Envisioning La Palma

Developing a Sustainable Future for the Island

Photo: Ana M. García Suárez, July 2023 La Palma

A Global Sustainability Fellows Program Report, Summer 2023 | November 2023

TABLE OF CONTENTS

CONTENTS

ABOUT US

THE GLOBAL SUSTAINABILITY FELLOWS PROGRAM

The Global Sustainability Fellows (GSF) program is The Sustainability Laboratory's (The Lab) educational initiative, designed to inspire, prepare, and mobilize new sustainability leaders to tackle the urgent sustainability issues facing the planet. Our program promotes system thinking, collaborative, interdisciplinary approaches to addressing sustainability issues, and combines an intensive theoretical orientation and classroom component with hands-on, experience-based learning, extensive fieldwork, and international and cross-disciplinary exposure.

THE SUSTAINABILITY LABORATORY

The Sustainability Laboratory (The Lab) is a non-profit, 501 (c)(3), research development and educational organization based in New York. Launched by Dr. Michael Ben-Eli, it was established to develop and demonstrate groundbreaking approaches to sustainability practices. Since its inception in 2008, The Lab has gained international recognition for its innovative contributions to the global sustainability agenda.

Founded on the belief that effective responses will not likely emerge from the same methods and mechanisms that perpetuate existing crises, The Lab fosters bold experimentation with untested ideas, approaches and technologies that transcend prevailing conventions. The concept of The Lab is also unique in scope. It embraces the whole planet, the integrity and health of its biosphere, and the well-being of humanity.

The Lab's activities, development projects and educational programs alike, are guided by its own signature approach—a unique and action-oriented conceptual framework that combines a system-thinking and system-oriented design strategy, a perspective on evolution and a theory of change, and a rigorous definition of sustainability and derived set of core sustainability principles.

The Lab's mission is to develop, over time, a portfolio of innovative demonstration projects that showcase implementation of its signature approach. It is being developed as a global network of activity centers based in different ecological zones—deserts and drylands, humid and dry tropics, island ecosystems, and alpine ecology.

(For more information, visit sustainabilitylabs.org)

OPENING REMARKS

REMARKS

Welcome!

In collaboration with La Universidad de las Palmas de Gran Canaria and La Universidad de la Laguna (Canary Islands, Spain), the Global Sustainability Fellows Program, organized by The Sustainability Laboratory (New York), spent an intensive three weeks in La Palma, Canary Islands, Spain, developing a fresh vision to address the future development of the island, guided by sustainability considerations.

This report contains the findings of the rigorous work conducted by the 2023 cohort as they were presented to the island's representatives on July 28, 2023. Here, you will find ideas that outline a vision for the future of the island from the multidimensional and polyhedral perspective of the five dimensions of sustainability, based on theoretical work on system dynamics and systemic thinking coupled and supported by knowledge of science, technology, society, culture, and history, among other areas.

You will see that the value proposition is inspired by considering multiple dimensions of humanity and the interrelationship between humans and non-humans. Our hope is that this relationship will be developed in the coming years by the society of La Palma and the social agents who, committed to a sustainability vision of our island, can give continuity to The Sustainability Laboratory in La Palma.

We hope that whoever reads this report will find it fruitful and inspiring for a sustainable future for La Palma.

We thank everyone that has shown interest in this work, those authorities and citizens who attended the session on July 28th, as well as those who participated in the program and financed its execution.

We also thank the 16 international GSF cohorts for coming to La Palma and utilizing their extensive experience in development, resilience, and other sustainability projects, and lending their talent and energies to reflect on the need for sustainable development and the challenge posed by the volcanic eruption that occurred two years ago.

I would also like to personally mention the School of Agrarian Training of Los Llanos de Aridane, and the people and professionals who took care of our stay at the school, especially its director, Carlos Reyes and his team. Thanks to Michael Ben-Eli, Founder of The Sustainability Laboratory, Vanessa Armendáriz, Director of the GSF, and Carlos Fernández Hernandez who, in a truly remarkable way, made this experience in La Palma possible.

Thank you to the entire team, and congratulations to all those who participated in any part of it.

Carmelo Javier León González
Director,
Institute of Tourism and Sustainable Economic Development (TIDES)

Dear Reader,

Thank you very much for your interest in the contribution of the Global Sustainability Fellows Program to the future development of La Palma.

This has been an intense, beautiful, and interesting experience for the cohorts in the GSF program and all of us on La Palma. The shared vision developed for the island was enriched by the tremendous backgrounds and expansive knowledge of each of our international fellows who came to the island as participants in an educational training, experiential, and transformational program, and, with the findings in this report, left us a piece of their legacy.

The findings of the GSF—necessarily limited, given that three weeks of coexistence and intense and deep relationships do not replace an exhaustive knowledge of the territory—resonates with many of the ideas and projects that have emerged in La Palma during the last decades, and it is a good reminder of our true path to a thriving island and our full potential.

Therefore, in this report, you will find an introduction to what is an ongoing process of reflection and vision-sharing between key change agents from La Palma and the GSF fellows, crossed with extraordinary methodologies led in a deep and conscientious way by The Sustainability Laboratory under the direction of Michael Ben-Eli and Vanessa Armendariz, with support from Therese Bennich of the Stockholm Sustainability Institute and the team of the Zurich consulting firm Syntegration and its director Constantin Malik.

We circumscribe this reflection in the context of La Palma, our quest for long-term visions, determined by the known fact in all processes of reconstruction and transformation: the volcano, which necessarily is a great learning part of our memory and determines any possible future for the island.

Special thanks to the Vice-Rector of Internationalization and Cooperation of the University of La Laguna, the Executive Director of the Biosphere Reserve, all participating experts and stakeholders involved in this process, and members of the community at large that are interested in the delivery and dissemination of results of the findings.

Carlos Fernández Hernández
Applied Economics Professor
Department of Applied Economics and Quantitative Methods
University of La Laguna

GSF LA PALMA

GSF 2023

We are currently at a crucial moment as human species. Our future and quality of life rely on our awareness of the possible paths to sustainability and our choice to commit to creating them. We are the creators of our future. The consequences of the dominant development paradigm of the last two centuries, along with climate change, call us to rethink and make better decisions in these critical times when we have the opportunity to respond to this challenge.

The Sustainability Laboratory was created by Michael Ben Eli with the intention of creating spaces for the emergence and experimentation of new forms of organization at a holistic level that allows us to face the unprecedented events that lie ahead. The GSF program is The Lab's commitment to extending a critical and clear vision of sustainability, and an invitation to align all our energy, life, infrastructure, economic, and social systems to the regenerative capacity of the earth. The program provides practical and scientific tools to strategic agents, our fellows, so that in any corner of

this planet theycan create a different development model inspired by a paradigm of living systems, where life is respected and honored.

I am especially grateful to be part of this team and, through a variety of promotions and collaborations with several universities, have come to learn more about the life and work of Dr. Ben Eli. Eight years ago, as a GSF fellow, I understood that working for sustainability would be overwhelming and impossible if we tried to solve what we perceive as a problem within the paradigmatic spaces that we inhabit today. Then I understood that connecting with the potential of living systems is a path that can really take us to other realities. I also understood that the technical and scientific tools that are urgent and relevant to move towards real development proposals, unfortunately, are not part of the universities' curricula today.

Today, as director of the GSF Program, I have been able to understand an even more critical and subtle aspect of the transformations we must experience toward a new experience of life. I understood the first transformation toward structural and significant transformation of our systems, identified as second order change, begins in a more intimate dimension. They begin from a shared intention, with people, with human beings who take responsibility for what it means to be alive today.

In this experience in La Palma, the intention of the collaboration was very clear from the first meeting with The Sustainability Laboratory. For that, I want to thank Carmelo León Gonzalez and Carlos Fernández Hernandez, our team in La Palma. Thanks to them, the message was delivered directly to La Palma decision-makers and organizations in the search for sustainable development visions, and it was possible to have this marvelous and full learning experience in La Palma. This partnership was much more than an educational experience—it was a genuine multi-sector collaboration,

which will hopefully nurture the metamorphosis of La Palma. The transformation of this wonderful island is already ongoing, powered by each of the projects currently led by many change-agents with whom we hope to continue strengthening our bonds for a lasting collaboration.

> *"...transformation toward these changes...begins from a shared intention."*

This report contains a vision of La Palma's infinite potential, seen through the lens of 16 international fellows, applying The Sustainability Laboratory's signature approach. In this process, we integrated dimensions from the deepest subtle spiritual level of the island to the more external material systems: water, energy, and infrastructure, all part of a whole organized system that, in the following decades, may go toward a declining behavior or will reach its maximum potential. This all depends on our ability to collaborate and create the future we want and to nurture the right conditions to make it happen.

To develop this vision, we utilized the skills and experience of the GSF cohort—16 fellows, from more than 14 countries—with whom we worked hand-in-hand alongside 55 local experts and stakeholders to understand the challenges of La Palma and its full potential. We also had the honor of working with 12 international specialists who were both educators and mentors in the Global Sustainability Fellows program.

We are deeply touched by the potential and commitment of each of our fellows and we thank them for their hard and intense work in service of La Palma.

We also thank our 2023 faculty and participating experts for such a remarkable learning experience for our fellows and La Palma.

