Sustainable Economic Observatory

GUATEMALA INNOVATION ROADMAP 2019

In collaboration with:
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EXECUTIVE SUMMARY

RTI International (RTI) and Universidad del Valle de Guatemala (UVG) are partners in the Sustainable Economic Observatory (SEO), an independent think tank funded by United States Agency for International Development (USAID) that is tasked with strengthening the participation and contribution of civil society, the public and private sectors, and other stakeholders, through analysis, design, and implementation of effective policies and programs. The SEO aims to implement an innovation roadmap (“roadmap”) to strengthen the innovation ecosystem and subsequently increase the impact that science, technology, and innovation can have on the GDP of Guatemala. The roadmap defines a set of prescribed actions that stakeholders in the public, private, and academic sectors in Guatemala can do to improve their economic prospects and to help improve the quality of life for citizens.

An innovation ecosystem, as defined by RTI, is a network of organizations and individuals with assets, such as human creativity, business acumen, scientific discovery, and investment capital. These organizations and individuals come together to cultivate ideas so they can grow into programs, enterprises, and industries to create positive societal and economic impacts. RTI uses an innovation framework to assess the opportunities, potential, and barriers to building an innovation ecosystem. For stakeholders in Guatemala, the innovation ecosystem framework provided a way to characterize the quality and frequency of interactions among actors, and the underlying foundation for those interactions and transactions.

To develop the roadmap, RTI analysts used the existing research on Guatemala’s innovation economy, assets, and human capital to create a common understanding of the status of the country’s innovation ecosystem. Analysts then conducted an introductory workshop with local stakeholders to understand the current context and attitudes about the potential for developing an innovation ecosystem in Guatemala. We augmented these findings with focused interviews with private industry partners who were under-represented in prior assessments including small, medium, and large businesses in food and beverage, biotechnology, financing, manufacturing, energy, and digital technology. We held an interactive workshop to vet the ideas resulting from the research and to identify actionable next steps. We then took the inputs from the workshop, and combined them with the findings from interviews to create five central pillars representing key areas of action:

- Improving human capital to innovate or more fully participate in an innovative workforce
- Strengthening university-industry alliances
- Modernizing legal structures
- Creating a coordinating entity to build a country-wide platform for innovation
- Building knowledge and capacity across the innovation ecosystem.

For each of the five pillars, we proposed a set of activities set related to a key goal that will to improve performance in that area. Each activity has a sector (industry, academia, or government) with primary responsibility for its implementation, as well as other supporting organizations that will contribute to implementation. The proposed activities are divided between short-term (activities that take 1–3 years to complete), medium-term (activities that take 3-5 years to complete), and long-term (activities that take 5 years or more to complete). We have developed a separate document, provided to the SEO, that contains a series of recommended performance indicators for the stakeholders and coordinating body to consider as they begin implementation of the roadmap. It is intended that future work will be undertaken to monitor progress toward implementing the areas of action for this roadmap.
ABOUT THE ROADMAP

RTI International (RTI) and Universidad del Valle de Guatemala (UVG) are partners in the Sustainable Economic Observatory (SEO), an independent think tank tasked with strengthening the participation and contribution of civil society, the public and private sectors, and other stakeholders through analysis, design, and implementation of effective policies and programs. In its program area of economic competitiveness, the SEO aims to implement an innovation roadmap to strengthen the innovation ecosystem and subsequently increase the impact that science, technology, and innovation can have on the GDP of Guatemala.

Prior to creating the innovation roadmap, RTI’s research team set out to understand the current state of the innovation ecosystem in Guatemala. The data for Guatemala shows a weak foundation and limited interaction among sectors in the ecosystem. The ecosystem struggles with low levels of human capital and a culture that discourages innovation. The country does not currently compete as a global innovator and struggles with low investment in education, low levels of enrollment in higher education, low levels of research and development (R&D), and little information about private sector innovation.

The SEO is eager to build from the extensive studies on Guatemala’s innovation economy to develop a plan to strengthen the components and linkages of the country’s innovation ecosystem. This roadmap provides a set of concrete, actionable recommendations, broken down into short-, medium-, and long-term actions for four stakeholder categories in the ecosystem: the public sector, the private sector, academia, and the SEO. The roadmap is designed to help these stakeholders clearly identify priority areas of action, make definitive plans, and prioritize initiatives for years to come.

The Sustainable Economic Observatory (SEO) is a five-year project that started in 2017. The project, based at the Universidad del Valle de Guatemala, has three additional partners that compose the consortium: ASIES (Research and Social Studies Association), RTI International, and FUNCAFE (Foundation of Coffee for Rural Development).

The SEO’s purpose is to work as an independent think tank that supports the efforts of civil society, the Government of Guatemala (GOG), private sector, academia, and local actors to strengthen their involvement at both the local and national levels to discuss, analyze, design, and promote evidence-based and effective public policies and programs in four critical areas for sustainable economic and social development.

The SEO will focus on food and nutrition security; development of the agricultural sector; environment, climate change, and biodiversity conservation; and a competitive and business-friendly environment. To date, the SEO has developed and managed a platform for discussion and has fostered strategic alliances to support advocacy efforts to encourage innovation ecosystems and entrepreneurship in Guatemala.

