 2030 Agenda; SDGs; traceability; poverty; education; governance.

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1. INTRODUCTION

In Mexico, the incorporation of the 2030 Agenda in subnational public planning has made visible progress in institutional language and in the proliferation of sectoral plans and programs. However, in many cases the link to the SDGs remains at a declarative level when it is not possible to follow, in a verifiable way, the route that connects objectives and goals with indicators, baselines, temporal targets, responsible, coordination and monitoring mechanisms (Government of Mexico, 2018; UNDP, 2019). We call this requirement of "being able to follow the route" here traceability: the ability to track, with clear evidence and rules, how an intention (SDG/target) translates into measurable results and management decisions.

This distinction is especially important in social policy, because the substantive results – poverty reduction (SDG 1) and improvement of educational trajectories (SDG 4) – require interannual continuity, inter-institutional coordination and comparable measurement over time. In addition, from an international perspective, comparative evidence underlines that a considerable part of the SDG targets depends on the actions and competencies of local and regional governments, which makes it crucial to have granular data and monitoring frameworks useful for decision-making in the territory (OECD, 2020).

In parallel, the use of subnational reporting exercises such as *Voluntary Local Reviews/Voluntary Subnational Reviews*, which seek to document progress and guide local strategies, has spread. However, accumulated experience shows that these reports tend to vary in depth: they often focus on aligning policies and describing actions, but they do not always consolidate a robust monitoring scheme (indicators, managers, targets, and institutional use of evidence) (Ortiz-Moya et al., 2020), which limits their transformative potential. In this context, the challenge is not only to "mention SDGs", but to build instruments that allow us to move from discursive alignment to verifiable results-oriented management.

Objective and scope of the study

The general objective of this article is to comparatively evaluate the degree of SDG traceability in social policy —with a focus on SDG 1 (poverty) and SDG 4 (education)— in Baja California and Jalisco, and to propose an SDG–Social Policy Operational Localization Matrix (MOL-SDG) together with a replicable traffic light that facilitates the transition from narrative alignment to operational traceability.

Specifically, the study seeks to:

1. Identify how the link to the SDGs is declared and operationalized in state sectoral plans and programs (SDG 1 and SDG 4).

2. Apply a traceability traffic light to compare both cases in a transparent and replicable way.
3. Derive operational recommendations to strengthen SDG localization and accountability in social policy (with an emphasis on responsibility, coordination, and monitoring).

Cases and Sources Considered

For Baja California, the following are considered: the State Development Plan 2022–2027 and, to ensure sectoral comparability with Jalisco, the state Sectoral Programs corresponding to social policy and education (Sectoral Program of Welfare for All 2022–2027 and Sectoral Program of Education 2022–2027). Additionally, the Tijuana 2024 Voluntary Subnational Report (VSI) is incorporated as complementary municipal evidence of location and SDG monitoring (Government of the State of Baja California, 2022; Government of the State of Baja California, 2023a; Government of the State of Baja California, 2023b; H. XXIV Tijuana City Council, 2024).

For Jalisco, the Jalisco State Governance and Development Plan 2018–2024 Vision 2030 (2021 update) and the thematic documents 2.1 Poverty and inequality and 2.2 Education, which disaggregate specific results, strategies, indicators and their link to SDG goals (Government of the State of Jalisco, 2021, 2022a, 2022b), are analyzed.

Finally, to strengthen the analysis in the educational field, the indicator system of the Institutional Development Plan (PDI) 2019–2025 Vision 2030 of the University of Guadalajara is used as an institutional reference, since it makes explicit a results-oriented approach and incorporates indicators with sources, methodologies and those responsible (University of Guadalajara, 2023). This benchmark helps distinguish between narrative alignment and operational measurement and provides practical criteria for a replicable traceability matrix.

This article provides:

1. A minimum standard of traceability SDG–social policy, expressed in verifiable criteria and operationalized in a traffic light.
2. A MOL-SDG Matrix with mandatory variables (result/action, SDG-target, indicator, baseline, target, responsible, source and monitoring) that allows instruments to be homologated with different logics (actions vs indicators).
3. A comparative demonstrative application at the state level (Baja California–Jalisco) and complementary municipal evidence (ISV Tijuana 2024) that make visible patterns of "symbolic alignment vs. operational alignment" in SDG 1 and SDG 4, useful for institutional diagnosis.

4. Evidence governance recommendations to move from discursive alignment to verifiability and the systematic use of indicators in the public policy cycle (planning–budgeting–monitoring–adjustment).

2. THEORETICAL FRAMEWORK

The localization of the SDGs is understood, in the strict sense, as the process by which a territory (state, municipality, or region) translates the 2030 Agenda into its institutional and social context: it prioritizes problems, defines expected results, adjusts means of implementation, and selects indicators to measure and monitor progress (Government of Mexico, 2018; UNDP, 2019). In this transition, comparative evidence insists that localization does not occur "by decree": it depends on multilevel governance, incentive alignment, data capacity, and monitoring mechanisms that connect global commitments with everyday public policy decisions (United Nations, 2024). In other words, localization is less exercise in "SDG labeling" and more practical architecture of public management that allows for coordination, measurement, and correction.

At the subnational level, this architecture faces a recurrent tension: on the one hand, planning can privilege action (program catalogs, coverage, population served); on the other, it can privilege the result (goals, baselines, indicators, and those responsible). The literature on the territorialization of the SDGs points out that both logics are necessary, but not equivalent: coverage can be politically visible and administratively simple, while the result requires comparable series, consistent definitions, and institutional arrangements to sustain monitoring (OECD, 2020). This explains why some instruments "see" aligned with SDGs without necessarily allowing us to verify whether well-being has changed (poverty) or if educational trajectories have improved (dropout, timely conclusion).

In parallel, the use of subnational reporting exercises such as *Voluntary Local Reviews*/*Voluntary Subnational Reviews*, whose purpose is to document progress and guide local strategies, has spread. However, the accumulated experience shows variation in depth: policy alignment and the description of actions are often emphasized, while the monitoring component—indicators, targets, perpetrators, and institutional use of evidence—appears with less consistency (Ortiz-Moya et al., 2020). In fact, international guidelines for local reviews explicitly recommend strengthening elements such as clear selection of indicators, institutional arrangements for monitoring, reporting periodicity, and mechanisms for integrating evidence into management (United Nations, 2020; United Cities and Local Governments & UN-Habitat, 2020). Therefore, the challenge is not only to "mention SDGs", but to build instruments that allow us to move from discursive alignment to verifiable results-oriented management.

In this article, traceability is conceptualized as a verifiable property of the public document: the possibility of reconstructing a minimum chain from the SDG and its goal to the local result and its measurement. Returning to the language of management for results, this chain is supported by the results chain —known in the literature as *results chain*—: (inputs/activities → outputs → results/*outcomes* → impact), which makes it possible to distinguish what is done from what changes (OECD, 2023). In order for this chain to be auditable at the documentary level, it is required that the instrument specifies at least: (a) local result or objective; (b) alignment with SDGs/targets; (c) intervention or strategy; (d) indicator with definition, baseline and target; (e) responsible; (f) source; and (g) follow-up mechanism (frequency, instance and/or routine).