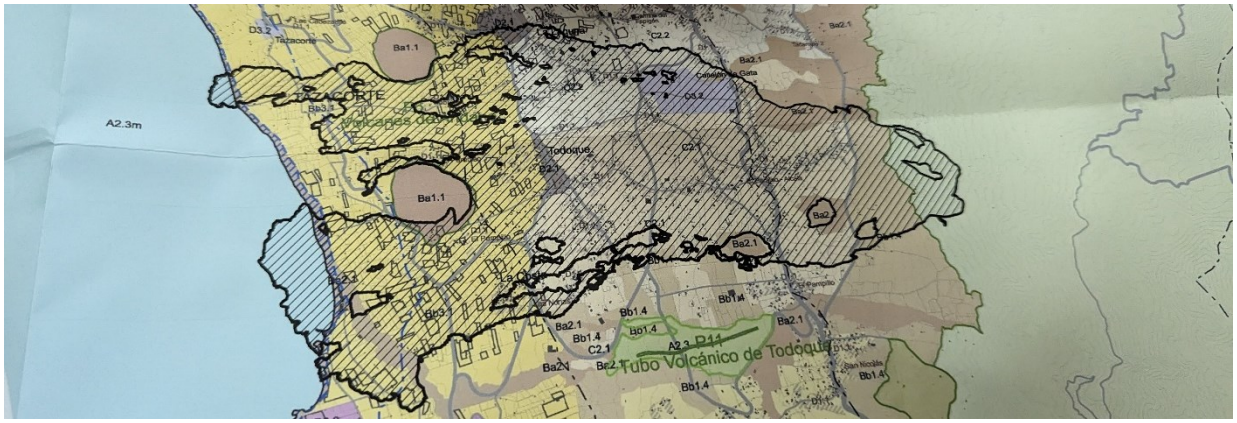
We extend our deepest gratitude to La Palma's experts and stakeholders for their willingness and commitment during the summer of 2023 to assist us in capturing and delivering one of the most important messages on the development of this island and its people.

We hope you enjoy this report and the vision portrayed of this wonderful island.

Vanessa Armendáriz
Director, Global Sustainability Fellows Program
The Sustainability Laboratory

THE GSF LA PALMA PROJECT

LA PALMA



LA PALMA

La Palma, pertaining to the Canary Islands (Spain), has a deep historical, cultural, and environmental significance. It is the fifth largest island of the archipelago by area, covering 708 square kilometers, and is home to over 83,000 inhabitants known as “Palmeros” and “Palmeras”. La Palma’s volcanic origins and geographic location in the eastern Atlantic Ocean have determined its unique climate, diverse topography, and rich ecosystems. These ecosystems host remarkable biodiversity, including several endemic species, and have led to the recognition of the island as a UNESCO Biosphere Reserve. La Palma is celebrated for its natural beauty, being referred to as “La Isla Bonita” (The Beautiful Island) and attracts growing numbers of tourists. Moreover, the island’s clear skies make it an exceptional destination for stargazing, astrotourism, and astronomical observation. The Roque de los Muchachos, with 2426 meters of altitude, hosts one of the world’s leading astronomical research centers.

However, La Palma is not exempt from challenges, including socio-economic, demographic, and environmental issues. These challenges were accentuated by the catastrophic effects of the volcanic eruption of 2021 in Cumbre Vieja, highlighting the need to promote the economic development of the island while preserving its delicate ecosystems.

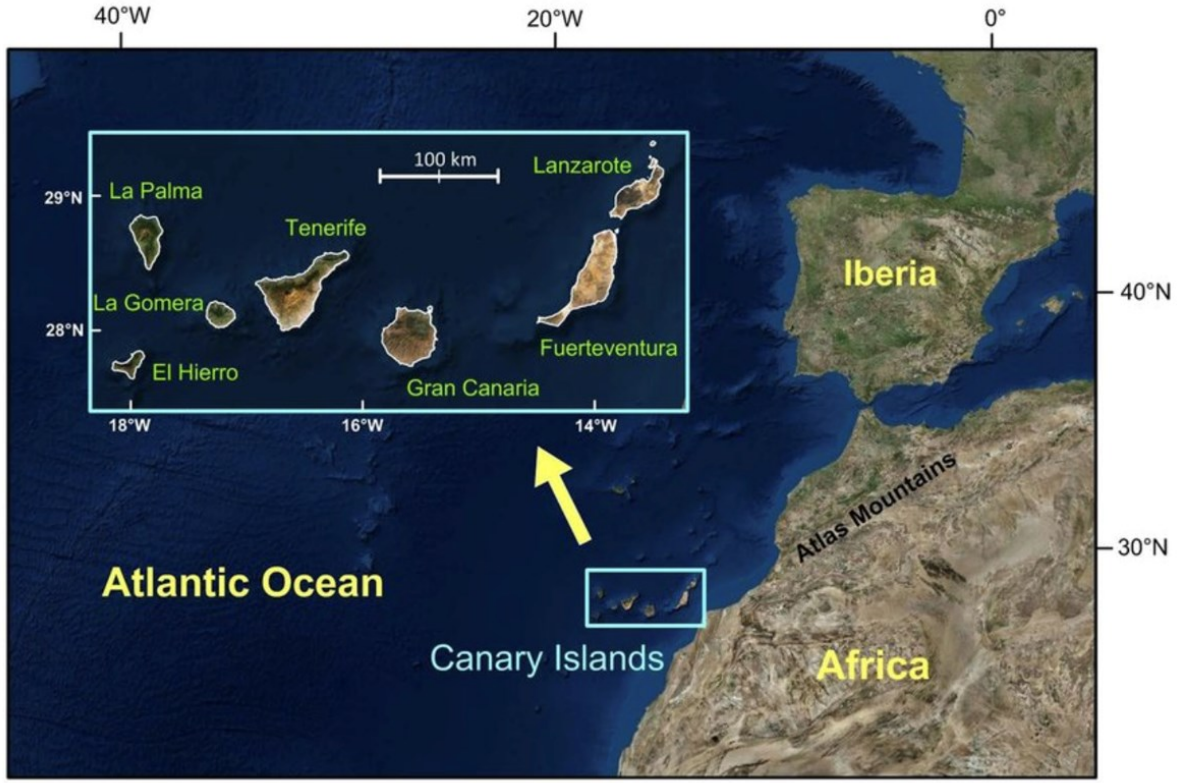


Figure 1. Canary Islands archipelago. Aeromagnetic anomalies reveal the link between magmatism and tectonics during the early formation of the Canary Islands (2018).

PROJECT PURPOSE

The purpose of the GSF program 2023 conducted in La Palma was to address the island's sustainability challenges to generate a vision and guidelines towards a prosperous future. The program provided an educational and applied experience for the global sustainability fellows to learn, collaborate and explore innovative solutions drawing from a systemic perspective of sustainability, in the unique context of La Palma.

The objective of this report is to present the initial outcomes and insights generated through the GSF program 2023 and to serve as a record of the collaborative efforts of local and international experts, local stakeholders, and the fellows. The report provides a multidimensional and holistic analysis, based on the signature approach and unique definition of sustainability developed by the Sustainability Laboratory of New York. The report aims to inspire and inform future sustainability initiatives on La Palma and beyond, emphasizing the importance of a systemic and transformative approach to sustainability.

Figure 2. GSF Program components. Own elaboration.

PROJECT METHODOLOGY

Project Development Process

Commencing in July 2023, the GSF program brought together sixteen international fellows and twelve faculty members with specialized knowledge and experience in sustainability. The multidisciplinary and multicultural program included lectures on The Lab's framework and approach, lessons on tools to analyze system dynamics as well as interviews and conversations with experts and local stakeholders. Finally, through collaboration, different perspectives were integrated to identify the main challenges and propose strategic guidelines. The program culminated with the presentation of preliminary results.

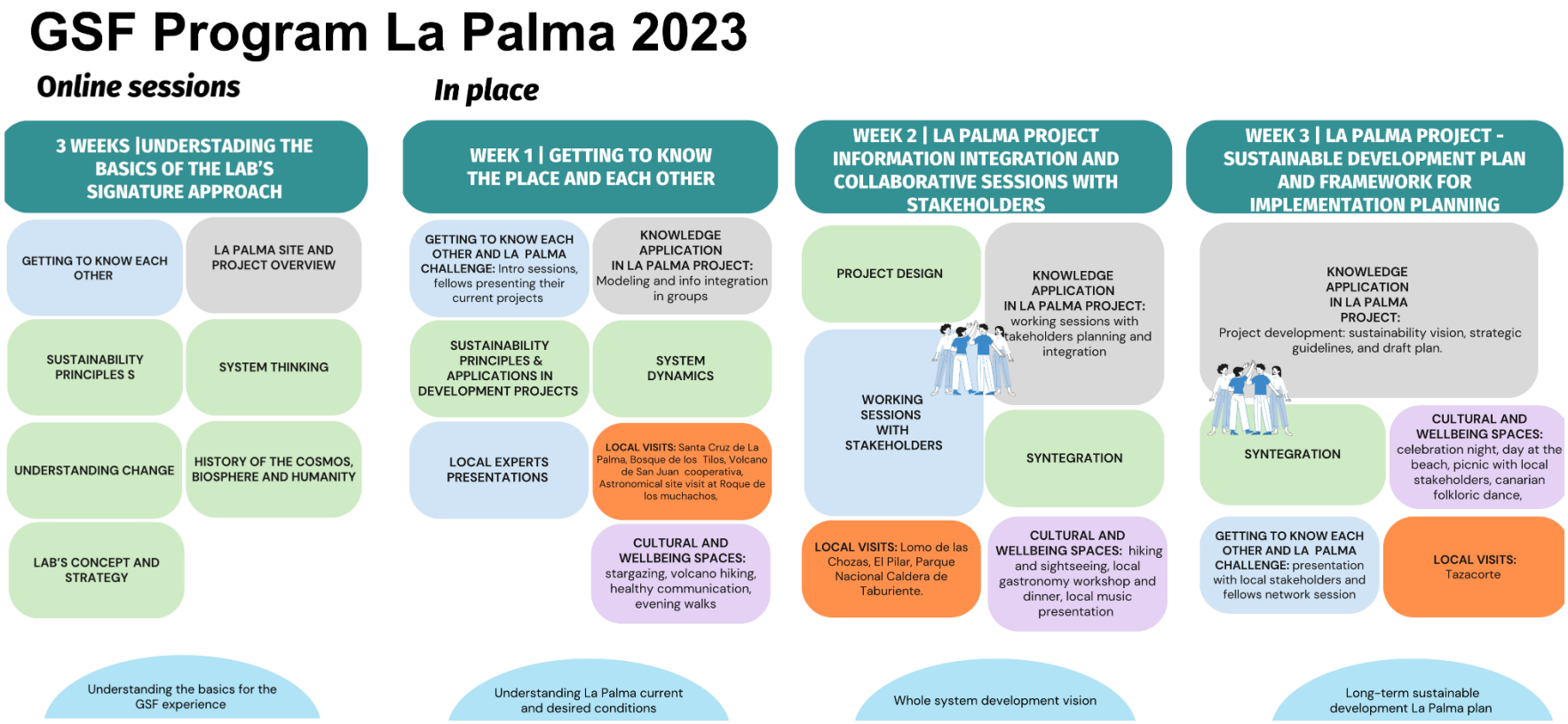


Figure 3. GSF Program overall process June 2023 - July 2023. Own elaboration.