The SENACYT was established as part of the National System of Science and Technology to enable Guatemala to achieve global competitiveness in science and build the workforce of tomorrow. SENACYT works to promote scientific research, innovation, and technology transfer at a national level.
ACRONYMS AND ABBREVIATIONS

AGEXPORT  Asociación General de Exportadores
AGG  Asociación de Gerentes de Guatemala
AMCHAM  American Chamber of Commerce in Guatemala
ASIES  Asociación de Investigación y Estudios Sociales
CAMAGRO  Cámara de Agricultura de Guatemala
CIG  Cámara de Industria de Guatemala
CONCYT  Consejo Nacional de Ciencia y Tecnología
FUNDEGUA  Fundación Desarrolla Guatemala
FUNDESA  Fundación para el Desarrollo de Guatemala
GEM  Global Entrepreneurship Monitor
GII  Global Innovation Index
INSEAD  European Institute of Business Administration
KTTO  Knowledge and Technology Transfer Office
NGO  Non-governmental Organization
PRONACOM  Programa Nacional de Competitividad
R&D  Research & Development
RTI  Research Triangle Institute
SENACYT  Secretaría Nacional de Ciencia y Tecnología
SEO  Sustainable Economic Observatory
SME  Small-to-Medium Sized Enterprises
STEAM  Science, Technology, Engineering, Arts, and Math
UNESCO  United Nations Educational, Scientific, and Cultural Organization
UVG  Universidad del Valle de Guatemala
WIPO  World Intellectual Property Organization
THE CHALLENGE

Guatemala is a medium-sized, lower middle-income country in Central America with a population of over 16 million. It spent much of the second half of the twentieth century in armed conflict between military governments and revolutionary forces, which ended with peace accords in 1996. Now, it has the fastest growing population in Central America with a large youth population, but has stagnant economic growth and high levels of income and gender inequality. The country has faced significant barriers to improving its economy, particularly in the areas of science, technology, and innovation (United Nations Education, Scientific and Cultural Organization [UNESCO], 2017). Guatemala ranks 102nd in the 2018 Global Innovation Index, and ranks low on human capital, institutions, and knowledge outputs in the Gender Inequality Index (GII) ranking (Cornell University, European Institute of Business Administration [INSEAD], and World Intellectual Property Organization [WIPO], 2018).

Guatemala is consistently an exporter of agricultural products and low-value manufactured goods, such as coffee, agricultural products, and textiles (Center for International Development at Harvard University, 2016). However, the country struggles with a low level of growth and development as measured by the GDP (Figure 1). Guatemala also has a culture of entrepreneurship and a small but motivated community of innovators; the majority of adults view entrepreneurship as a good career option and aspire to start their own businesses (GEM, 2017). In combination with a growing youth population, it is an opportune time for Guatemala to envision, build, and develop its innovation ecosystem to drive growth and economic opportunity. Accordingly, stakeholders in the public, private, and academic sectors acknowledge the need to place the economy and workforce on a growth trajectory that is driven by innovation and higher value-added goods and services.

Figure 1: Guatemala and Central American Peers: Gross Domestic Product (GDP) Per Capita, Purchasing Power Parity (PPP) (2017)
Source: World Bank World Development Indicators, 2017
We define an innovation ecosystem as a network of organizations and individuals with assets, such as human creativity, business acumen, scientific discovery, and investment capital. These organizations and individuals come together to cultivate ideas so they can grow into programs, enterprises, and industries to create positive societal and economic impacts.
OUR APPROACH

RTI analysts used the existing research on Guatemala’s innovation economy, assets, and human capital to create a common understanding of the status of the country’s innovation ecosystem. Analysts then conducted an introductory workshop with local stakeholders to understand the current context and attitudes about the potential for developing an innovation ecosystem in Guatemala. We augmented these findings with focused interviews with private industry partners who were under-represented in prior assessments. The private-sector companies included a mix of small, medium, and large businesses in food and beverage, biotechnology, financing, manufacturing, energy, and digital technology. Finally, we held an interactive workshop to vet the ideas generated by the research and to identify actionable next steps. The results of the workshop are presented in this roadmap.
THE RESULTS

RTI drew from existing research from national and international sources, including innovation data, and used RTI’s innovation ecosystem framework (Figure 2) to identify strengths, weaknesses, and gaps in the existing innovation climate in Guatemala. The existing analyses reviewed by the research team pointed out an ecosystem with low outputs of innovative activities, challenges in existing legal structures, and difficulty developing and retaining skilled human capital. RTI presented its findings to the SEO, and a group of approximately 65 stakeholders from the public, private, academic, NGO, and donor sectors in a multiday stakeholder workshop in September 2018. RTI presented approximately 30 ideas for action, and workshop participants also generated their own ideas. Following a facilitated stakeholder discussion with an impact-difficulty matrix (Figure 3), RTI directed the group to agree on a definition of impact. After the workshop, RTI synthesized key findings and created five central pillars representing key areas of action.

![Impact Difficulty Matrix](image-url)

Figure 3: Impact Difficulty Matrix used to help prioritize ideas for the Innovation Roadmap
Stakeholders defined the impact of innovation as:

• Improving the quality of life
• Generating quality, well-paid jobs
• Improving human capital
• Generating businesses
• Attracting investment
How to Use This Roadmap

For each of the five pillars, RTI has proposes a series of activities. Each activity has a sector with primary responsibility for its implementation (designated with a star in the roadmap), as well as other supporting organizations (designated with a circle) that will contribute to implementation. Additionally, the activities are color-coded and correspond to the categories/goals listed in the upper right hand box in each of the diagrams. There are two formats for the diagrams. First, the roadmap displays the activities for each of the five pillars. The short-, medium-, and long-term actions are shown in each diagram and subsequent table. In the appendix of this document, there are three larger diagrams that illustrate the roadmap by time horizon: one for each of the short-term, medium-term, and long-term activities across each of the five pillars.
At the workshop, the participants worked in teams to create impact difficulty matrices that prioritized all of the ideas for action. They then all worked together to identify key trends and themes. RTI then synthesized all matrices to determine five key thematic pillars of action.