In the monitoring and evaluation literature, the critical point is that the performance matrix not only lists indicators but also establishes their logic of use: baselines and goals as part of the performance framework and as a support for corrective decisions (Kusek & Rist, 2004). This point is central because it allows us to differentiate instruments that "declare" commitment from instruments that enable decisions: if there are no baseline, goal and responsibility, the indicator loses its function of guiding the management cycle (planning-monitoring-adjustment). This is the conceptual basis of the traceability traffic light proposed in the article.

Under this definition, traceability makes it possible to differentiate two symmetrical risks. The first is declarative alignment: the document mentions SDGs, but does not offer a verifiable bridge to targets, indicators, and monitoring. The second is technocratic programmatism: the document includes indicators, but lacks monitoring institutions (who reviews, when, with what consequences), which can turn the indicators into an inert annex. The recent international agenda on SDG Localization rightly underscores that progress requires "closing the loop" between planning, data, local reporting (e.g., voluntary local reviews), and multilevel coordination for monitoring to have real effects on management (United Nations, 2024).

In social policy, this discussion is especially relevant because the SDGs involved (such as SDG 1 and SDG 4) demand measurement sensitive to changes in well-being and trajectories. For poverty, the robust benchmark is multidimensional measurement (income + deprivation), because it allows comparing territories with standardized criteria, avoids reducing well-being to a single variable, and enables a reading of changes in social rights (CONEVAL, 2023).

For education, traceability is strengthened when trajectory indicators are used that approximate the results of the system: for example, the dropout rate (percentage of students who leave school with respect to the initial enrollment) and terminal efficiency (percentage who conclude a level in a timely manner according to the

scheduled duration) (INEGI, n.d.-a; INEGI, n.d.-b). Together, these indicators help prevent "action" (workshops, scholarships, infrastructure) from being automatically taken as an "outcome" with no evidence of change.

Finally, the localization literature insists that the tools for landing SDGs in the territory must be adaptable and replicable: guides and roadmaps propose steps for awareness-raising, alignment with existing planning, implementation, and monitoring, precisely so that localization is not reduced to a communicational exercise (UNDP, UCLG, & UN-Habitat, 2016). In methodological terms, evaluating traceability as a documentary property is consistent with the use of documentary analysis and content analysis: approaches that allow for the systematic examination of public texts, identification of coding patterns (what is declared, what is operationalized), and the application of replicable classification rules (Bowen, 2009; Krippendorff, 2019; Schreier, 2012). The contribution of the article lies at this intersection: to propose a minimum matrix and a traceability traffic light that allow comparing instruments with different logic, identifying documentary gaps and offering an operational way to move from narrative to verifiability.

3. METHODOLOGY

Focus and type of study

A qualitative study was developed, with a descriptive-comparative scope, based on documentary analysis of official planning and programming instruments. This approach is relevant when the objective is not to measure impact, but to examine how public documents formulate problems, define results, and establish (or not) conditions for monitoring, through indicators, goals, and institutional mechanisms (Bowen, 2009). The design is non-experimental and cross-sectional, focused on assessing SDG traceability in two fields of social policy: poverty (SDG 1, with analytical support from SDG 10) and education (SDG 4).

To ensure that the analysis is replicable, a qualitative content analysis logic was used guided by an explicit *coding frame*: instead of "reading and giving an opinion", variables and decision rules were defined to extract and classify documentary evidence in a consistent manner (Schreier, 2012; Krippendorff, 2019).

Documentary Case Studies

Baja California and Jalisco were selected for: (a) availability of comparable public instruments; (b) presence of explicit elements of linkage to SDGs; and (c) the possibility of anchoring the contrast with standardized sources of context. Likewise,

the authors are located in the institutional and territorial context of two of the most relevant subnational cases in the country, which favors access, situated understanding of the instruments and comparative reading for methodological purposes.

In order to ensure sectoral comparability (SDG 1 and SDG 4) and avoid asymmetries due to "documentary genre", the corpus was integrated with equivalent state instruments in both entities:

Baja California (state level):

State Development Plan 2022–2027 and the sectoral and

state welfare/social policy and education: Sectoral Program for Welfare for All 2022–2027 and Sectoral Program for Education 2022–2027 (Government of the State of Baja California, 2022; Government of the State of Baja California, 2023a; Government of the State of Baja California, 2023b).

Complementary municipal evidence (not a substitute for the state level): First Voluntary Subnational Report (ISV) of Tijuana 2024, incorporated to contrast the type of traceability usually shown by subnational reporting exercises (H. XXIV Tijuana City Council, 2024).

Jalisco (state level):

Jalisco State Governance and Development Plan 2018–2024 Vision 2030 (2021 update) and thematic documents 2.1 Poverty and inequality and 2.2 Education (Government of the State of Jalisco, 2021, 2022a, 2022b).

Unit of analysis.

The unit of analysis was the documentary statements that allow the reconstruction of the SDG-public policy chain: objectives/results, strategies or lines of action, fact sheets or mentions of indicators, references to baselines and targets, assignment of responsibilities and monitoring/evaluation mechanisms.

Evidencia contextual (no evaluativa)

To contextualize the discussion, standardized sources were used by state:

1. Poverty: multidimensional measurement based on ENIGH 2022 (CONEVAL, 2023).
2. Education: official tabulations by state of school dropout and terminal efficiency (INEGI, n.d.-a; INEGI, n.d.-b).

These sources are used as context and contrast to interpret the relevance of monitoring (e.g., why certain trajectories matter), not as a program impact evaluation.

MOL-ODS Matrix and Extraction Protocol

Based on the national framework for the implementation of the 2030 Agenda and recommendations for subnational localization (Government of Mexico, 2018; UNDP, 2019), the SDG–Social Policy Operational Localization Matrix (MOL-ODS) was designed as an extraction and comparison instrument.

Minimum variables recorded for each documentary finding (row):

1. Specific objective or result (what change is sought).
2. SDGs and linked target (explicit or inferred with rule).
3. Strategy/intervention (how it is intended to be achieved).
4. Verifiable indicator (what is measured and how it is defined).
5. Baseline (value and year).
6. Goal (value and year).
7. Target population (to whom it applies and with what criteria).
8. Responsible institution and coordination mechanism (who responds and with whom it articulates).
9. Data source (where the indicator comes from).
10. Monitoring/evaluation mechanism (frequency, instance, routine or procedure).

Decision rules:

a) When the SDG target is not explicit, inferred linkage is allowed only if the outcome statement or indicator directly matches the content of the SDG (e.g., extreme poverty, educational lag, school dropout).

b) If there is an indicator but there is no baseline or temporary goal, it is considered incomplete traceability (see traffic light).

c) If there are actions or beneficiaries without an outcome indicator, they are recorded as evidence of operational management, but not as a measure of welfare change (OECD, 2023).

d) For the state-state contrast, the MOL-SDG prioritizes statements that explicitly connect result/objective with indicators and targets; the municipal ISV is used as a documentary contrast of subnational reporting, without equating it to the state instrument.

Minimum traceability traffic light

Based on the MOL-ODS, a traffic light was built with three categories, to transparently classify the degree of document traceability:

1. Green (full traceability): SDG/target + indicator + baseline + target (value and year) + responsible + explicit monitoring.
2. Amber (partial traceability): there is SDG/target and indicator, but there is no baseline or goal, or monitoring is not clearly institutionalized (there is no routine, instance or periodicity).
3. Red (declarative alignment): ODS reference with no verifiable indicator or no minimum elements to reconstruct the chain.