The Lab's Framework and Sustainability Principles

The program introduced the fellows to the signature approach of the Sustainability Lab, which emphasizes the importance of systems thinking in gaining a holistic view to examine and understand sustainability. It argues that complex sustainability issues cannot be adequately addressed with simplistic, linear approaches that analyze the system's elements in isolation.

Fellows also learned The Lab's rigorous definition of sustainability, which corresponds to the dynamic equilibrium of the interaction between a population and the carrying capacity of its environment. From this definition five core sustainability principles emerge, corresponding to five different work areas or domains. These principles briefly explained below, are interconnected and interdependent and all five domains need to be analyzed simultaneously for proposed strategic guidelines to stir towards a truly sustainable development.

- **Spiritual Domain**: identifies the importance of attitudes and values and provides the basis for a universal code of ethics.
- **Social Domain**: provides the basis for social interactions.
- **Domain of Life**: provides the basis for appropriate behavior in the biosphere to maintain the essential diversity of all life forms.
- **Material Domain**: constitutes the basis for regulating the flow of materials and energy to ensure non-declining resources.
- **Economic Domain**: provides a guiding framework for defining, creating and managing wealth.

Whole System Perspective: Expert Interviews and Causal Loop Diagrams

Figure 4. Causal Loop Diagrams developed with local experts.

Fellows had the invaluable opportunity to engage with individuals who generously shared their knowledge and experiences, enriching their learning journey and their holistic vision of sustainability. They actively engaged with more than 40 local stakeholders and experts in interviews and conversations focusing on different topic areas such as ecology, socio-cultural aspects, economic activities, science and technology, as well as energy, water and waste management.

During the interactions, fellows developed a whole system visualization of La Palma using causal loop diagrams (CLDs), in which the experts' and stakeholders' perspectives and knowledge were integrated.

Figure 5.1 Fellows and local experts sessions in La Palma, 2023.

Figure 5.2 Group session with local experts and GSF fellows in La Palma.

Causal Loop Diagrams (CLDs) are a powerful qualitative tool, which enable the visualization of interactions and interdependencies among different variables in the system. CLDs can be used to show the way in which a set of variables are interlinked. This type of diagram pays particular attention to the way in which problems can be self-reinforcing. It also provides an opportunity to identify leverage points within the system, which will serve to inform a strategy.

Figure 6. GSF fellow modeling biodiversity issues in La Palma.

Figure 7. Group model building session on water issues in La Palma with GSF fellows.

How to Read Causal Loop Diagrams

In Causal Loop Diagrams, arrows represent relationships between variables (as seen in Figure 8 below). Each arrow is marked with a polarity sign (+ or -) and, for improved clarity, color coded by blue (for +) and red (for -). The polarity is assigned by looking at each relationship individually, and asking what would happen to the dependent variable if the independent variable increases, all else equal. A plus sign states that an increase in the independent variable will also lead to an increase in the dependent variable, whereas a minus sign would indicate that an increase in the independent variable causes a decrease in the dependent variable. In other words, a plus sign indicates that the dependent variable moves in the same direction as the independent variable, whereas a minus sign indicates that the dependent variable moves in the opposite direction of the independent variable. In some cases, the +/- polarity can also signify an improvement/dis-improvement in the dependent variable, instead of an increase/decrease.

In Figure 8, the arrow marked with a plus sign says that an improvement in the State of the community's environment (the independent variable in this case) will lead to more Appreciation of their surroundings (the dependent variable in this case), all else equal. It also says that a deterioration of the community's environment will lead to less appreciation of their surroundings.

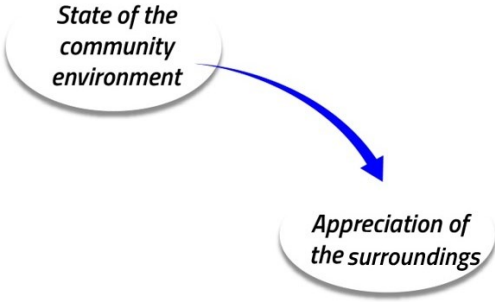


Figure 8: Positive causal relationship. Own elaboration.

Figure 9 shows an example of a feedback loop. In this loop we see how more Appreciation of surroundings will lead to less polluting the environment (for example, people will be less likely to litter or dump trash carelessly). Less pollution will then lead to a better State of the community environment, which will again lead to more Appreciation of surroundings, less Pollution, and thus an even better State of the environment. As such, we can see that there is a reinforcing feedback effect.

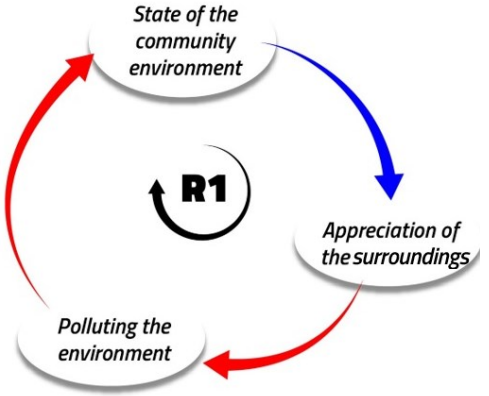


Figure 9: An example of a reinforcing feedback loop. Own elaboration.

As described, this loop can work as a "virtuous" feedback loop, in which a better state of the environment will eventually lead back to a better state of the environment—a desirable outcome. However the loop can also work in the opposite direction, in which a deteriorating environment leads to less appreciation of the environment, which leads to more polluting, and thus an even more deteriorated environment. In this instance, it would constitute a "vicious" loop.

When we have a feedback structure with an uneven number of negative causal relations, we can expect a balancing feedback effect, which means that structure will tend to stagnate over time, opposite to a reinforcing feedback effect which will tend to an exponential growth or decay. The combination of these two types of loop in any system is what creates the amazingly complex behavior of living systems. Strategies and policies aiming to make a transformation or change in a system performance have to deal correctly with the system structures responsible for the overall system behavior.

La Palma Whole System Visualization

A total of 24 CLDs were generated and included over 430 variables, encompassing a range of economic activities, indicators of population well-being, environmental issues, or demographic factors. The integration of these diagrams into a whole system visualization helped uncover intricate relationships and feedback loops, and provided insights into the system's behavior. In the next image the five sustainability domains areas are identified (Figure 10).

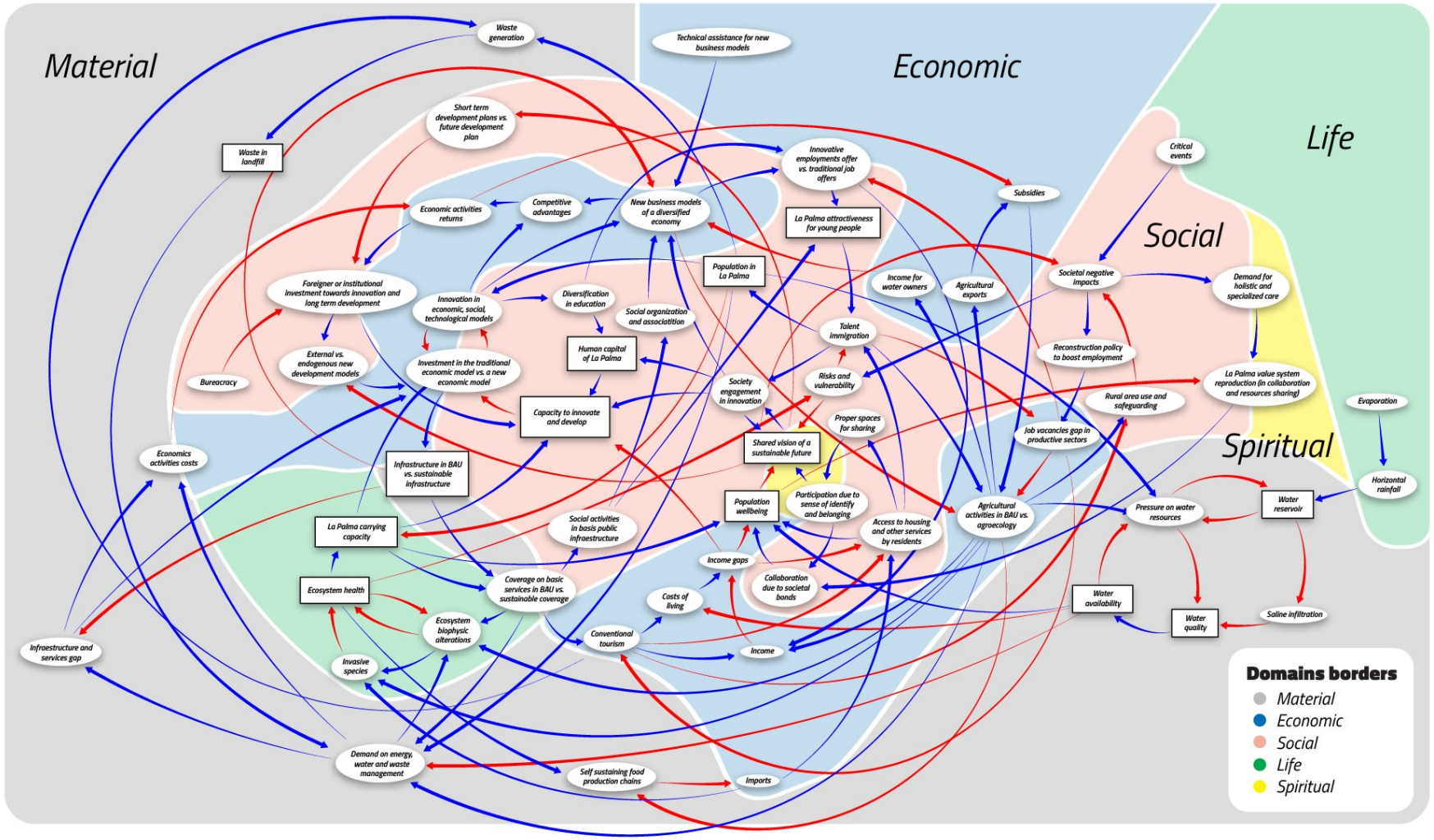


Figure 10. La Palma General Model by Sustainability domains. Own elaboration.