RTI organized the priority activities by time frame and by the key organizations or institutions needed to implement each activity.

The time frame for the activities is divided as follows:

- Short-term (activities that take 1–3 years to complete)
- Medium-term (activities that take 3–5 years to complete)
- Long-term (activities that take 5 years or more to complete)

Below, for each activity, we list the primary sectors needed for implementation along with example organizations.

- The SEO acts as a facilitator across the innovation ecosystem, working with its partners, including Asociación de Investigación y Estudios Sociales (ASIES), Red Nacional de Grupo Gestores, and with its strategic alliances, including those with Programa Nacional de Competitividad de Guatemala (PRONACOM), Asociación de Gerentes de Guatemala (AGG), Fundación para el Desarrollo de Guatemala (FUNDESA), Cámara de la Industria Guatemalteca (CIG), Asociación de Exportadores de Guatemala (AGEXPORT), American Chamber of Commerce (AMCHAM), and Cámara de Agricultura (CAMAGRO).

- Government: This includes public institutions for science and technology (e.g., Secretaría Nacional de Ciencia y Tecnología [SENACYT] and Consejo Nacional de Ciencia y Tecnología [CONCYT]), and relevant ministries, including the Ministry of Economy and Ministry of Education, and public agencies, such as PRONACOM.

- Academia: Examples include the primary research universities in the country, as well as technical colleges and other institutions of higher education.

- Industry: Examples include industry associations, such as AGEXPORT, chambers of industry, large exporters and manufacturers, multinationals, small and medium enterprises (SMEs), and start-ups.

- Support services and connectors: These include domestic support organizations like AGEXPORT and Campus Tec, as well as international nongovernmental organizations (NGOs) based in Guatemala.

- Investors: These include domestic investors in innovation from the private and public sectors, as well as foreign direct investors and cooperation funders.
IMPROVE HUMAN CAPITAL

People are the foundation of the innovation ecosystem. Innovation in the private sector, start-ups, academia, the public sector, and within society begins with educated human capital. It requires a mix of primary and secondary education, technical education, STEAM, university education, doctoral research, and creativity. Guatemala struggles with low levels of funding for education and low enrollment in higher education. Therefore, improving education is critical for establishing an innovation ecosystem.

The SEO and stakeholders identified the following series of goals to improve human capital and improve the foundation of the ecosystem:

- Strengthen/facilitate implementation of Ley de Fortalecimiento al Emprendimiento, which aims to improve primary and secondary education, particularly in areas of innovation and entrepreneurship. For example, expand innovation and entrepreneurship to the intermediate cities outside of the capital, aligning the cities with the Urban Agenda and Plan K’atun 2032.
- Improve and promote STEAM education at the primary and secondary levels.
- Improve and promote STEAM education at the technical and university levels. Incentivize attraction and retention of graduate and doctoral students for technology and other careers based on the industry needs.

GOALS

Strengthen/facilitate implementation of Ley de Fortalecimiento al Emprendimiento, which aims to improve primary and secondary education, particularly in areas of innovation and entrepreneurship.

Improve and promote STEAM education at the primary and secondary levels.

Improve and promote STEAM education at the technical and university level. Incentivize attraction and retention of graduate and doctoral students.

- Invite entrepreneurs to speak at rural and city schools to inspire the youth to see themselves in the speaker’s role.
- Study curriculum needs and deficiencies in Guatemala, as well as global best practices for innovation and entrepreneurship.
- Increase and standardize the invitation of scientists and engineers to mentor students and speak at rural and city schools to inspire the youth to see themselves in the speaker’s role.
- Create a community of practice group for STEAM students that engages, supports, and encourages their retention in STEAM for the long-term.

Develop curriculum and plan for innovation and entrepreneurship.

- Pilot innovation and entrepreneurship curriculum in 6–10 schools.
- Develop/strengthen STEAM-based programs and activities that cultivate interest in STEAM, develop applied scientists, and create communities of practice (e.g., First Robotics, Odyssey of the Mind, and science fair competitions) to prepare these students to continue into advanced education.
- Establish recruitment activities and job placements between STEAM students and Guatemalan companies.
- Identify and recruit companies to sponsor scholarships and grants for undergraduate and doctoral researchers in their areas of interest.

Chart performance of pilot schools for at least 3–5 years after curriculum implementation.

Address needed improvements in curriculum.

Expand innovation and entrepreneurship curriculum nationwide.

- Establish a formal, regularly occurring mentoring program between scientists and engineers from leading Guatemalan companies and target schools.
- Increase STEAM funding for primary and secondary education.
- Hire specialized faculty in STEAM, innovation, and entrepreneurship.
- Increase funding for STEAM, innovation, and entrepreneurship to universities.
For each of the five pillars, there is a table that repeats the information relayed in the graphic and text from the previous page. The table has been included because it demonstrates how the short-, medium-, and long-term actions build upon each other to enable completion of the goal.

The sectors listed next to each activity in the chart below play a role in completing the action. The sector in bold is the lead facilitator, responsible for coordinating the roles and responsibilities of all contributors. However, since this is a team effort, the lead sector is not the lead implementor of activities.