This traffic light does not intend to "qualify governments", but to offer an operational diagnosis: to identify what pieces are missing to move from discursive alignment to verifiable results-oriented management.

Comparative analysis strategy

The analysis was carried out on three levels:

1. Intra-documentary: the SDG-result-indicator-monitoring chain for SDG 1 and SDG 4 was reconstructed with the SDG-ODS within each instrument.
2. Intra-case: patterns were synthesized by entity (Baja California; Jalisco), highlighting consistencies, gaps and asymmetries (for example, predominance of coverage vs. predominance of goals).
3. Inter-case: both localization styles were compared, and structural findings (not anecdotes) were derived, useful for decisions: what is gained and what is lost when reporting by actions versus when planning by indicators.

Methodological note: the Tijuana ISV is analyzed as "complementary municipal evidence" to observe how traceability operates in subnational reporting exercises, but the main comparison is supported by equivalent state instruments.

Ethical considerations and limitations

The study uses exclusively public and documentary information, without personal data or intervention with subjects. It is recognized that document traceability does not automatically equate to effectiveness or impact: an instrument may be well formulated and measured, and still not produce results due to budget constraints, implementation failures, or coordination problems. Likewise, the documents may vary in their level of detail: the absence of an indicator or a file does not prove that it does not exist in the administration, but it does indicate that it is not verifiably available in the instrument analyzed (Bowen, 2009).

4. RESULTS AND DISCUSSIONS

Baja California (state level): sectoral planning with SDG alignment and monitoring components

In Baja California, the State Development Plan 2022–2027 is complemented by sectoral instruments that seek to operationalize priorities through objectives, indicators, and monitoring mechanisms in key areas of social policy. For the field of SDG 1 (poverty), the Sectoral Program for Well-being for All 2022–2027 declares its alignment with the 2030 Agenda and makes explicit links with SDGs and targets, in addition to incorporating a monitoring and evaluation section that allows, at least at the documentary level, to reconstruct a part of the SDG-result-measurement chain (Government of the State of Baja California, 2022; Government of the State of Baja California, 2023a).

For SDG 4 (education), the Education Sector Programme 2022–2027 presents alignments with SDGs and proposes a monitoring framework with operational indicators and definitions. This type of formulation strengthens formal traceability, to the extent that it makes it possible to identify what is intended to be changed and with what evidence progress will be observed (Government of the State of Baja California, 2023b).

Overall, the state style of Baja California, through its sectoral programs, is close to a logic of monitoring by indicators (with the possibility of including those responsible, goals and mechanisms), although its final quality – as in any case – depends on whether the monitoring is effectively institutionalized: who reviews, with what periodicity and with what management consequences.

Baja California (Tijuana): complementary municipal evidence of location by actions and population served.

The Tijuana 2024 Voluntary Subnational Report (VSI) documents the localization of the 2030 Agenda mainly through lines of action of the municipal government and beneficiary population, which is valuable for operational accountability (what was done and how many people it reached). SDG 1 reports support for the low-income population, social assistance for the elderly, and actions for children in street situations, with more than 6,000 people benefiting (H. XXIV Tijuana City Council, 2024).

SDG 4 identifies actions such as strengthening English in primary school, teacher updating, promotion of libraries, incentives for school permanence and attention to students with disabilities; the municipality reports more than 23,000 students benefited (H. XXIV Tijuana City Council, 2024). Overall, the ISV shows a strength: it leaves clear evidence of territorial implementation and operational priorities of the municipality.

Declared vertical traceability. The ISV affirms the consonance of the Municipal Plan with the State Development Plan and the National Plan, observing the 2030 Agenda, which suggests multilevel coherence (H. XXIV Tijuana City Council, 2024; Government of the State of Baja California, 2022; Government of Mexico, 2018). However, when applying the SDG-MOL, the document leans towards progress measured as activity/coverage (actions and beneficiaries) rather than as an outcome (e.g., verifiable changes in poverty, school dropout, or terminal efficiency).

In terms of strict traceability, this opens up a clear margin for improvement: turning coverage into results-oriented monitoring through indicators, baselines, and time targets. Note: By methodological design, the ISV (VLR) is used here as supplemental municipal evidence, not as a substitute for the state level.

Jalisco: sectoral planning with indicators, baselines and goals

In contrast, the sectoral documents of Jalisco show a high density of formal traceability. In axis 2.1 Poverty and inequality, the document presents a diagnosis and structures specific results linked to SDGs and targets. It highlights the integration of sectoral indicators with a baseline and 2024 targets (e.g., Gini coefficient and extreme poverty) and the articulation between government, civil society, and private initiative as a condition for influencing multidimensional poverty (Government of the State of Jalisco, 2021, 2022a).

In axis 2.2 Education, the document frames education as a right and as a lever for the fight against poverty and social mobility; it links specific results to SDG 4 targets and proposes strategies in digital culture, inclusion and pedagogical strengthening (Government of the State of Jalisco, 2022b). In addition, it incorporates the SDG horizon in higher education by suggesting that new programs include content or activities related to the 2030 Agenda (Government of the State of Jalisco, 2022b). Overall, Jalisco's style tends to privilege the logic of monitoring by indicators, although its final quality depends on whether the monitoring is effectively institutionalized (who reviews, with what periodicity and with what management consequences).

Comparative synthesis of traceability (SDG 1 and SDG 4)

The results allow us to characterize two levels and three documentary styles of SDG localization:

1. Main comparison (state level): Baja California and Jalisco have state instruments that seek to articulate objectives, strategies and indicators for SDG 1 and SDG 4; Jalisco shows greater density in baselines and targets within its thematic documents, while Baja California incorporates

SDG alignment and monitoring components in state sectoral programs (Government of the State of Baja California, 2023a, 2023b; Government of the State of Jalisco, 2022a, 2022b).

2. Complementary municipal evidence (ISV): Tijuana shows more direct evidence of implementation and territorial coverage (actions and beneficiaries), which strengthens operational accountability, but with less strict traceability towards measurable results (H. XXIV Tijuana City Council, 2024).

To anchor the contrast with comparable evidence, the multidimensional measurement of poverty (CONEVAL, 2023) and the official tabulations of educational trajectory (school dropout and terminal efficiency) (INEGI, n.d.-a; INEGI, n.d.-b). These sources are not used to "evaluate the impact" of the instruments, but to emphasize that, if we intend to talk about results in poverty or education, it is advisable that the instruments include outcome indicators consistent with these measurements.

Criteria	Minimum expected evidence	Traffic Light Rule
Linkage SDG Target	SDGs and clearly explicit or inferable target	GREEN whether it is explicit
Verifiable indicator	Indicator with name/definition and source	GREEN whether there are an indicator and source
Baseline	Reference value and year	AMBER If missing
Goal	Goal (value and year) or threshold of achievement	AMBER If missing
Responsible and coordination	Dependencia responsable + articulación intersectorial	ÁMBAR If it's diffuse
Follow-up Evaluation	Periodicity and mechanism (dashboard, report, evaluation)	RED if it doesn't exist

Table 1. Minimum traceability traffic light SDG–social policy (study proposal)

SDG	Baja California State	Jalisco State	Traceability
SDG 1 Poverty	SDG/target alignment and monitoring framework in the Sectoral Wellbeing Government of the State of Baja California, 2023a).	Results linked to SDGs/targets; indicators with baseline and 2024 target (e.g., Gini, extreme poverty) (Government of the State of Jalisco, 2022a).	BC: Green–Amber (depending on the presence of baseline/finish line and routine). Jalisco: Green-Amber (strong in design; depends on tracking).
SDG 4 Education	SDG 4 alignment with indicators in the Education Sector (Government of Baja California, 2023b).	Results linked to SDG 4 targets; (Government of the State of Jalisco, 2022b).	BC: Green–Amber. Jalisco: Green–Amber.