The next part of this section is dedicated to describing the current situation in La Palma, delving into critical issues and leverage areas and overarching strategic guidelines towards its sustainable development. Specific strategic guidelines of each sustainability domain will be explained in the next chapter.

Critical Issues in La Palma

By analyzing survey data, in-depth discussions with key stakeholders and a deeper study of each sustainability domain in La Palma three main critical development issues were identified:

- **Diversification of the economy**
- **Youth emigration and aging population**
- **Island sustainability planning for affordable housing, territorial cohesion and well-being**

Each of these issues are embedded in feedback structures currently working as vicious cycles.

Diversification of The Economy

The economic activities in La Palma and their gross value added by 2019 had the following characterization: Agriculture 8.6% with 97,2 million EUR, Industry 4.1% with 89 million EUR, Building sector 7.9% with 127,6 million EUR, Services 79.4% with 47,40 million EUR. During the last decade, activities such as tourism and construction had significantly increased in gross value, whereas banana production became the predominant economic activity.

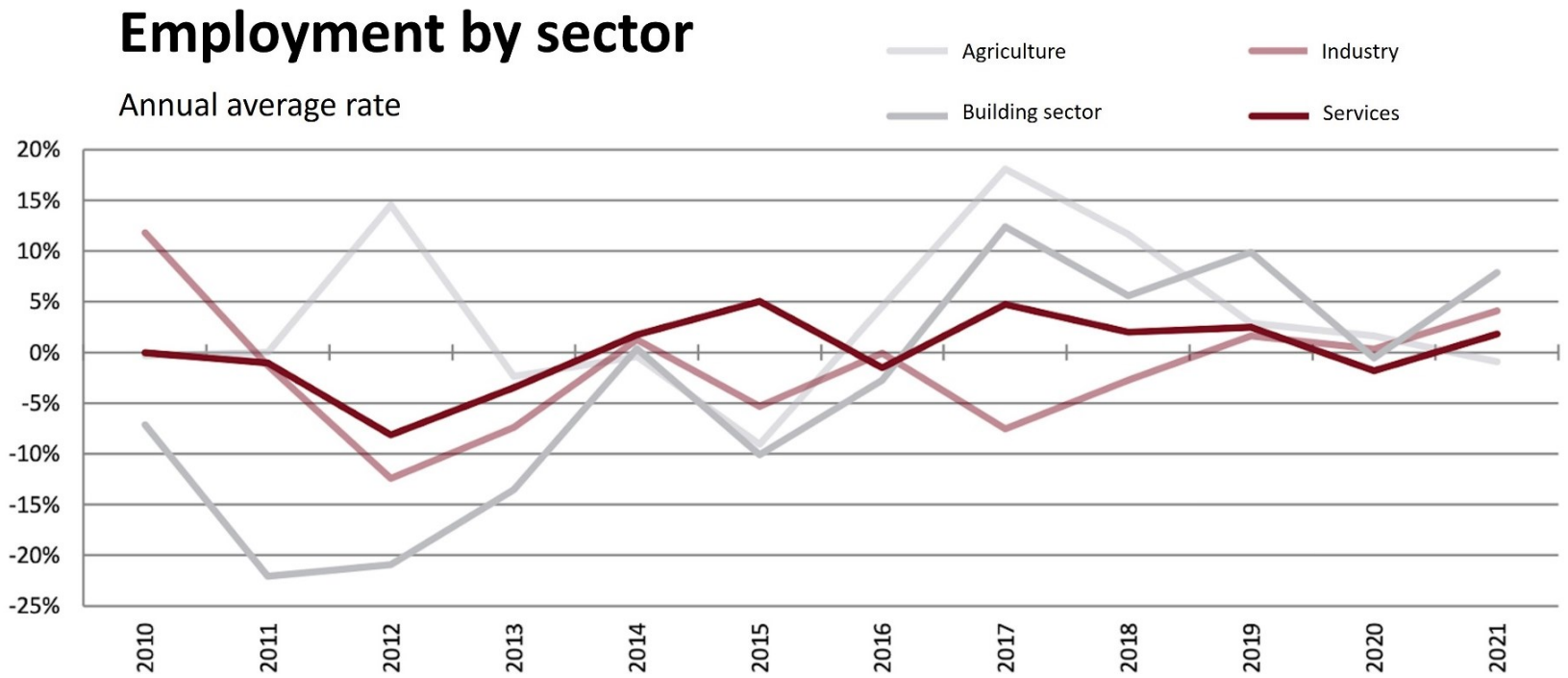


Figure 11. La Palma employment by sector. La Economía de La Palma en gráficos (2021)

Banana agriculture production and exports have been historically heavily subsidized, however, there is a risk of decreasing aid when crop areas in the island are not growing at the pace of the market demand. In La Palma, banana production during the last decade kept its performance from 144378 tons in 2009 to 144328 tons in 2021. La Palma has 70% of the banana agricultural workers of the whole archipelago, yet the average production rate per agricultural worker is significantly less than in the rest of the other islands (Ortega, 2022).

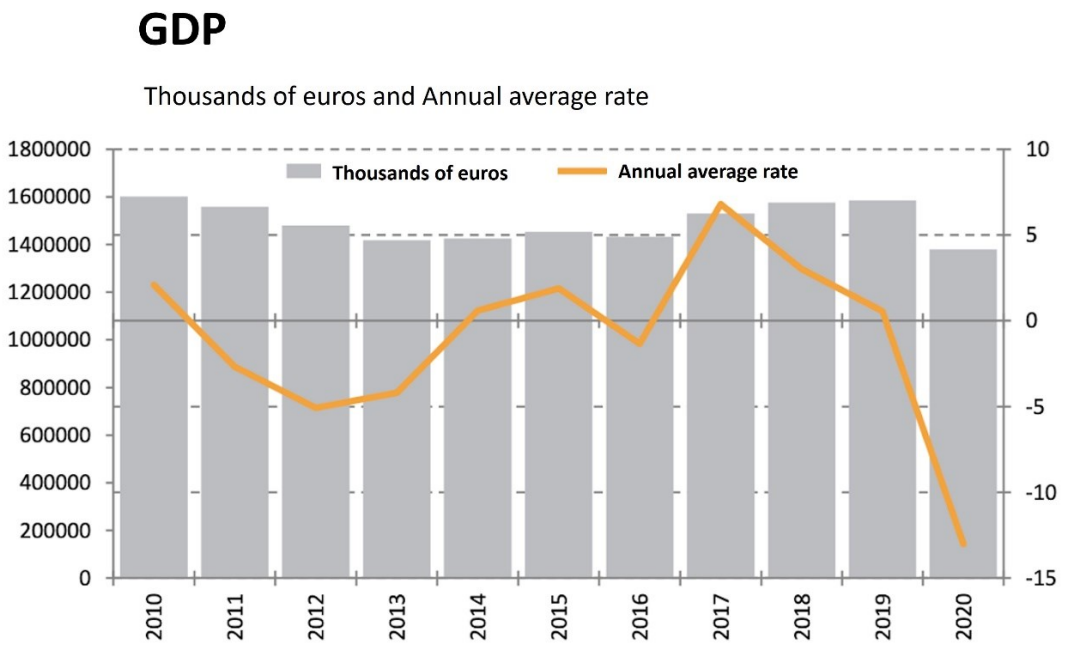


Figure 12. La Palma GDP overtime. La Economía de La Palma en gráficos (2021)

La Palma experiences a trend of decreasing the gross value added in all sectors except the banana production sector. However, the agricultural sector presents its own risks to the future (Figure 13). Besides the risk of losing the subsidy aid, the demographic performance and production costs associated with energy demand for water availability could challenge what is today the main pillar of La Palma economy. Technology and infrastructure innovation and economic diversification becomes urgent, specially in the light of the demographic pressures described in the next point below.