Figure 4: Short-, Medium-, and Long-Term Actions to Improve Human Capital

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>GOAL</th>
<th>SHORT-TERM ACTION</th>
<th>MEDIUM-TERM ACTION</th>
<th>LONG-TERM ACTION</th>
</tr>
</thead>
</table>
| SEO/GOVT/ACAD/INDUS | Strengthen/facilitate implementation of Ley de Fortalecimiento al Emprendimiento, which aims to improve primary and secondary education, particularly in areas of innovation and entrepreneurship. | • Invite entrepreneurs to speak at rural and city schools to inspire the youth to see themselves in the speaker’s role.  
• Study curriculum needs and deficiencies in Guatemala, as well as global best practices for innovation and entrepreneurship. | • Develop curriculum and plan for innovation and entrepreneurship.  
• Pilot innovation and entrepreneurship curriculum in 6-10 schools. | • Chart performance of pilot schools for at least 3–5 years after curriculum implementation.  
• Address needed improvements in curriculum.  
• Expand innovation and entrepreneurship curriculum nationwide. |
| ACAD/GOVT/SEO/INDUS | Improve and promote STEAM education at the primary and secondary levels. | Increase and standardize the invitation of scientists and engineers to mentor students and speak at rural and city schools to inspire the youth to see themselves in the speaker’s role. | Develop/strengthen STEAM-based programs and activities that cultivate interest in STEAM, develop applied scientists and create communities of practice, (e.g., First Robotics, Odyssey of the Mind, and science fair competitions) to prepare these students to continue into advanced education. | • Establish a formal, regularly occurring mentoring program between scientists and engineers from leading Guatemalan companies and target schools.  
• Increase STEAM funding for primary and secondary education. |
| ACAD/SEO/INDUS/GOVT | Improve and promote STEAM education at the technical and university level. Incentivize attraction and retention of graduate and doctoral students. | Create a community of practice group for STEAM students that engages, supports, and encourages their retention in STEAM for the long- term. | • Establish recruitment activities and job placements between STEAM students and Guatemalan companies.  
• Identify and recruit companies to sponsor scholarships and grants for undergraduate and doctoral researchers in their areas of interest. | • Hire specialized faculty in STEAM, innovation, and entrepreneurship.  
• Increase funding for STEAM, innovation, and entrepreneurship to universities. |
STRENGTHEN UNIVERSITY-INDUSTRY ALLIANCES

Industry sectors and firms with university links tend to have higher productivity, market share, quality of products and services, and cost competitiveness when compared to similar sectors or firms without these types of relationships. Formalized university-industry alliances facilitate improved human capital development, technology transfer, industry-led research, incubation, and informal transfers of knowledge between the academic and private sectors.

The SEO and stakeholders identified the following series of goals to improve university-industry alliances:

• Build a national platform for technology transfer of university research to provide a portal for easy communication to industry. This national platform should build off existing assets and expansion of KTTOs working at the university level.

• Streamline, or make more efficient and effective, mechanisms for universities to provide research services to the private sector. For example, providing research services requires a different business model than teaching students or conducting government-funded research. Business processes, such as project management, service delivery, payment, and contracts, must be designed to deliver value to industry.

• Continue creating university-industry clusters in targeted sectors to spur economic growth and competitiveness. Figure 5 shows short term actions for building an agriculture cluster.

GOALS

Build a national platform for technology transfer of university research to provide a web portal for easy communication to industry.
Enable the universities to provide research services to the private sector.
Continue creating university-industry clusters in targeted sectors for economic growth and competitiveness.

Color of action text corresponds to goal above.

Map and categorize the assets of each university. Identify technologies ready for transfer. Identify the technology transfer capabilities of each university.

Conduct a pilot training on university knowledge and technology transfer office best practices.
Identify individuals at leading universities who are responsible for sponsored research. Learn about their challenges to identifying industry partners and needs. Train them on ways to overcome these challenges.
Create university-industry internship program in the agriculture sector.
Form pilot agriculture cluster with university, industry, and government.
Leverage public and private funding for industry specific research projects in the pilot cluster.

Expand technology transfer training to the majority of Guatemalan universities.

Educate and train university officials on options for working with industry (i.e., sponsored research, research as a service).

Develop agriculture industry-specific curriculum at universities.

Expand the university-industry cluster beyond the agriculture sector to other targeted sectors, such as ICT, manufacturing, creative industries, robotics, pharmaceuticals, and/or other strategic areas for Guatemala.

Establish a network of knowledge and technology transfer offices to form a community of practice, sharing practices and learnings.

Expand the knowledge from trained sponsored research leaders and university officials to the wider community of universities so that best practices can further be adopted.

Continue expansion of the university-industry cluster beyond the agriculture sector to other targeted sectors, such as ICT, manufacturing, creative industries, robotics, pharmaceuticals, and/or other strategic areas for Guatemala.
### Figure 5: Short-, Medium-, and Long-Term Actions to Strengthen University-Industry Alliances

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>GOAL</th>
<th>SHORT-TERM ACTION</th>
<th>MEDIUM-TERM ACTION</th>
<th>LONG-TERM ACTION</th>
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<tbody>
<tr>
<td>SEO/ACAD</td>
<td>Build a national platform for technology transfer of university research to provide a web portal for easy communication to industry.</td>
<td>- Map and categorize the assets of each university. Identify technologies ready for transfer. Identify the technology transfer capabilities of each university. - Conduct a pilot training on university knowledge and technology transfer office best practices.</td>
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<td>Establish a network of knowledge and technology transfer offices to form a community of practice, sharing practices and learnings.</td>
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<tr>
<td>SEO/ACAD/INDUS</td>
<td>Enable the universities to provide research services to the private sector.</td>
<td>Identify individuals at leading universities who are responsible for sponsored research. Learn about their challenges to identifying industry partners and needs. Train them on ways to overcome these challenges.</td>
<td>Educate and train university officials on options for working with industry (i.e., sponsored research, research as a service).</td>
<td>Expand the knowledge from trained sponsored research leaders and university officials to the wider community of universities so that best practices can further be adopted.</td>
</tr>
<tr>
<td>ACAD/SEO/INDUS</td>
<td>Continue creating university-industry clusters in targeted sectors for economic growth and competitiveness.</td>
<td>- Create university-industry internship program in the agriculture sector. - Form pilot agriculture cluster with university, industry, and government. - Leverage public and private funding for industry specific research projects in the pilot cluster.</td>
<td>- Develop agriculture industry-specific curriculum at universities. - Expand the university-industry cluster beyond the agriculture sector to other targeted sectors, such as ICT, manufacturing, creative industries, robotics, pharmaceuticals, and/or other strategic areas for Guatemala.</td>
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MODERNIZE LEGAL STRUCTURES FOR INNOVATION