Table 2. Comparative synthesis of traceability (SDG 1 and SDG 4) between Baja California and Jalisco (state instruments)

Criteria	Tijuana (VLR Municipal)	Traceability
SDG 1 Poverty	Actions and beneficiaries (>6,000); declared multilevel coherence (H. XXIV Tijuana City Council, 2024).	Ámbar (predomina cobertura; mejora posible con indicadores, línea base, meta y seguimiento).
SDG 4 Education	Lines of action; beneficiaries >23,000; emphasis on English, teacher training, libraries, permanence and inclusion (H. XXIV Tijuana City Council, 2024).	Amber (predominant coverage).

Table 3. Complementary municipal evidence: traceability at ISV (Tijuana) for SDG 1 and SDG 4

Traceability patterns detected in SDG 1 and SDG 4

The comparison allows us to identify patterns that are not evident with a superficial reading, but emerge when applying the MOL-ODS and the minimum traffic light:

Hedging inflation (hedge ≠ profit). Evidence by beneficiaries is useful for management and transparency; however, it tends to displace outcome indicators (poverty, abandonment, terminal efficiency), so traceability is incomplete if the document does not specify a baseline, goal, and mechanism for monitoring the change in well-being.

1. Indicators without institutionalized monitoring. The indicator style can remain programmatic if it is not accompanied by a clearly described monitoring routine: who reviews, when, how often, and what decisions are derived when the indicator does not advance. The traffic light captures this point when the tracking is diffuse or non-existent (it goes from "potential green" to amber/red due to the absence of data governance).
2. Traceability asymmetry between levels (stated coherence vs. verifiable evidence). Declaring multilevel coherence is a step forward; But strong traceability requires that consistency to land on comparable indicators, baselines, and targets. Otherwise, coherence operates as a narrative framework, not as a follow-up mechanism.
3. Double risk of "false sufficiency". In the stock-based style, the risk is to confuse activity with change. In the indicator-based style, the risk is to confuse technical design with effectiveness when coordination, budget, or incentives to use evidence are lacking.
4. Two levels, the same bottleneck: evidence governance. The difference is not "who does it best", but what institutional capacities are activated: operational management (actions) versus follow-up by results (indicators). The usefulness of the MOL-SDG is precisely to turn this difference into a verifiable agenda for improvement: what variable is missing, who should define it and how often it should be reviewed.

Why traceability matters for public decision.

These results suggest that SDG localization becomes useful for decision-makers when it allows three practical questions to be answered: (1) what outcome is sought, (2) how progress will be measured, and (3) what the institution will do if it does not make progress. At the state level, both Baja California and Jalisco show efforts to formalize by indicators; at the municipal level, the Tijuana ISV shows strength in visibility of actions and coverage. In all cases, the leap in quality occurs when the document makes explicit the "circuit" of follow-up: responsibilities, periodicity and use of evidence.

VLR/ISV as an opportunity: from reporting to management

International guidelines on subnational voluntary reviews have insisted that these exercises can be more than a document: a process that strengthens institutional coordination, monitoring, and learning. However, they also warn that if the report focuses only on action, the location tends to remain in a "narrative of progress" and loses management potential. In this sense, the proposed traceability traffic light can be understood as an operational complement to voluntary reviews: it helps to "close" what is usually left open (indicators, baselines, targets and monitoring) (UN-Habitat & UCLG, 2020; United Nations, 2020).

Governance implications: data controller, coordination and use

La discusión no es solo técnica. Un indicador sin responsable claro o sin periodicidad de revisión se convierte en un dato ornamental. Por ello, el criterio de responsable/coordinación en la MOL-ODS es decisivo: en pobreza y educación hay interdependencias (salud, empleo, protección social, capacidades digitales), y la trazabilidad exige definir quién "posee" el resultado y quién aporta insumos. La trazabilidad, así, funciona como un criterio práctico de gobernanza: hace visibles vacíos institucionales que no se detectan con listados de acciones.

Minimum package to strengthen traceability SDG 1 and SDG 4

Based on the patterns detected, four minimum actions are proposed for planning teams and decision-makers:

1. Separate outcome coverage in the document: keep beneficiaries as operational evidence but add at least 1–2 outcome indicators by SDG (poverty; dropout/terminal efficiency).
2. Require a baseline and time target for each priority indicator (value + year), avoiding goals without a calendar.

3. Assign "owner" of the indicator (responsible) and make explicit the intersectoral coordination mechanism when the result depends on more than one agency.
4. Institutionalize the review (dashboard or periodic report) and define what decision is activated if the indicator stalls (reorientation, targeting, coordination, budgeting, redesign).

5. CONCLUSIONS

The state-level comparison between Baja California and Jalisco, complemented by municipal evidence from the Tijuana ISV, confirms that alignment with the SDGs at the subnational level can be expressed in at least two predominant formats: (i) a report of actions and territorial coverage—useful for operational accountability—and (ii) an architecture of results, indicators, baselines, and goals —more suitable for results-oriented monitoring— (H. XXIV Tijuana City Council, 2024; Government of the State of Baja California, 2023a, 2023b; Government of the State of Jalisco, 2022a, 2022b). Both approaches provide public value but produce different levels of verifiability when social policy is interpreted as a commitment to SDG targets.

In poverty (SDG1), the state documents of Jalisco show high formal traceability by linking specific results with SDG goals and integrating indicators with a baseline and time target; Baja California, through its sectoral program, incorporates SDG alignment and monitoring components that allow part of the SDG–result–measurement chain to be reconstructed, although traceability depends on the consistency with which baselines, time targets, and monitoring routines are made explicit in the instruments analyzed. At the municipal level, the Tijuana ISV provides clear evidence of implementation through actions and beneficiary population, which allows us to observe operational scope, although with less capacity to infer welfare changes in comparable terms (H. XXIV Tijuana City Council, 2024; Government of the State of Baja California, 2023a; Government of the State of Jalisco, 2022a).

In education (SDG 4), both Baja California and Jalisco express orientation to inclusion, permanence and pedagogical strengthening; however, the challenge remains to connect actions with standardized outcome indicators—such as school dropout and terminal efficiency—so that monitoring does not depend exclusively on activity reports (Government of the State of Baja California, 2023b; Government of the State of Jalisco, 2022b; CONEVAL, 2023; INEGI, n.d.-a; INEGI, n.d.-b). Taken together, the findings reinforce that SDG-relevant traceability is not about "mentioning" targets, but about making the path to results verifiable through indicators that are comparable over time.

The main contribution of this article is proactive and applicable: the SDG Operational Localization Matrix (MOL-SDGs) and the minimum traceability traffic light offer a replicable instrument to move from discursive alignment to a documentarily verifiable alignment, through a minimum chain: SDG/target → local result → indicator → baseline → temporal goal → source → responsible → periodicity and monitoring mechanism. As a minimum quality standard, it is recommended that subnational instruments adopt indicator sheets with stable definitions, explicit sources and unified methodologies, in addition to making it clear who reviews the indicators, with what frequency and with what management consequences; in this sense, the results-based monitoring approach documented in the teaching and research staff of the University of Guadalajara functions as a useful institutional reference (University of Guadalajara, 2023).