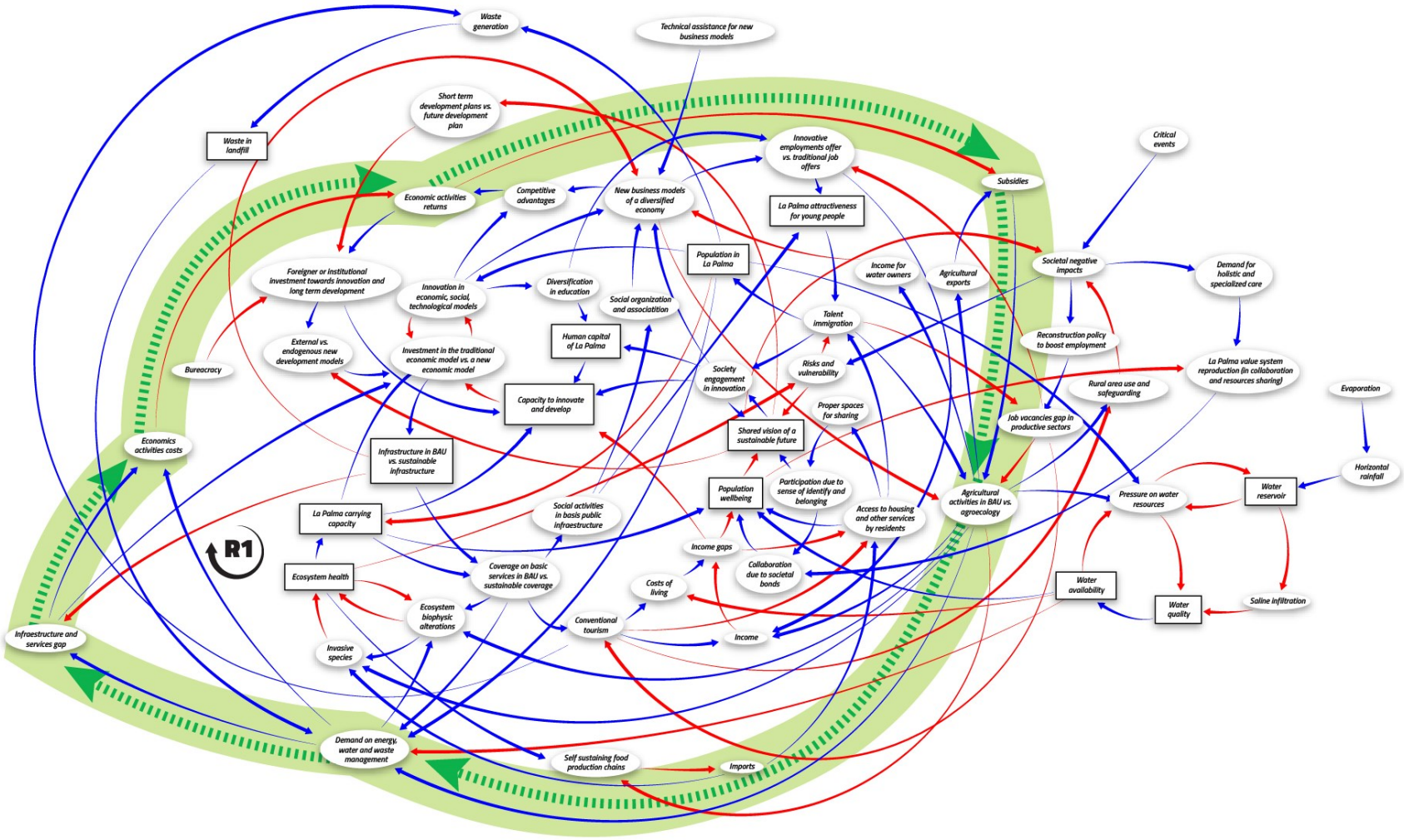


Figure 13. Reinforcing feedback structure Increasing economic costs of agricultural activities and subsidies dependency in La Palma. Own elaboration.

Demography: Youth Migration and Aging Population

The population of La Palma has been greatly impacted by the current economic model and the volcanic eruption, leading to difficulties in adapting to new living conditions and a perceived loss of 5% of their current population in the last decade (ISTAC, 2021). The housing and transportation precarity, and the lack of education and job opportunities increase the feeling of uncertainty about the future which results in youth emigration from the island. Additionally the general lack of infrastructure for social conviviality affects the variety of social activities specially for the youth and limits their social support networks therefore a sense of connection with their communities.

The current crisis has raised concerns about the decline in quality of life, increased rental prices, and separation from family members. It is seen as urgent to address the population challenge comprehensively, economically, socially, and culturally, to encourage people to stay on the island (Figure 14). The lack of young people has also a significant effect in the innovation capacity of the economic system, therefore, the island keeps its traditional job opportunities, decreasing its attractiveness to local or foreigner young talent. New development perspectives are required to revert this effect, which will be described in the following point.

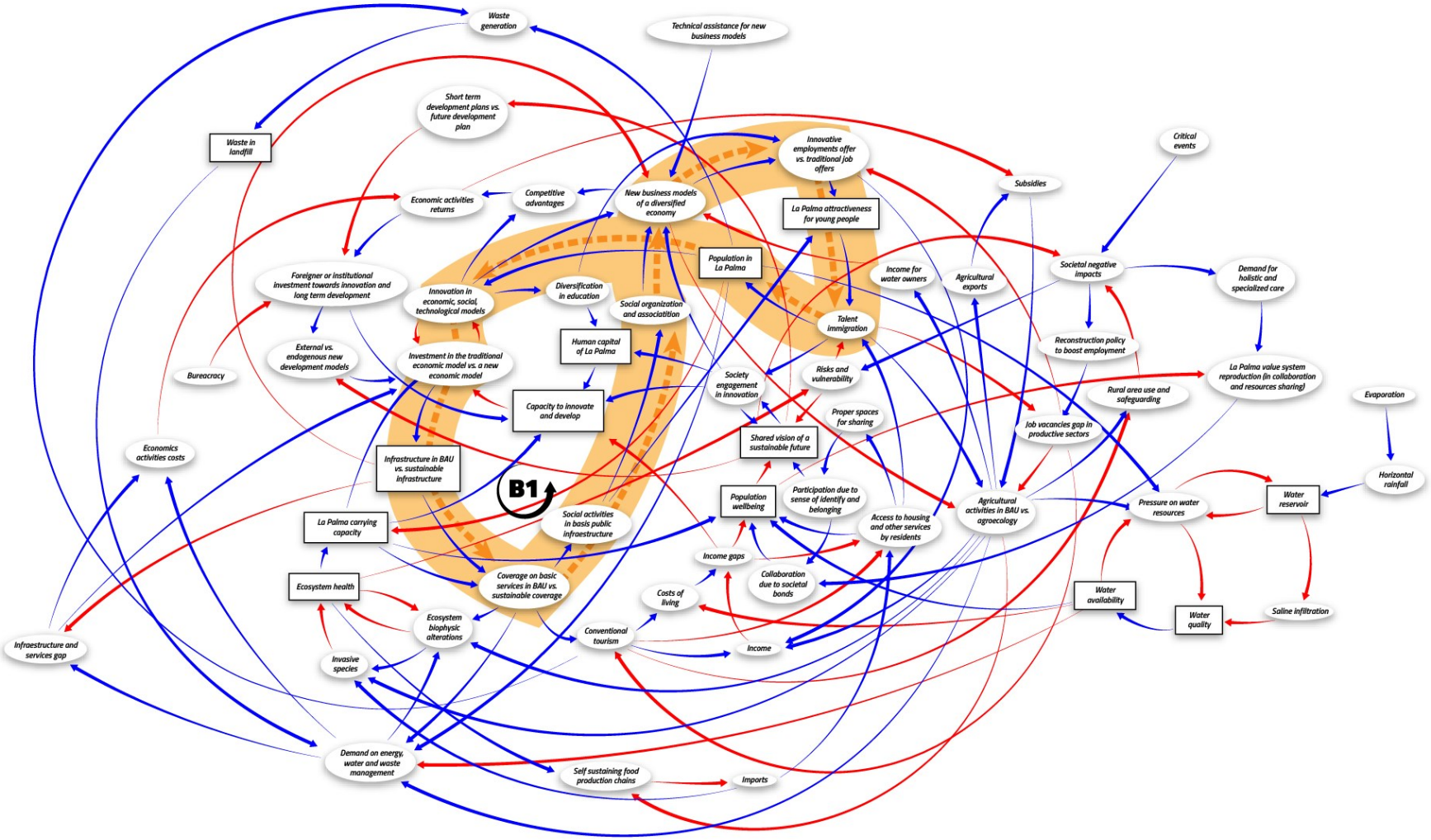


Figure 14. Balancing feedback structure Population drivers in La Palma. Own elaboration.

Island Sustainability Planning for Affordable Housing, Territorial Cohesion and Well-being

Despite the immediate issues of concern related to the volcanic eruption, long-term questions for sustainability planning represent a great opportunity to structurally address critical issues such as affordable housing. Precisely the lack of a shared vision for a sustainable future reinforces the short-term perspective on development plans, negatively affecting the island's possibility to receive investment, decreasing its capacity to innovate and invest in critical infrastructure and services (Figure 15). As a result, the current economic model heavily based on traditional agriculture production is reinforced. The low income levels related to the current economic activities increase the income gaps, decreasing population well-being.

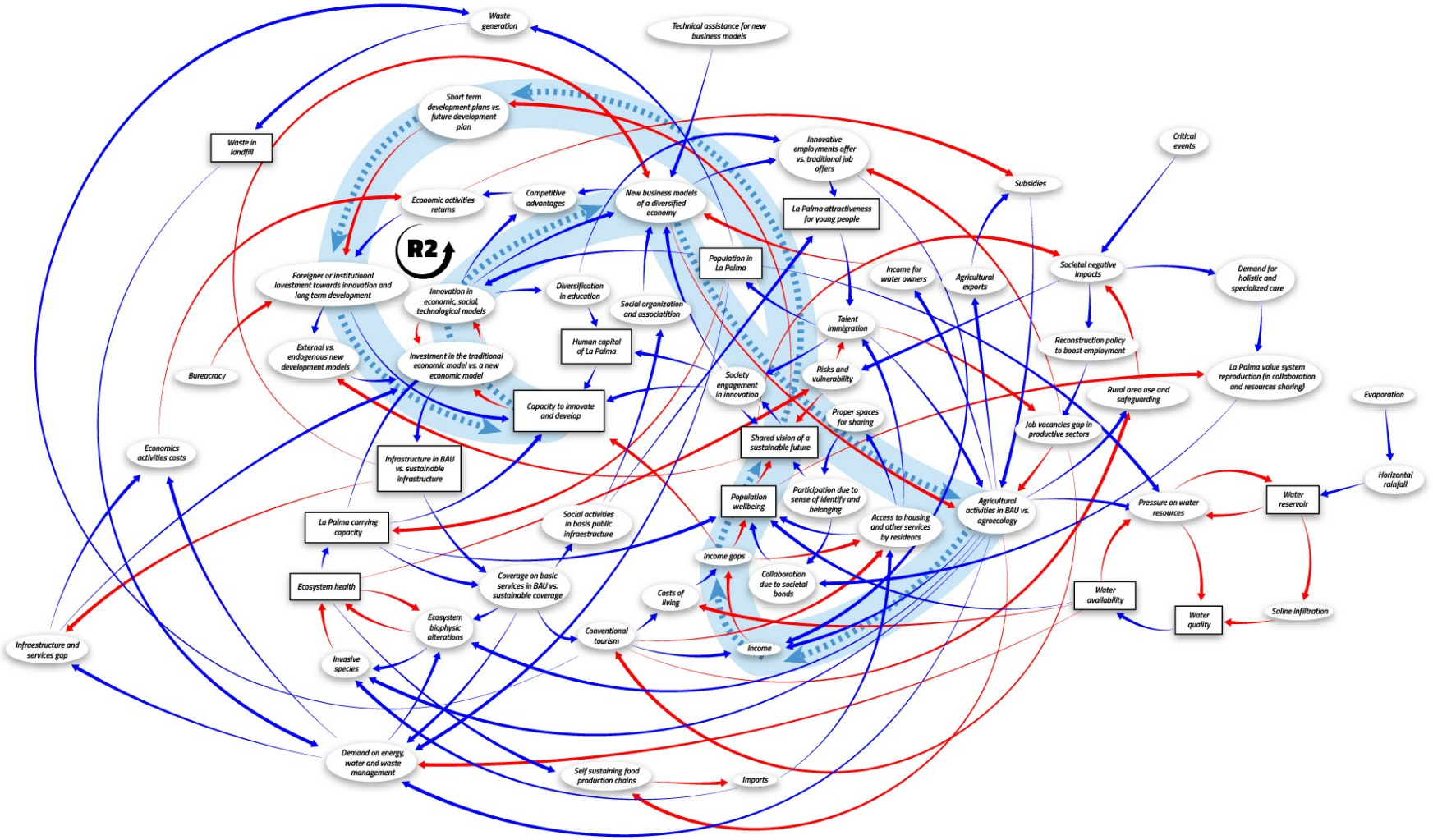


Figure 15. Reinforcing feedback structure Impacts of short-term development plans on economy and population well-being in La Palma. Own elaboration.