Innovation policy builds the enabling environment to protect new ideas and to help ensure that innovators have access to the resources needed to bring new ideas to market. Improved legal structures include tax benefits for R&D, intellectual property laws, investor protection, ease of doing business, and better contract protection for small businesses. Guatemalan innovators and entrepreneurs today face a challenging legal system with barriers to scale-up university research and start-ups.

To modernize Guatemala's legal structures, the SEO and stakeholders identified the set of goals presented below that, once achieved, can improve innovative business competitiveness and innovation output. In implementing this roadmap, it is important to take into consideration and align with the National Science and Technology Plan, Plan K’atun 2032 and National Competitiveness Policy and in its regional strategies, Plans for Intermediate Cities, and Decree 20-2018: Law of Strengthening Entrepreneurship. This can include the review, update, design, promotion, and implementation of public programs, public policies, guidelines instruments, and laws.

- Incentivize research and development through tax credits and other mechanisms that can stimulate innovation.
- Modernize and streamline the process of intellectual property protection.
- Continue updating laws for equity investors, particularly protection for minority investors in start-ups.
- Streamline laws for business formation, contracting, and ease of doing business for entrepreneurs.

GOALS

| Incentivize research and development through tax credits and other mechanisms that stimulate innovation. |
| Modernize and streamline the process of intellectual property protection. |
| Continue updating laws for equity investors, particularly protection for minority investors in start-ups. |
| Streamline laws for business formation, contracting, and ease of doing business for entrepreneurs. |

Color of action text corresponds to goal above.

- Share global best practices in incentivizing R&D through tax credits and financial mechanisms.
- Identify legal obstacles to university technology transfer through intellectual property protection.
- Educate the public by creating an awareness and education page on the SEO’s website (e.g., https://ipassesment.uspto.gov/).
- Identify obstacles for minority shareholders and equity investors; share global best practices.
- Understand the legal hurdles for creating and managing businesses.

- Train legislators and government officials on the benefits of fiscal incentives for stimulating innovation.
- Train legislators and government officials on IP policy.
- Train legislators and government officials on investor protection policy.
- Shorten the time required to start a business to less than 7 days by updating the legal structure (the current average is more than 25 days).

- Establish an R&D tax credit and other fiscal incentives for investing in innovation.
- Update laws for IP legal protection to address the obstacles faced by innovators.
- Establish a structure for continuous evaluation and improvement of effective policy.
- Update investment laws to promote investment and protect minority investors.
- Evaluate outcome of new policy to verify that business formation process is quicker.
### Figure 6: Short-, Medium-, and Long-Term Actions to Modernize Legal Structures for Innovation

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>GOAL</th>
<th>SHORT-TERM ACTION</th>
<th>MEDIUM-TERM ACTION</th>
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<tbody>
<tr>
<td>SEO/GOVT/INDUS</td>
<td>Incentivize research and development through tax credits and other mechanisms that stimulate innovation.</td>
<td>Share global best practices in incentivizing R&amp;D through tax credits and financial mechanisms.</td>
<td>Train legislators and government officials on the benefits of fiscal incentives for stimulating innovation.</td>
<td>Establish an R&amp;D tax credit and other fiscal incentives for investing in innovation.</td>
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<td>SEO/GOVT</td>
<td>Modernize and streamline the process of intellectual property protection.</td>
<td>· Identify legal obstacles to university technology transfer through intellectual property protection. · Educate the public by creating an awareness and education page on the SEO's website (e.g., <a href="https://ipassessment.uspto.gov/">https://ipassessment.uspto.gov/</a>).</td>
<td>Train legislators and government officials on IP policy.</td>
<td>· Update laws for IP legal protection to address the obstacles faced by innovators. · Establish a structure for continuous evaluation and improvement of effective policy.</td>
</tr>
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<td>SEO/GOVT</td>
<td>Continue updating laws for equity investors, particularly protection for minority investors in start-ups.</td>
<td>Identify obstacles for minority shareholders and equity investors; share global best practices.</td>
<td>Train legislators and government officials on investor protection policy.</td>
<td>Update investment laws to promote investment and protect minority investors.</td>
</tr>
<tr>
<td>SEO/INDUS/GOVT</td>
<td>Streamline laws for business formation, contracting, and ease of doing business for entrepreneurs.</td>
<td>Understand the legal hurdles for creating and managing businesses.</td>
<td>Shorten the time required to start a business to less than 7 days by updating the legal structure (the current average is more than 25 days).</td>
<td>Evaluate outcome of new policy to verify that business formation process is quicker.</td>
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DEVELOP A CENTRAL PLATFORM TO UNITE AND COORDINATE ACTIVITIES

A central platform, or coordinating organization, often established through a public-private partnership, can create longevity of the relationships that exist in an ecosystem. Individuals and institutions involved in the ecosystem acknowledge that there are many activities happening in silos.