In practical terms, the findings suggest that strengthening SDG localization does not imply choosing between "actions" or "indicators" but integrating both levels: maintaining coverage as evidence of implementation but accompanying it with a minimum core of outcome indicators with a baseline and time targets. This allows accountability to be simultaneously operational (what was done and to whom it reached) and substantive (what changed in poverty and educational trajectory).

As future lines, it is proposed: (i) to incorporate time series and evaluation strategies to better distinguish between coverage and results; (ii) expand the analysis to other municipalities and sectors (health, care, employment) to explore horizontal coherence of SDG planning; and (iii) to analyze in greater depth the role of intersectoral coordination as a condition that can explain differences in the quality of traceability and, eventually, in the improvement of indicators associated with poverty and education (Government of Mexico, 2018; UNDP, 2019).

Involvement in decision-makers

In terms of public management, SDG localization is strengthened when subnational instruments make it possible to move from "showing actions" to "governing results". The proposed minimum standard (MOL-SDG + traffic light) offers a simple rule: any SDG commitment on poverty or education must be traceable to an indicator with a baseline, time-bound target, responsible and monitoring routine. When that chain is missing, the document can communicate progress, but it hardly enables timely corrections. Therefore, the central contribution of this methodological note is to turn SDG localization into a verifiable planning and monitoring practice, useful for budgeting, coordinating, and being accountable with evidence.

Minimum Element	Guiding question (yes/no)	Expected evidence
1. Specific result or objective	Are the SDG and the target identified (explicit or inferable without ambiguity)?	Verifiable result/ objective statement
2. SDG linkage – target	Are the SDG and the target identified (explicit or inferable without ambiguity)?	SDGs and targets cited or clearly deduced
3. Intervention / Strategy	Is it explicit how the result is intended to be achieved? Is it explicit how the result is intended to be achieved?	Strategy, line of action or intervention
4. Verifiable indicator	Is it defined what is measured and how it is calculated?	Indicator Name + Definition
5. Data Source	Is there a reference value and year?	Identifiable institutional/ documentary source
6. Baseline	Are there reference values and year?	Baseline (value + year)
7. Target / Year	Is there a goal with value and year (achievement threshold)?	Goal (value + year)
8. Target population	Is it specified to whom it applies and the criteria for targeting?	Target population + criteria
9. Responsible and coordination	Is there an "owner" of the result/ indicator and defined coordination?	Responsible dependency + articulation mechanism
10. Monitoring / evaluation	Is periodicity and review mechanism established?	Dashboard/report/ evaluation + periodicity + responsible body

Table 4. MOL-SDG Checklist for Minimum Traceability in SDG 1 (Poverty) and SDG 4 (Education)

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CHAPTER 9

SDG 17: NATIONAL ALLIANCE OF NODESS TIJUANA IN NORTH, CENTRAL AND SOUTH MEXICO WITH 2030 AGENDA[1]

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ABSTRACT: NODESS Tijuana is the first Node for the Promotion of the Social and Solidarity Economy (NODESS) on the northern border of Mexico, created in 2022 under the leadership of the Tecnológico Nacional de México, Campus Tijuana. Its initial strategic axis focuses on food sovereignty, culture, and social innovation through the Sustainable Development Goals (SDGs) of the 2030 Agenda. Promotion of the

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Social and Solidarity Economy (SSE) to promote alternative models of economic development based on cooperation, solidarity and sustainability. And regional linkage through articulating efforts with other NODESS in the northern, central and southern regions of Mexico and with national strategic programs (PRONACES) of SECIHTI. NODESS TIJUANA has become a Research Network in Social and Solidarity Economy (RIESS Network) in the National Category.

1. INTRODUCTION

On September 22, 2022, the National Tour and Territorial Roundtables of Nodes for the Promotion of the Social and Solidarity Economy (NODESS) was held, for the Northern Border Region, based at the TecNM Campus Instituto Tecnológico de Cd. Jiménez, in Chihuahua. At first, a technical meeting was held with the liaisons and those responsible for the participating NODESS and NODESS PRE from the Northern Border Region of Mexico, which had the purpose that the representatives of the Higher Education Institutions share the results of the projects developed and the areas of opportunity for strengthening, of multiplying mechanisms of articulation methodologies, taking advantage of the experience generated for the benefit of new NODESS PRE in the Municipalities and the development of Cooperation Networks of NODESS PRE and regional NODESS [1].

In the intervention of the representation of the Technological Institute of Tijuana (ITT), Mtra. Maribel Guerrero Luis, Deputy Director of Planning and Liaison, announced the strategic role that the Technological Institute of Tijuana has played in more than 54 years in the region; in the training and development of specialized talent contributing to the strengthening of the different sectors of society, through leadership in Technological Higher Education, distinguishing this house of studies for the academic level, research and sectoral linkage, highlighting the statistics of Researchers with SNI Recognition of CONACYT, development and impact of research projects [2].

Likewise, Dr. Rodolfo Martínez Gutiérrez, head of NODESS TIJUANA, announced, and contextualized the actions derived from the Strategic Plan of the ITT Directorate since 2019 to develop the PRE NODESS TIJUANA project, presented the strategic allies of the project, the demonstrative effect of the initial phase of the PRE NODES TIJUANA was announced, which was oriented to the thematic line of Food Sovereignty, with specific objectives to map the needs of the supply chain and areas of opportunity in social innovation, in accordance with the National Strategic Programs (PRONACES) of CONACYT.

Finally, the project undertaken in 2019 as PRE NODESS TIJUANA, crystallized. Achieving the ITT, the national registration as the FIRST NODESS in the Northern Border Region of Mexico, occupying the leadership in the Border Municipalities of Baja California, Sonora, Chihuahua, Coahuila, Nuevo León and Tamaulipas.

The main objective of the NODESS TIJUANA Model presented at the national level by the TecNM Tijuana campus is the multiplying development of NODESS projects with a systemic approach (Fifth Systemic Helix) for institutional linkage with the different sectors of society, and with the aim of empowering the learning curve generated in the principles of the Social and Solidarity Economy.

The ITT contributes with academic linkage and strategic research actions to the collaborative work with the Municipal Institute of Citizen Participation of the City of Tijuana as Titular Member of the Sectoral Subcommittees for the monitoring of the progress of objectives and goals of the Municipal Development Plan 2022-2024 and the Strategic Plan for Municipal Development 2022-2036, all under the approach of alignment of competencies of the undergraduate and graduate educational programs to the National Strategic Programs of CONACYT, so that all together we can contribute to the challenges of the Plan de Nación in each region of Mexico.