In the next section the desired future vision for La Palma elicited from dialogues with community members and experts is explained, as well as leverage areas and strategic guidelines for a sustainable future in La Palma.

La Palma Potential and Overarching Strategic Guidelines

Throughout the inclusive and participatory dialogues between fellows and local stakeholders, a shared vision for a sustainable future for La Palma emerged:

> ***"La Palma is a laboratory for a healthy island ecosystem with high well-being and quality of life, where sustainable practices, technologies, and infrastructures are put into practice for the transition towards self-sufficiency, wealth, and the regeneration of the island and its people."***

In order to create future vision there are leverage areas to work on (Figure 16). The next visualization shows in green those areas that need to be activated: 1) shared island's sustainability vision, 2) long-term planning. In blue are the areas that need investment: 3) creation of a new economic model and 4) innovative employment. Finally those that need to be transformed are highlighted in red: agricultural activities in business as usual (BAU) and conventional tourism. These leverage areas were studied and integrated in strategic guidelines for sustainable development in La Palma.

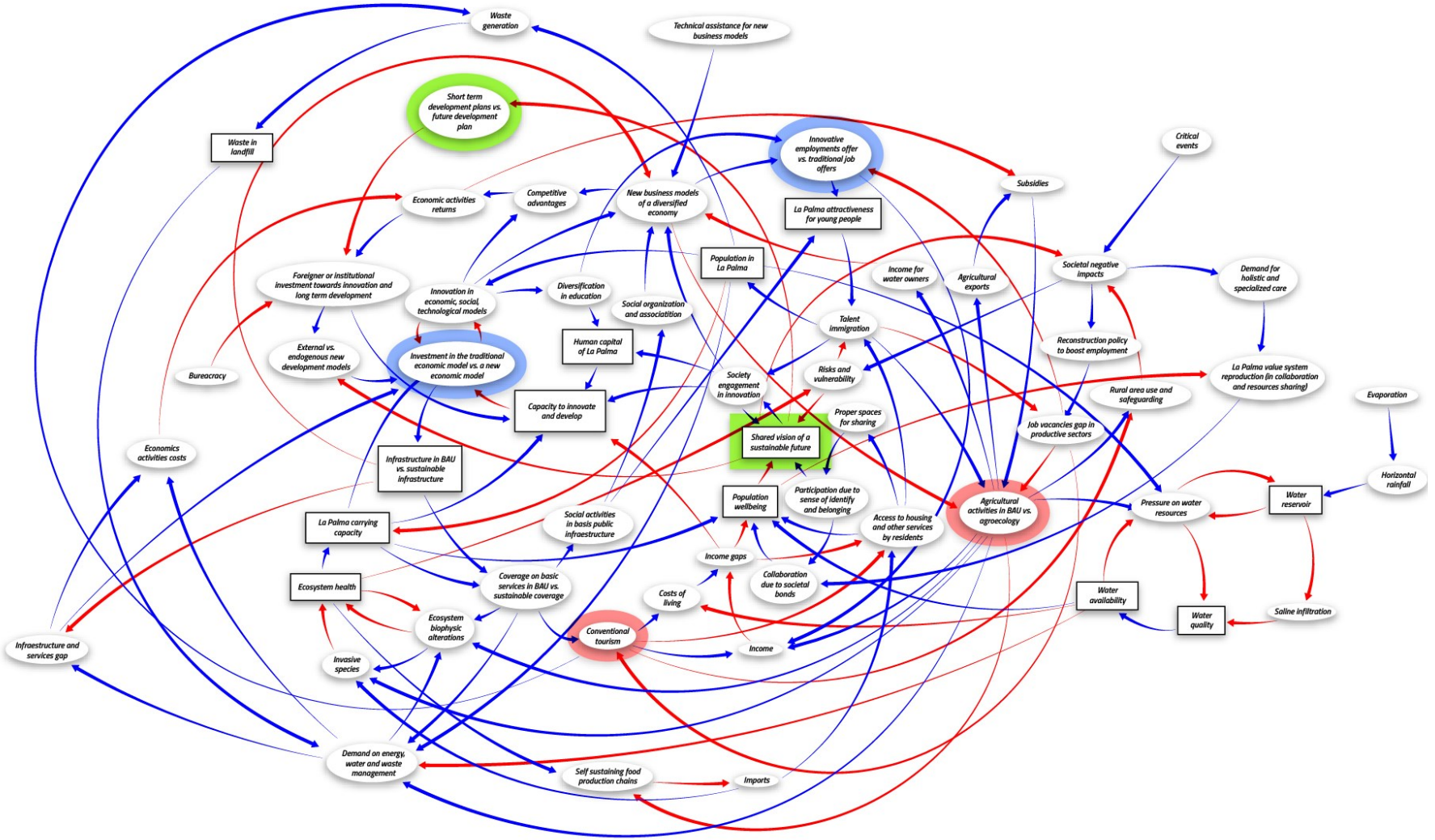


Figure 16. Leverage areas in La Palma. Own elaboration.

Overall strategic guidelines towards the desired vision:

- Envision an appropriate future sustainable development process and agree on its key features and implementation steps. Three specific areas of emphasis are:
    - agroecological production system aiming for food security.
    - regenerative tourism on the island
    - sustainable energy infrastructure for the island, taking strict care of its biosphere.
- Define a new set of indicators of sustainable development and economic well-being (beyond GDP) based on long-term plans for the island.
- Catalyze investment toward the new economic model with emphasis on creating innovative economic activities and employment.

In the next chapter of this report we will go deeper into issues related to each of the five key sustainability domains.

SUSTAINABILITY DOMAINS IN LA PALMA

In this section, each area of work will be explored in more depth. These areas of work correspond to the distinct domains as defined by the sustainability principles of The Lab.

DOMAINS

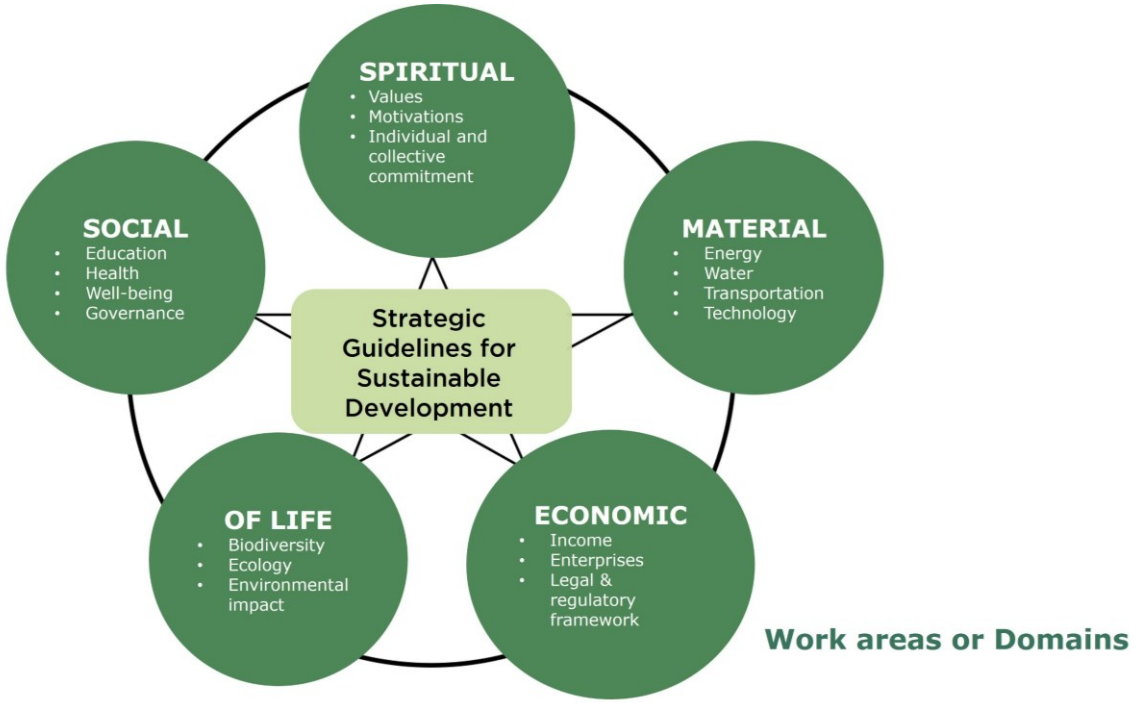


Figure 17. Topics covered by sustainability domain. Own elaboration.

Figure 17. Topics covered by sustainability domain. Own elaboration.

Within each domain, this exploration will encompass several critical aspects: an understanding of the sustainability dimension, an overview of its current state, an analysis of the corresponding model, the envisioned desired state, an assessment of key challenges, proposed strategic guidelines for meaningful progress, and conclusions drawn.