To develop a coordinating platform, the SEO, and stakeholders identified the following series of goals that will facilitate knowledge sharing and free flow of ideas:

- Establish a coordinating organization through a public-private partnership to serve as a neutral intermediary, create connections, and facilitate information flow.
- Leverage and expand existing spaces for collaboration (both physical and online), such as Campus Tec in Guatemala City, an innovation incubator that seeks to recreate the success of Silicon Valley in California. Guatemala has spaces for innovation within its capital city, and leaders in the interior of the country desire similar spaces in their towns and regions.
- Establish formal linkages between sectors in the ecosystem.
- Create an online or digital platform that aggregates and creates support resources to enable start-ups and entrepreneurs. The Global Innovation Through Science and Technology (GIST) network is an example of a global platform with online resources that entrepreneurs can participate in.

GOALS
Establish a coordinating organization through a public-private partnership to serve as a neutral intermediary, create connections, and facilitate information. Leverage and expand existing spaces for collaboration (both physical and online), such as Campus Tec. Guatemala has spaces for innovation within its capital city, and leaders in the interior of the country desire similar spaces in their towns and regions. Establish formal linkages between sectors in the ecosystem. Create an online or digital platform that aggregates and creates support resources to enable start-ups and entrepreneurs.

Color of action text corresponds to goal above.

- Map the existing ecosystem of coordinating organizations. Identify roles and strengths of existing sectors. Continue to expand existing spaces for innovation that respond to the needs of entrepreneurs and innovators. Create an online or digital platform to improve communications and transactions between institutions in the innovation ecosystem.
- Create an advisory committee, bringing together key members from each sector of the ecosystem to meet monthly and discuss/coordinate around issues that are central to Guatemala. Build a start-up hub, run by the SEO, for which start-ups have to register. The internet-based hub will have resources on funding and webinars (e.g., how to pitch an idea and how to register a business).
- Formalize the SEO as the coordinating organization for activities in the innovation ecosystem. Develop coordinating committee for 1-2 industry sectors similar to the work already created in the agricultural sector.
- Expand and build innovative spaces in the interior of the country, municipalities outside of the capital, and low-income and vulnerable communities.
- Formalize linkages between government and private sector entities that are acting in the ecosystem. Hold a start-up conference that brings together the community of entrepreneurs to discuss issues, successes, and plans for the coming year.
- Secure funding and establish laws for long-term sustainability and protection of the coordinating organization.
- Develop 2-3 coordinating committees for industry sectors to promote the formation of clusters.
- Secure funding for long-term sustainability of the infrastructure to manage ecosystem activities and communication.
- Sustain linkages through a public-private partnerships and establish institutional rules for ongoing evaluation and good governance of the partnership.
**Figure 7: Short-, Medium-, and Long-Term Actions to Develop a Central Platform to Unite and Coordinate Activities**

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>GOAL</th>
<th>SHORT-TERM ACTION</th>
<th>MEDIUM-TERM ACTION</th>
<th>LONG-TERM ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEO/ INDUS/ ACAD/ GOVT</td>
<td>Establish a coordinating organization through a public-private partnership to serve as a neutral intermediary, create connections, and facilitate information.</td>
<td>Map the existing ecosystem of coordinating organizations. Identify roles and strengths of existing sectors.</td>
<td>· Formalize the SEO as the coordinating organization for activities in the innovation ecosystem. · Develop coordinating committee for 1-2 industry sectors similar to the work already created in the agricultural sector.</td>
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</tr>
<tr>
<td>SEO/ INDUS/ GOVT</td>
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<td>Secure funding for long-term sustainability of the infrastructure to manage ecosystem activities and communication.</td>
</tr>
<tr>
<td>ACAD/ SEO/ INDUS/ GOVT</td>
<td>Establish formal linkages between sectors in the ecosystem.</td>
<td>Create an advisory committee, bringing together key members from each sector of the ecosystem to meet monthly and discuss/coordinate around issues that are central to Guatemala.</td>
<td>Formalize linkages between government and private sector entities that are acting in the ecosystem.</td>
<td>Sustain linkages through a public-private partnerships and establish institutional rules for ongoing evaluation and good governance of the partnership.</td>
</tr>
<tr>
<td>SEO/ INDUS</td>
<td>Create an online or digital platform that aggregates and creates support resources to enable start-ups and entrepreneurs.</td>
<td>Build a start-up hub, run by the SEO, for which start-ups have to register. The internet-based hub will have resources on funding and webinars (e.g., how to pitch an idea and how to register a business).</td>
<td>Hold a start-up conference that brings together the community of entrepreneurs to discuss issues, successes, and plans for the coming year.</td>
<td></td>
</tr>
</tbody>
</table>
BUILD KNOWLEDGE AND CAPACITY IN THE ECOSYSTEM

Knowledge sharing through mentoring, formal training, and communities of practice creates an environment for improved innovation capacity. Building on the stock of human capital, knowledge, and capacity building creates a culture of collaboration and trust. A small community of innovators with experience can help new entrants to the ecosystem avoid the mistakes and errors of the past.

The SEO and stakeholders identified the following three goals for building and improving knowledge and capacity in the ecosystem:

- Invest in R&D, taking care to determine high impact topics that will generate the broadest enabling impacts based on market and social needs.
- Establish a network of mentors and a community of practice to share learning and experiences.
- Provide training and support services for entrepreneurs and start-ups.

GOALS

Invest in R&D.
Establish a network of mentors and a community of practice to share learning and experiences.
Provide training and support services for entrepreneurs and start-ups.

Evaluate the continuity of current R&D investments and establish an independent oversight committee that aligns R&D funding with national innovation goals.
Create success stories to help Guatemalans believe in themselves.
Establish a community of mentors with lived experience who can provide support to new entrants into the ecosystem.
Conduct a lean start-up pilot training.
Start a monthly community of practice with guest speakers from the start-up community.