2. METHODS AND MATERIALS

On March 6, 2024, the Tecnológico Nacional de México awarded the LETTER of ACCEPTANCE of the Social Economy Research Network (RIESS Network) in the NATIONAL Category, issued by the Directorate of Postgraduate, Research and Innovation in Mexico City. The RIESS Network has Researchers from North, Central and South Mexico, organized through a Board of Directors that integrates Regional Leaders; M.C. Blanca Esthela Zazueta Villavicencio from the Technological Institute of Agua Prieta (North Region 2), M.C.E. Adolfo Rivera Castillo from the Technological Institute of Hermosillo North Region 3), Dr. Armando Alberto León López from the Interdisciplinary Center for Research and Teaching in Technical Education - TecNM-CIIDET (Central Region), Dr. Jamín Balderrabano Briones from the Technological Institute of Úrsulo Galván (Southern Region), and as National Leader, Dr. Rodolfo Martínez Gutiérrez of the Technological Institute of Tijuana (Northern Region 1); Network Accepted with a validity for the period from January 2024 to December 2027. The agreements of the meeting of the RIESS Network was the formation of a Strategic Plan of the Network for the 3 years of validity, products will be established by Working Commissions for the rest of the members under a series of meeting activities to configure lines of action for Human Resources Training, Professional Residencies, Social Service, Local, regional, national and international liaison [3].

Likewise, the Development of Research Projects, Undergraduate and Postgraduate Theses. Consolidation of the work developed in the National Network of NODESS (Social and Solidarity Economy Development Nodes), the mechanisms of analysis and promotion of the lines of research of Academic Bodies, through the training and updating of Teachers and Researchers with links to the different Sectors of Society,

considering methodological tools of intervention such as the Fifth Systemic Helix (QHS); which includes representatives of the Government, Academia, Companies, Associations and Consultants.

3. RESULTS

From an approach to the analysis of the Sectoral Ecosystems in the different Regions of the National Territory (see Figure 1). The National Strategic Plans (PRONACES) and the Sustainable Development Goals (SDGs) of the UN's 2030 Agenda are a core point of the work axes for the development of Proposals for the improvement of a National Plan with an impact on the development and well-being of Society and the most vulnerable groups, towards a long-term sustainable approach.

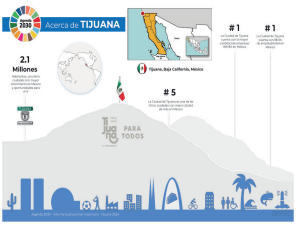
Figure 1: Map of the RIESS Network

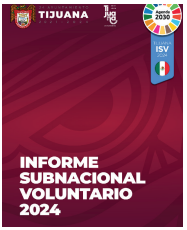
The RIESS Network is organized into a Board of Directors with regional leaders; below, the activities developed for strategic linkage at the national level in various cities of North, Central and South of Mexico are presented, promoting activities of Social Economy, Solidarity (SSE) and the 2030 Agenda, promoting the collaborative work of Academic Bodies, Research Groups, as well as administrative people and students to promote the empowerment of good practices of innovation and research according to local needs. regional and national.

NORTH of México

TIJUANA, B.C. – Installation of a Commission to Promote the Social Economy between Tijuana City Council and TecNM, an alliance of NODESS Tijuana [4].

TIJUANA, B.C. - Collaboration agreement for ISV Tijuana 2024 and 2025, between Tijuana City Council and TecNM Tijuana (Red RIESS and NODESS Tijuana) [5, 6].





ENSENADA, B.C. - TecNM Ensenada welcomes an International Speaker in the Framework of the 2030 Agenda and Agreement with Red RIESS – NODESS Tijuana [7].

NORTH of México

MEXICALI, B.C. – Mexicali is moving towards sustainable development with the preparation of the VLR 2025 (Agreement between the City Council and TecNM) [8, 9].

MEXICALI, B.C. – Mexicali is moving towards sustainable development with the preparation of the VLR 2025 (Agreement between the City Council and TecNM) [8, 9].

NOGALES, SON. - Agreement for Voluntary Subnational Report of the City of Nogales with TecNM Nogales and Red RIESS [11, 12].

NORTH of Mexico

AGUA PRIETA, SON. – Agreement for a Voluntary Subnational Report of the City Council of Agua Prieta with TecNM Agua Prieta and Red RIESS [13,14].

HERMOSILLO, SON. - Agreement for a Voluntary Subnational Report of the City of Hermosillo with TecNM Hermosillo and Red RIESS [15].

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CENTER of México

TLÁHUAC, CDMX. – Agreement between Academic Bodies and the RIESS Network [18].

Educación
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TECNOLÓGICO NACIONAL DE MÉXICO

INICIATIVA NACIONAL DE INFORMES SUBNACIONALES VOLUNTARIOS DE AGENDA 2030 CON APOYO DEL TECNM EN AYUNTAMIENTOS DE TODO MÉXICO

19 de marzo de 2025

Se desarrollo una reunión de trabajo sobre la iniciativa nacional para el progreso de los Informes Subnacionales Voluntarios (VLR) en los Ayuntamientos, con el apoyo del Tecnológico Nacional de México (TecNM) en todo el territorio nacional, a través de los Docentes e Investigadores Miembros del SNII del SECIHTI pertenecientes a Cuerpos Académicos de la Red Investigación de Economía Social y Solidaria (Red RIESS) del TecNM, con el apoyo legislativo de acuerdo a sus alcances, del Diputado Federal C. **Edén Garces Medina**, con la participación del Dr. **Rodolfo Martinez Gutierrez**, Líder Nacional de la Red RIESS del TecNM Campus Tijuana, como Asesor metodológico para el desarrollo de los VLR en los Ayuntamientos; la participación de la Dra. **Ana Lilia Bárcenas** Directora del TecNM Campus Tláhuac III, Dr. **Ignacio Nava Díaz**, Subdirector de Planeación y Vinculación de TecNM Tláhuac III.

Se analizo la hoja de ruta mas eficiente y los mecanismos de vinculación y articulación institucional para eficientizar los procesos de participación de mas Ayuntamientos y los distintos sectores de la sociedad, cabe mencionar que este tipo de ejercicios promueven el desarrollo local, las capacidades de articulación sistémica y dar a conocer los esfuerzos de cooperación del Gobierno, Academia, Empresas, Asociaciones y Consultores (Enfoque sistémico "QHS") para el desarrollo y progreso social sectorial, todo en beneficio de la sociedad, vinculando actividades de los NODESS, servicio social, residencias profesionales, tesis, programas de especialización . Todo lo anterior se deriva de los esfuerzos de colaboración entre la Dirección General y Secretaria Académica del Tecnológico Nacional de México con el Secretariado Ejecutivo de la Agenda 2030 de la Secretaria de Economía, y ahora con el respaldo de las gestiones legislativas del Diputado Federal C. Edén Garces Medina.

CENTER of México

TLÁHUAC, CDMX. – Agenda 2030 Reporting Agreement with Red RIESS [19].

Educación
Secretaría de Educación Pública

TECNOLÓGICO NACIONAL DE MÉXICO

SE IMPARTE EL TALLER PARA SISTEMATIZACIÓN DE PROYECTOS E INNOVACIONES EN ECONOMÍA SOCIAL Y SOLIDARIA Y AGENDA 2030

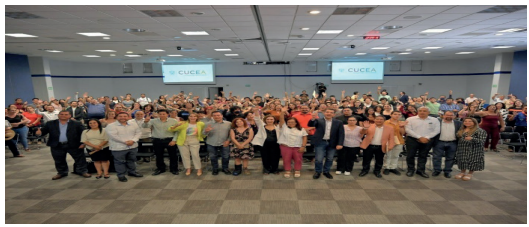
19 de febrero de 2025

Como parte de las actividades del NODESS Centiliztli y de la Maestría en Economía Social y Solidaria del Instituto Tecnológico de Tláhuac III, se llevó a cabo el Taller para Sistematización de Proyectos e Innovaciones en Economía Social y Solidaria, impartido por el Dr. **Rodolfo Martínez Gutiérrez**, Líder del Cuerpo Académico Competitividad Sectorial, Innovación Social y Desarrollo Sostenible del Instituto Tecnológico de Tijuana.