The information covered about La Palma to be found in this report contextually in each domain is:

- **Spiritual Domain**: identifies the importance of attitudes and values and provides the basis for a universal code of ethics.
- **Social Domain**: provides the basis for social interactions.
- **Domain of Life**: provides the basis for appropriate behavior in the biosphere to maintain the essential diversity of all life forms.
- **Material Domain**: constitutes the basis for regulating the flow of materials and energy to ensure non-declining resources.
- **Economic Domain**: provides a guiding framework for defining, creating and managing wealth.

THE SPIRITUAL DOMAIN

The spiritual domain encompasses a complex and profound dimension of human existence that extends beyond the material, biological, and technological realms. It reflects humanity's innate drive to transcend the ordinary, integrating a broader reality while seeking wholeness and completeness. This not only shapes individual development but also influences the trajectory of societies. The extent to which this spiritual domain is allowed to manifest in daily affairs significantly impacts people's choices and the quality of their actions. It distinguishes between a self-centered, exploitative mindset and a nurturing, inclusive perspective that acknowledges our interconnectedness with the larger ecosystem. Incorporating the wisdom of diverse traditions, the term "spiritual" in this context conveys a profound essence encompassing inspiration, purpose, meaning, and overarching values. The spiritual domain calls for universal ethics guiding humanity towards a more sustainable and harmonious future.

– Sustainability: Definition and Five Core Principles, A New Framework (2015)

The concept of spirituality, often multifaceted and individually perceived, can be analyzed within the context of La Palma. While definitions from the Real Academia de la Lengua Española (RAE) describe spirituality as the "nature and condition of being spiritual" and "pertaining or relating to the spirit," they leave us seeking a more comprehensive understanding. The spiritual domain within La Palma's sustainability context relates to the intangible aspects of human experience, encompassing personal connection, values, and a sense of purpose. It is the underlying motive behind human interaction, choices and behaviors, ultimately shaping the island's culture and trajectory. From this understanding, the investigation in La Palma focused on three primary questions:

- **Why do people come to La Palma?**
- **What encourages them to stay?**
- **And why do they return?**

Current State and Key Challenges

The current state of spirituality on La Palma reflects a diverse spectrum of beliefs, practices, and perspectives among residents and visitors. The analysis involved constructing a causal diagram (see Figure 18) to visualize the intricate relationships between these challenges and to identify key influencing factors.

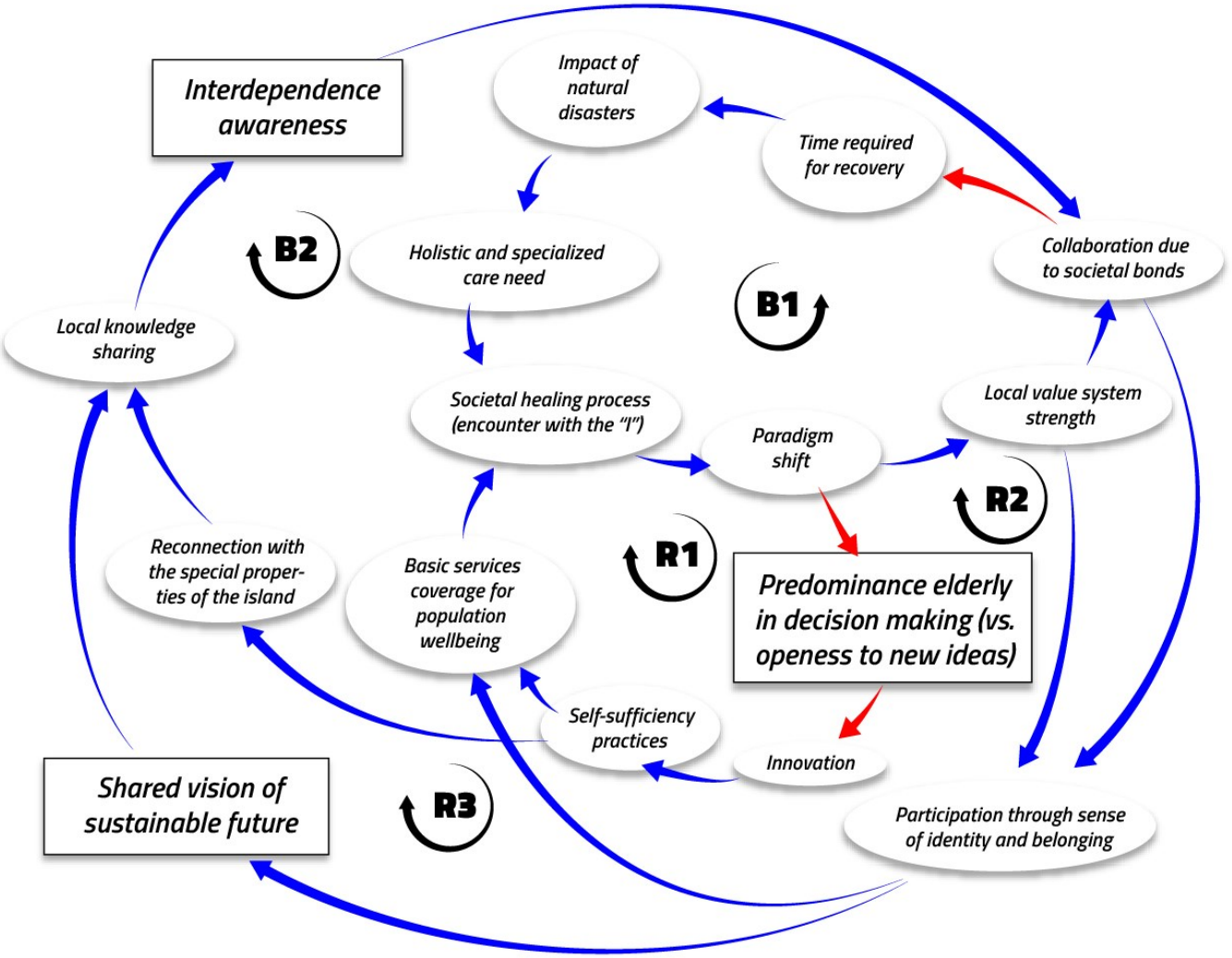


Figure 18. CLD of La Palma through the lens of the Spiritual Domain of Sustainability. Own elaboration.

La Palma has long been recognized as a place of natural beauty and tranquility, which has attracted individuals seeking spiritual connection and solace. While many residents engage in traditional practices, such as festivals and community gatherings, the island has also seen an influx of nature and wellness enthusiasts (R3). However, the island faces concerns related to rapid and disorderly growth, which raises questions about its capacity to sustain both its population and economic activities while potentially resulting in adverse effects for its residents. Moreover, the impact of natural disasters, including volcanic eruptions and fires, have negatively affected the well-being of the population (B1).

Key challenges identified are:

1. Lack of Structured Emotional Support: La Palma faces challenges related to emotional well-being, community cohesion, and coping with uncertainty (R2). Despite the recognition of the importance of community support in the face of critical events, such as volcanic eruptions and fires, there remains a lack of structured emotional support. Recent data indicates that 35% of La Palma's residents reported feeling emotionally unprepared to cope with the volcanic eruption in 2021. This underscores the need for accessible emotional resources and strategies to promote well-being and resilience in the face of adversity.

2. Erosion of Traditional Practices: La Palma's rich cultural heritage is at risk due to a lack of generational succession in traditional practices (B2). Data from the local heritage preservation agency reveals that, over the past two decades, there has been a decline of 25% in the number of young people actively participating in traditional festivals. The risk of losing these cultural treasures highlights the importance of revitalizing and preserving intangible heritage.

3. Tourism Impact on Values: La Palma's thriving tourism sector, while vital for the economy, has faced challenges in terms of aligning with the island's spiritual values. A survey conducted by the Institute of Sustainable Tourism found that 42% of tourists visiting La Palma expect authentic and transformative experiences (B2). However, 28% of tourists expressed concerns about the potential erosion of local values due to unsustainable tourism practices. This presents a delicate balance between economic prosperity and preserving the island's spiritual heritage and connection to nature.

Looking at the interconnected variables at play in relation to the impact of natural disasters it can be observed that these events underscore the need for holistic and specialized care to help individuals reconnect with themselves, reducing materialistic tendencies. Notably, La Palma has been fortunate to avoid loss of human life in recent natural catastrophes, thanks to early interventions fostering values like collaboration and gratitude. Additionally, strengthening family and community bonds lead to shorter recovery times, effectively minimizing the overall societal impact of such events (B1).

Desired State

The vision developed from the active collaboration between fellows and local stakeholders and experts envisions a transformation where spirituality becomes a cornerstone of sustainable progress:

> ***"An island that progresses as a sustainable territory, harmoniously combining conscious tourism and local traditions united with pioneering technology. United in a collective vision, both locals and visitors preserve the cherished identity of the island, nurturing a thriving ecosystem where the common values typical of the inhabitants of the territory can flourish. La Palma serves as an example of sustainability for the rest of the world."***

Strategic Guidelines

In view of the identified challenges and proposed desired vision, the following strategic guidelines aim to steer La Palma toward a more sustainable and resilient future while preserving its cultural heritage:

1. **Caring for Individuals and Community Resilience.** The objective is to cultivate unity, mutual support, and adaptability through community well-being events that encourage open communication, connection with nature, and acceptance of uncertainty. This guideline proposes the establishment of a network of well-being professionals across the island who provide continuous support and resources for emotional health and resilience. It recommends the development of a platform that offers holistic services for physical, psychological, and spiritual well-being, ensuring accessibility to all residents by establishing regional well-being centers in different municipalities.

2. **Preserving Cultural Heritage and Integrating Tradition with Innovative Sustainability.** This guideline aims to preserve the island's traditional practices while employing them intelligently through innovative technologies. This fusion will not only safeguard traditions but also advance sustainability and self-sufficiency. It requires the identification of new technologies that enhance and streamline traditional professional activities, reducing individual work dependency and increasing its attractiveness, such as smart farming of bees. The revival of traditions through events that increase the appeal to younger generations is also recommended. Campaigns and fairs can assist in revaluing traditional crafts and facilitate the transfer of intergenerational knowledge, while promoting networking.