Monitor and ensure that R&D spending is following rules and best practices set earlier.
Increase public and private R&D investment in Guatemala to 0.5% of the GDP.
Link the community of mentors with the larger coordinating platform.
Develop lean start-up curriculum at each university.
Grant competition for start-ups funded by the SEO.

Increase public and private R&D investment in Guatemala to 1% of the GDP
Expand the network of mentors into a national community of practice, linked by the coordinating platform, to connect with aspiring innovators and entrepreneurs.
### Figure 8: Short-, Medium-, and Long-Term Actions to Build Knowledge and Capacity in the Ecosystem

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>GOAL</th>
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</table>
| SEO/INDUS/ACAD/GOVT | Invest in R&D.                            | • Evaluate the continuity of current R&D investments and establish an independent oversight committee that aligns R&D funding with national innovation goals.  
• Create success stories to help Guatemalans believe in themselves. | • Monitor and ensure that R&D spending is following rules and best practices set earlier.  
• Increase public and private R&D investment in Guatemala to 0.5% of the GDP. | Increase public and private R&D investment in Guatemala to 1% of the GDP.                                                                 |
| SEO             | Establish a network of mentors and a community of practice to share learning and experiences. | Establish a community of mentors with lived experience who can provide support to new entrants into the ecosystem. | Link the community of mentors with the larger coordinating platform.                      | Expand the network of mentors into a national community of practice, linked by the coordinating platform, to connect with aspiring innovators and entrepreneurs. |
| SEO/INDUS/ACAD   | Provide training and support services for entrepreneurs and start-ups. | • Conduct a lean start-up pilot training.  
• Start a monthly community of practice with guest speakers from the start-up community. | • Develop lean start-up curriculum at each university.  
• Grant competition for start-ups funded by the SEO. |                                                                                                      |
Monitoring and Evaluation of Progress of the Roadmap

Moving forward, the coordinating body and participants in the roadmap will need to ensure that they are monitoring progress towards achieving the vision and objective of this roadmap: to strengthen the innovation ecosystem and subsequently increase the impact that science, technology, and innovation can have on the GDP of Guatemala. In working towards this objective, stakeholders should understand and track the country’s baseline performance in national-level indicators including:

- Percent of GDP that can be attributed to science, technology, and innovation
- Overall Global Innovation Index score
- Key indicators related to human capital, including enrollment in tertiary education and education levels of the workforce
- Innovation output sub-index score and its components, including patent production and intellectual property licensing revenue

Additionally, while implementing the activities in the roadmap during the short-, medium-, and long-term, we recommend that the actors agree on a set of performance indicators related to the outputs, outcomes, and impacts of activities within each of the five pillars. We propose developing a framework for periodic review of data in the short-, medium-, and long-term along with milestones for evaluation.

The stakeholders responsible for the implementation of the roadmap should start by gaining a baseline understanding of the current status of each and agree on a way to track and benchmark progress. RTI has developed a separate document, provided to SEO, that contains a series of recommended performance indicators for the stakeholders and coordinating body to consider as they begin implementation of the roadmap.
MOVING FORWARD

This roadmap defines a set of prescribed actions that stakeholders in the public, private, and academic sectors in Guatemala can take to improve their economic prospects and help improve the quality of life for Guatemalan citizens. As we worked on this roadmap, it became clear that Guatemala’s greatest strength is its commitment to growth, improvement, and its people. To that end, many of the activities identified across the five pillars are already underway or have been completed, such as the following:

- The formalization of several industry-academy alliances including FUNDESA, CAMAGRO, AGEXPORT, and CIG.
- The formation of an industry-academia sub-commission that is part of CONCYT’s industry commission and aims to accelerate academia-based services for Industry Chamber members.
- The formation of a university-industry cluster and a platform for the agricultural development and innovation system.
- The completion of a strategy to coordinate higher-level scholarship programs for talent attraction.
- The ongoing participation of SEO in national science and innovation platforms with the public and private sectors.
- The development of a set of voluntary guidelines for private sector actors that promote a fair business environment.
- The implementation of public policies and laws related to research, innovation, and entrepreneurship.

We are confident that, given Guatemalans’ strength, perseverance, and ambition, they will implement the actions identified in this roadmap and transition the country toward a competitive, innovation-led economy.

“Sustainable development is the pathway to the future we want for all. It offers a framework to generate economic growth, achieve social justice, exercise environmental stewardship, and strengthen governance.”

— Ban Ki-moon

Former Secretary General, United Nations
APPENDIX

References:


Roadmap Diagrams:
On the following pages, there are three diagrams that illustrate the roadmap by time horizon. The activities in these diagrams are the same as the activities in the pillar specific diagrams earlier in this document. There is one diagram each for the short-term, medium-term, and long-term time frames and they contain the corresponding activities from across all pillars.
Short-Term

- Invite entrepreneurs to speak at rural and city schools to inspire the youth to see themselves in the speaker’s role.
- Study curriculum needs and deficiencies in Guatemala, as well as global best practices for innovation and entrepreneurship.
- Increase and standardize the invitation of scientists and engineers to mentor students and speak at rural and city schools to inspire the youth to see themselves in the speaker’s role.
- Create a community of practice group for STEAM students that engages, supports, and encourages their retention in STEAM for the long-term.