Este taller es una pieza clave para el desarrollo profesional continuo de nuestro profesorado, beneficiando directamente a las maestrías en Educación, Matemática Educativa, Enseñanza de las Ciencias Básicas y Tecnologías de la Información, con un enfoque especial en la Maestría en Economía Social y Solidaria. Durante la sesión, se fortalecieron conocimientos y habilidades en innovación social y desarrollo sostenible, además de fomentar una mayor colaboración académica y la generación de contribuciones científicas a través de publicaciones, propiedad intelectual y vínculos comunitarios.

CENTER of México

GUADALAJARA, JAL. – Agreement with CIATEJ and the University of Guadalajara for SECIHTI's research project with Red RIESS



ZITÁCUARO, MICH. – Conference on the 2030 Agenda and RIESS Network at the TecNM Research Congress.

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CENTER of México

COLIMA, COL. – Agreement for the Voluntary Subnational Report of the City of Colima with TecNM and RIESS Network [20, 21].

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4. CONCLUSIONS AND REFLECTIONS

The NODESS Tijuana Program has become a Social and Solidarity Economy Research Network (RIESS Network) with systemic linkage at the national level with different actors in society, the RIESS Network has defined strategic objectives for its operation:

1. Strengthen research on social and solidarity economy issues.
2. To consolidate graduate programs within the TecNM linked to this area.

3. Generate projects with a social impact, promoting cooperative, community and sustainable economic models.
4. Linking researchers from different regions of the country (North, Central, and South) to create a collaborative academic ecosystem.
5. Strengthening Lines of Generation and Application of Knowledge (LGAC).

The RIESS Network is characterized by promoting and promoting the following principles:

1. Academic: Promotes collaboration among researchers and strengthens scientific production.
2. Social: Promotes projects that seek to improve the quality of life through solidarity economy models.
3. Institutional: Reinforces the role of TecNM as a leader in research applied to social and economic problems.

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CHAPTER 10

SDG 17; RESEARCH AND DEVELOPMENT OF THE UN 2030 AGENDA, CASE: RIESS INTERNATIONAL NETWORK[1]

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[1] **Como citar:** Martinez Gutierrez, R., Lucas Bravo, G., Cerdá Suarez, L. M., Nagao Menezes, D. F., Wulf Betancourt, E., Morales Guerrero, R. E., Álvarez Rodríguez, J. F., Cuéllar de Reyes, G. Y., Arce Cordero, G., Quirós, M. J., & Arce Portugués, R. (2026). SDG 17; research and development of the UN 2030 Agenda, case: RIESS International Network. En *Systemic development for sustainability: Case studies of QHS methodology and 2030 agenda in voluntary local reports (VLRs)* (pp. 199–210). Atena. https://doi.org/10.22533/at.ed.727261102

ABSTRACT: In the context of the research project carried out by the Tecnológico Nacional de México (TecNM) called: "Systematization and Regional Analysis of the Voluntary Local Reports (VLR) of the Mexico 2030 Agenda" and the Project duly authorized by the Secretariat of Science, Humanities, Technology and Innovation (SECIHTI), a project entitled: "The NATIONAL OBSERVATORY OF SOCIAL AND SOLIDARITY ECONOMY PROJECTS, PRONACES, RESEARCH NETWORKS AND AGENDA 2030" will be developed in the Research Group Modality, with the active participation of the members of the Social and Solidarity Economy Research Network (RIESS Network) of the National Technological Institute of Mexico (TecNM) located on the Tijuana Campus, as well as with the collaboration of International Researchers. Under the outstanding national and international direction of the renowned researcher of the National System of Level 2 Researchers and coordinator of the graduate program, Dr. Rodolfo Martínez Gutiérrez, an extensive and exhaustive agenda of activities has been developed with the purpose of strengthening inter-institutional collaboration and academic connection at the national and global level. focused on issues such as the social economy, sustainability and the achievement of the Sustainable Development Goals (SDGs).

1. INTRODUCTION

The RIESS Network (Social and Solidarity Economy Research Network and Agenda 2030) of the Tecnológico Nacional de México (TecNM) is an academic framework that unites multiple TecNM institutions and guest institutions in the RIESS Network under the same objective: to research and promote the social and solidarity economy in Mexico, with leadership from TecNM Tijuana, Since its creation in 2024, it has generated local, regional, national and international linkage actions with different institutions.

It is worth mentioning that in 2025 he received an invitation from the Ministry of Foreign Affairs and the Executive Secretariat of the 2030 Agenda of the Ministry of Economy of the Government of Mexico as a distinguished member of the Official Delegation of the Government of Mexico to the prestigious High-Level Political Forum (HLPF) for the 2030 Agenda, the development of the international engagement agenda was extended to various countries, including Spain, El Salvador, Costa Rica, Panama, Colombia, Brazil and Chile, with the aim of promoting and strengthening academic interaction in relation to the evaluation reports of the Sustainable Development Goals at the regional level.

This initiative seeks to replicate the successful experience carried out in the border city of Tijuana, through the outstanding work carried out by the Tijuana Sustainable Development Node (NODESS Tijuana) and the Network of Sustainable Higher Education Institutions (RIESS), as highlighted by the expert in the field. The

outstanding active participation of Dr. Rodolfo Martínez in this relevant international commission, strongly supported by the Mexican government authorities, has as its main objective to strengthen and promote the collaboration and global projection of prestigious academic groups, in order to establish solid strategic alliances in the field of higher education and the generation of innovative high-impact scientific initiatives developed in the field of higher education. Mexican territory [1].

2. METHODS AND MATERIALS

Among the outstanding actions of linkage and international cooperation, it is relevant to mention the Participation in the United Nations Organization (New York, United States): It was part of the Official Delegation of the Government of Mexico in the High-Level Political Forum (HLPF), coordinated by the Mission of Mexico to the UN [2] on the 2030 Agenda where progress at the global level in the Sustainable Development Goals was addressed. see Figure 1.

Likewise, significant collaborations have been made in various countries in Europe and Latin America, promoting and promoting various projects and academic alliances in different countries such as Spain [3] (See Figure 2), El Salvador [4, 5] (See Figure 3), Costa Rica [6, 7, 8] see Figure 4, 5 and 6, Panama [8] see Figure 7, Colombia [9] see Figure 8, Brazil [10] see Figure 9 and Chile [11, 12] see Figure 10, with the laudable purpose of successfully replicating methodologies for evaluating the Sustainable Development Goals (SDGs) and significantly strengthening regional cooperation. And finally, the excellent collaboration between the Executive Secretariat of the 2030 Agenda of Mexico and the RIESS Network [13] see Figure 11. Linkage with INAES dissemination mechanisms – NOVEDADESS [14] see Figure 13.

Figure 1. Attendance at HLPF 2025 at UN New York from Agenda 2030 [2].

Figure 2. Linkage between the RIESS Network and UNIR University in Spain [3].

Figure 3. Linkage between the RIESS Network and UNIR University in Spain [3].

Figure 4. Linkage between the RIESS Network and the National Technical University (UTN) of Costa Rica [6].