**Categories:**
- Improve human capital
- Strengthen university-industry alliances
- Modernize legal structures for innovation
- Develop a central platform to unite and coordinate activities
- Build knowledge and capacity in the ecosystem

- Map and categorize the assets of each university. Identify technologies ready for transfer. Identify the technology transfer capabilities of each university.
- Conduct a pilot training on university knowledge and technology transfer office best practices.
- Identify individuals at leading universities who are responsible for sponsored research. Learn about their challenges to identifying industry partners and needs. Train them on ways to overcome these challenges.
- Create university-industry internship program in the agriculture sector.
- Form pilot agriculture cluster with university, industry, and government.
- Leverage public and private funding for industry specific research projects in the pilot cluster.

- Share global best practices in incentivizing R&D through tax credits and financial mechanisms.
- Identify legal obstacles to university technology transfer through intellectual property protection.
- Educate the public by creating an awareness and education page on the SEO’s website (e.g., https://ipassessment.uspto.gov/).
- Identify obstacles for minority shareholders and equity investors; share global best practices.
- Understand the legal hurdles for creating and managing businesses.

- Map the existing ecosystem of coordinating organizations. Identify roles and strengths of existing sectors.
- Continue to expand existing spaces for innovation that respond to the needs of entrepreneurs and innovators.
- Create an online or digital platform to improve communications and transactions between institutions in the innovation ecosystem.
- Create an advisory committee, bringing together key members from each sector of the ecosystem to meet monthly and discuss/coordinate around issues that are central to Guatemala.
- Build a start-up hub, run by the SEO, for which start-ups have to register. The internet-based hub will have resources on funding and webinars (e.g., how to pitch an idea and how to register a business).

- Evaluate the continuity of current R&D investments and establish an independent oversight committee that aligns R&D funding with national innovation goals.
- Create success stories to help Guatemalans believe in themselves.
- Establish a community of mentors with lived experience who can provide support to new entrants into the ecosystem.
- Conduct a lean start-up pilot training.
- Start a monthly community of practice with guest speakers from the start-up community.
Medium-Term

Develop curriculum and plan for innovation and entrepreneurship.
Pilot innovation and entrepreneurship curriculum in 6–10 schools.
- Develop/strengthen STEAM-based programs and activities that cultivate interest in STEAM, develop applied scientists, and create communities of practice (e.g., First Robotics, Odyssey of the Mind, and science fair competitions) to prepare these students to continue into advanced education.
- Establish recruitment activities and job placements between STEAM students and Guatemalan companies.
- Identify and recruit companies to sponsor scholarships and grants for undergraduate and doctoral researchers in their areas of interest.

- Expand technology transfer training to the majority of Guatemalan universities.
- Educate and train university officials on options for working with industry (i.e., sponsored research, research as a service).
- Develop agriculture industry-specific curriculum at universities.
- Expand the university-industry cluster beyond the agriculture sector to other targeted sectors, such as ICT, manufacturing, creative industries, robotics, pharmaceuticals, and/or other strategic areas for Guatemala.

- Train legislators and government officials on the benefits of fiscal incentives for stimulating innovation.
- Train legislators and government officials on IP policy.
- Train legislators and government officials on investor protection policy.
- Shorten the time required to start a business to less than 7 days by updating the legal structure (the current average is more than 25 days).

- Formalize the SEO as the coordinating organization for activities in the innovation ecosystem.
- Develop coordinating committee for 1-2 industry sectors similar to the work already created in the agricultural sector.
- Expand and build innovative spaces in the interior of the country, municipalities outside of the capital, and low-income and vulnerable communities.
- Formalize linkages between government and private sector entities that are acting in the ecosystem.
- Hold a start-up conference that brings together the community of entrepreneurs to discuss issues, successes, and plans for the coming year.

- Monitor and ensure that R&D spending is following rules and best practices set earlier.
- Increase public and private R&D investment in Guatemala to 0.5% of the GDP.
- Link the community of mentors with the larger coordinating platform.
- Develop lean start-up curriculum at each university.
- Grant competition for start-ups funded by the SEO.
Long-Term

- Chart performance of pilot schools for at least 3–5 years after curriculum implementation.
- Address needed improvements in curriculum.
- Expand innovation and entrepreneurship curriculum nationwide.
- Establish a formal, regularly occurring mentoring program between scientists and engineers from leading Guatemalan companies and target schools.
- Increase STEAM funding for primary and secondary education.
- Hire specialized faculty in STEAM, innovation, and entrepreneurship.
- Increase funding for STEAM, innovation, and entrepreneurship to universities.
- Establish a network of knowledge and technology transfer offices to form a community of practice, sharing practices and learnings.
- Expand the knowledge from trained sponsored research leaders and university officials to the wider community of universities so that best practices can further be adopted.
- Continue expansion of the university-industry cluster beyond the agriculture sector to other targeted sectors, such as ICT, manufacturing, creative industries, robotics, pharmaceuticals, and/or other strategic areas for Guatemala.
- Establish an R&D tax credit and other fiscal incentives for investing in innovation.
- Update laws for IP legal protection to address the obstacles faced by innovators.
- Establish a structure for continuous evaluation and improvement of effective policy.
- Update investment laws to promote investment and protect minority investors.
- Evaluate outcome of new policy to verify that business formation process is quicker.
- Secure funding and establish laws for long-term sustainability and protection of the coordinating organization.
- Develop 2-3 coordinating committees for industry sectors to promote the formation of clusters.
- Secure funding for long-term sustainability of the infrastructure to manage ecosystem activities and communication.
- Sustain linkages through a public-private partnerships and establish institutional rules for ongoing evaluation and good governance of the partnership.
- Increase public and private R&D investment in Guatemala to 1% of the GDP.
- Expand the network of mentors into a national community of practice, linked by the coordinating platform, to connect with aspiring innovators and entrepreneurs.
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