Figure 5. Linkage between Red RIESS and Universidad Braulio Carrillo (UBC) of Costa Rica [7].

Figure 6. Linkage between Red RIESS and Universidad Nacional (UNA) of Costa Rica [8].

Figura 7. Vinculación entre Red RIESS y Universidad de Panamá [9].

Figure 8. Linkage between Red RIESS and Potificia Universidad Javeriana de Bogotá, Colombia [10].

Figure 9. Linkage between Red RIESS and FACAM of Campinas in Brazil [11].

Figure 10. Linkage between Red RIESS and Universidad de la Serena de Chile [12].

Figure 11. Linkage between the RIESS Network and Mexico's 2030 Agenda [13].

Figure 12. TecNM's institutional support for the RIESS Network

Figure 13. Dissemination of RIESS Network activities in INAES' NovedaDESS [14].

3. RESULTS

The ambitious Voluntary Subnational Reporting (VSR) project has as its main objective to carry out an exhaustive analysis of the adequate implementation of the Sustainable Development Goals (SDGs) in a total of 100 Mexican cities, thus establishing a significant connection at the international level. In addition, it seeks to promote the democratization of knowledge and the wide dissemination of best practices in this area that is so relevant for sustainable development. In this interesting context, the respected academic has placed special emphasis on the relevance of establishing connections between the activities of the project and international specialists, with the purpose of "enhancing the productivity rates of both consolidated researchers and emerging researchers of the RIESS Research Network, as well as of the academic groups involved, through collaboration agreements and the exploration of possibilities that result in benefits for the local region".

Dr. Martínez was able to strengthen his connections at the global level with a variety of academics and authorities, including representatives of the Catholic University of El Salvador, the Pontificia Javeriana University of Bogotá (Colombia), the National University of Costa Rica, the National Technical University of Costa Rica, the Braulio Carrillo University (Costa Rica), the University of Panama, the University of La Serena (Chile), the Campinas University Center (Brazil) and the International University La Rioja (UNIR) in Spain.

4. CONCLUSIONS AND REFLECTIONS

The ISV project seeks to democratize knowledge and link international experts to implement the SDGs in 100 Mexican cities, led by the TecNM and Dr. Rodolfo Martínez. "We seek to carry out projects and publications that contribute to local development in areas such as sustainability and the social economy through the lines of research," added Martínez, who is also the postgraduate coordinator at the TecNM.

It is important to note that the Tecnológico Nacional de México (TecNM) is an outstanding educational institution with an impressive number of more than 600,000 students enrolled in higher education and graduate programs throughout the country, with a total of 264 campuses and centers dedicated to research and innovation. This modern communications infrastructure effectively facilitates the link and coordination with the different City Councils located in the north, center and south of the Mexican territory. Within its policy of institutional linkage and intersectoral collaboration, a comprehensive and holistic approach to the Fifth Systemic Helix (QHS) has been actively promoted, which synergistically involves representatives of the Government, Academia, Companies, Associations-Chambers, Researchers and Consultants, thus enriching a methodological strategy of inclusion and citizen participation in all areas and segments of society.

In the course of its activities, the Tecnológico Nacional de México Campus Tijuana has carried out a wide variety of research projects related to the 2030 Agenda, establishing a detailed intervention model for the implementation of an Urban Sustainability Index that can be replicated through collaboration agreements in a number of more than 10 cities. with prospects of expansion to more than 100 locations between 2025 and 2028. The significant impact of the international link of the RIESS Network can be summarized in fundamental pillars that have strengthened its presence at the national level, strengthening the RIESS consolidating the leadership in the National Network of Research in Social and Solidarity Economy, these actions have allowed this network to have a national and international reach, connecting Mexican researchers with colleagues from other countries. See Figure 14.

1. SDGs and 2030 Agenda: Its projects seek to systematize voluntary local reports (VLRs) in Mexico and share experiences with other countries, contributing to the regional evaluation of the SDGs, such as SECIHTI's project for 100 ISVs in 100 City Councils in Mexico, as well as the training of 1,000,0000 students in the Sustainable Development Goals (SDGs) of the UN 2030 Agenda [15, 16, 17, 18, 19].

Figure 14. Books and articles developed by the RIESS Network at regional, national and international level (Publications in Spanish, English, Portuguese and Chinese).

All of the above with the purpose of consolidating the Research Network to address national problems, through collaborative work from academia, government, companies, associations and researchers and consultants (QHS Methodology approach).

2. The leadership of the RIESS Network has achieved a strategic national and international link that combines participation in global forums (UN), academic alliances in Europe and Latin America, research stays abroad and publications in international conferences (See Figure 15). All this positions the RIESS Network as a benchmark in Mexico in issues of social economy, sustainability and international cooperation for the SDGs, to promote the development of new researchers from different regions of Mexico and internationally through cooperation, linkage and research projects.

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Figure 15. Key institutions for 100 VLR project in 100 Cities through TecNM RIESS Research Network (2025 – 2027), and the city of Tijuana as a national reference [20].

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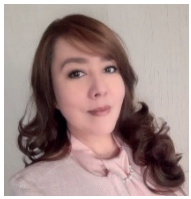
Competitividad Sectorial, Innovación Social y Desarrollo Sostenible

NODESS Tijuana Baja California

TecNM • Red de Investigación RIESS Economía Social y Solidaria

QHS METODOLOGÍA
QUINTA HÉLICE SISTÉMICA
Desarrollo y Crecimiento de la Sociedad



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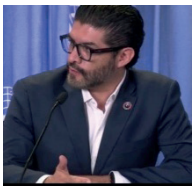

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EN MÉXICO

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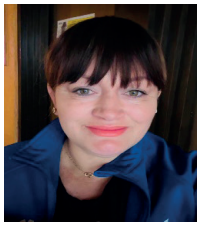

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She is an outstanding professional and academic with a solid background in the economic-administrative and international business areas. He has a master's degree in international executive management from the Universidad Iberoamericana Tijuana campus and a bachelor's degree in administration from the Tijuana Institute of Technology. Currently, he is a PhD candidate in Administration and International Business from the Educational Society of Baja California, A.C. His professional career is distinguished by his extensive experience in logistics and supply chain, particularly within the medical cluster of the manufacturing industry in Baja California. In the academic sector, she is a collaborator in the development of content for state specialty subjects at the TecNM, a university professor and researcher in the area of economic-administrative sciences, where she currently plays a managerial role at the TecNM ITT coordinating the Master's Degree in Administration, as well as head of the department which groups four undergraduate and two postgraduate degrees.

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Academic and professional in the field of education. Since 2022 he has held the position of Academic Secretary of Research and Innovation at the Tecnológico Nacional de México, where he supervises curriculum design, research, innovation and other activities in the institution's 254 institutes, centers and technological units in Mexico. Academic training includes a Bachelor's Degree in Secondary Education with a specialty in Physics from the Escuela Normal Superior de México, as well as several Master's Degrees in Education Sciences, Educational Technology and Education, obtained in recognized institutions such as the Institute of University Studies of the State of Mexico, the Technological Institute of Higher Studies of Monterrey and the Inter-American University for Development. In addition, a doctorate in Educational Management and Intervention at the Interdisciplinary Center for Innovation and Postgraduate Studies. His commitment to the advancement of education and his dedication to academic development make him an inspiring leader in his field.

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Case Studies of QHS Methodology and 2030 Agenda in Voluntary Local Reports (VLRs)

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