3. **Regenerative Tourism Development.** To achieve a type of tourism that aligns with the island's values and benefits both visitors and residents, this guideline proposes a redefinition of La Palma's marketing strategies. These should highlight the island's unique qualities, focusing on authenticity, sustainability, inclusion, health and wellness options, natural beauty and traditional practices with the aim of attracting visitors who share in its values. Moreover, residents should be encouraged to actively participate in and benefit from tourism-related activities, fostering a sense of ownership.

Figure 19. Examples of possible regenerative tourism projects. Own elaboration.

Conclusions

The spiritual domain holds tremendous potential for guiding La Palma towards being a global reference for sustainability, health, and well-being that inspires the world, grounded in the preservation of nature and the value systems nurtured by its inhabitants. "La Palma, an island with soul." Additionally, its volcanic eruption history, with emphasis in the recent events of 2021 which has indeed been a tragedy for La Palma, also opens a window of opportunity to shape a better and more sustainable future. With proper planning, investment, and international support, La Palma can emerge stronger and become a model of resilience and sustainable development for other regions facing similar challenges.

THE SOCIAL DOMAIN

> ***The social domain encompasses the complex arena of human interactions and societal structures. It is based on the recognition that diversity, inclusivity, and compassion are important for the robustness and long-term vitality of societies. It acknowledges the fallibility of human knowledge and the rejection of the notion of a single ultimate truth. Instead, it advocates for the coexistence of diverse truths without one dominating the others. The social domain is grounded in an understanding of human nature as adaptable and with the potential for individuals to move towards inclusive and compassionate behavior.***
>
> *– Sustainability: Definition and Five Core Principles, A New Framework (2015)*

The social domain sustainability principle calls for inclusive governance, plurality of expression, tolerance, equitable access to resources, global cooperation, and sustainability education. It seeks to guide the transformation of our societies into more inclusive, compassionate, and sustainable entities, with the aim of creating a brighter and more harmonious future for all.

Current State and Key Challenges

This narrative delves into the social sustainability domain of La Palma, exploring its current state and key challenges. In collaboration with the diverse stakeholders who contributed their expertise, an overview of the island's current social landscape was captured and the most relevant factors are highlighted in the following causal loop diagram.

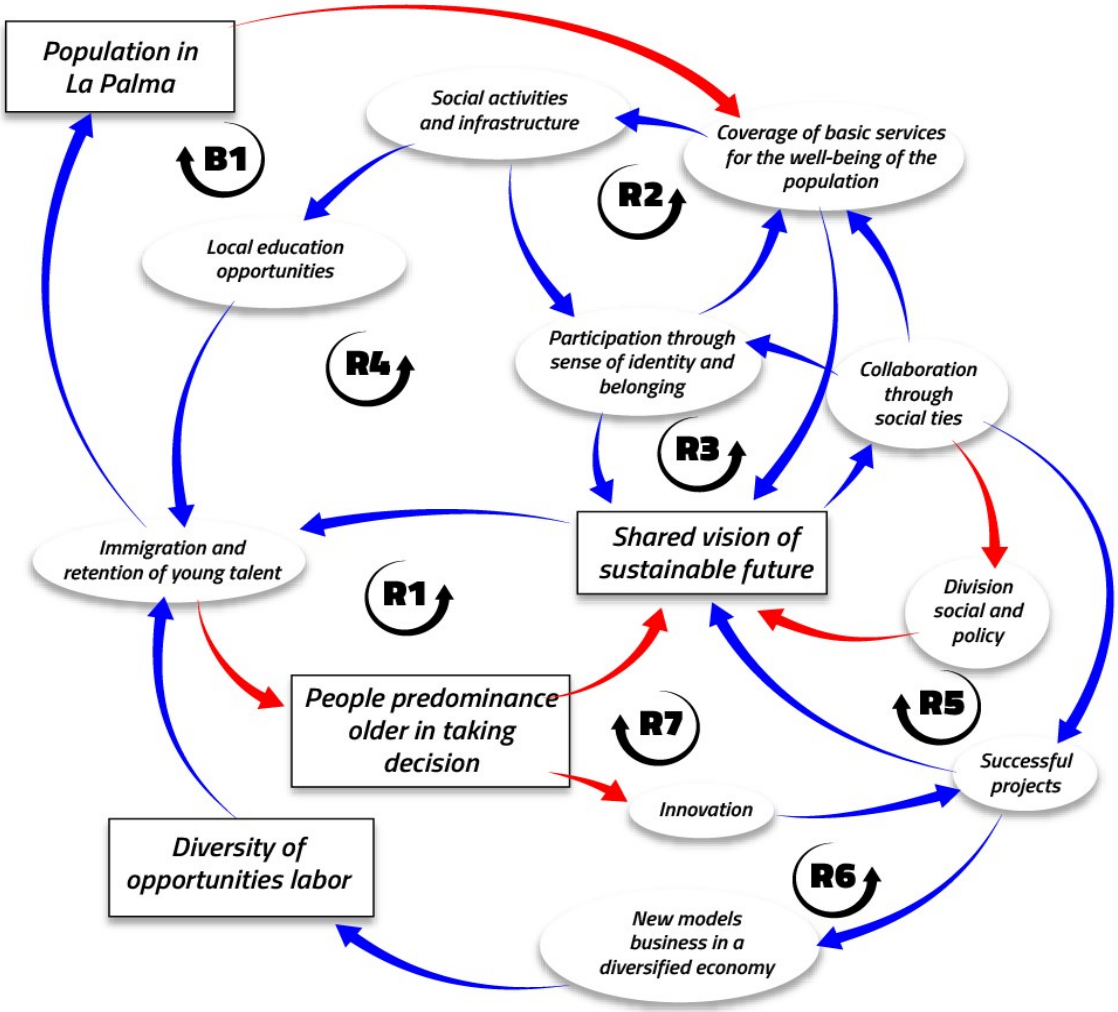


Figure 20. CLD of La Palma through the lens of the Social Domain of Sustainability. Own elaboration.

The population of La Palma is relatively small, with 83,439 inhabitants in 2022, and it faces challenges in terms of renewal. There has been a negative natural population growth over the last two decades, with consistent declines in natality. The number of births was as low as 410 in 2021. Nonetheless, the population has remained somewhat stable due to immigration. Approximately 30% of La Palma residents were born in other territories, including other Canary Islands, mainland Spain (10% of the population), other European countries (10%), predominantly UK, Germany and Italy, and Latin American countries (10%), particularly Venezuela and Cuba. The arrival of new residents to La Palma has had some noticeable positive effects, including the revitalization of housing, improved urban connectivity, a boost in the local economy, and the blend of cultural richness and social vitality that define its unique character. However, it also presented negative impacts, such as reinforcing isolation in rural areas, leading to weaker community bonds. Conversely, an overwhelming growth of the population could also reduce the ability to achieve the coverage of basic services as well as that of having a shared vision for a sustainable future (B1).

Holding a shared vision for the future of La Palma, that addresses how to collectively overcome its main challenges and strive towards sustainable development, plays an essential role in increasing the attractiveness of the island for immigrants and young residents. Currently, a significant percentage of young people, especially those aged 17 to 25, leave the island in pursuit of higher education and job opportunities elsewhere. Approximately 30% of La Palma's youth choose to migrate, often leading to long-term emigration and resulting in a significant loss of human capital. This has led to an aging population in La Palma, with an aging index of 1.87 (there are 187 elderly individuals for every 100 young people). The average age on the island is around fifty years old and a substantial portion of residents fall into the 65+ age group. This demographic trend has given rise to a notable generational gap, which has created a disconnect, with cultural values, traditions, and knowledge held by older generations not being passed on to the youth. Moreover, youth participation in significant processes is limited, meaning that many of the island's decisions are made by individuals of advanced age. This undermines the ability of creating a shared future vision, and in turn reduces the desire of youth to remain on the island or return (R1).

Looking at the diagram (Figure 20), it can be observed how social activities and infrastructure are related to social participation, which contributes to the provision of basic services (R2). Additionally, participation through a sense of belonging is directly related to the ability of the population to agree on common future goals and achieve higher social collaboration (R3). This can be exemplified by the crucial role that the topography of the territory plays in the sociocultural configuration of La Palma. Challenges around mobility and, in more recent times, the preference of residing in urban areas, have contributed to the isolation of some communities and the depopulation of others. These factors have changed the nature of social relationships, reducing the prominence of cultural elements tied to rural life and emphasizing more individualistic behaviors. These contribute to the weak social participation observed in La Palma and have led to a diminished interest in community engagement and the common good. Furthermore, the fact that decision-making processes are failing to effectively integrate citizen participation has caused a political division and a loss of trust in political processes. This, in turn, undermines the achievement of a shared vision for the future of the island.

The limited availability of higher education options on the island contributes to the youth seeking educational and career prospects off-island. Similarly, job opportunities that offer growth are currently limited. Both are indirectly related to the lack of active collaboration and loss of social ties. On the one hand, the educational offer is affected through decreased basic services and diminished social activities and infrastructure (R4). On the other hand, job diversity is slowed down due to a reduced number of successful projects and new business models (R5, R6). In this regard, it is relevant to consider the importance of the loss of social ties of those who emigrated and return to La Palma only as visitors for leisure and holidays, often being those of higher entrepreneurial capacity. Another factor influencing the availability of creative projects and new business models is the lack of innovation driven by the predominance of elderly population in decision making (R6), who primarily focus on traditional activities.

In view of these challenges, the formulation of a collective shared vision for a sustainable future, that truly includes the interests of all inhabitants of La Palma as well as those Palmeras and Palmeros who live abroad, seems to be a key leverage point to effect transformative change towards sustainable development.

Desired State

During the GSF program 2023, fellows had the privilege of adopting a forward-looking perspective, akin to looking through a lens, allowing them to see the desired future of La Palma. In this case, the picture painted for the social domain is both inspiring and challenging.

> ***"La Palma is filled with youth and hope, sharing a unified vision of a sustainable future that drives social initiatives. These initiatives are rooted in a revitalized culture that gives rise to new employment and educational programs built upon the island's potential. Additionally, collaborative efforts are emerging to support innovation, sustainability and to meet the needs of future generations."***

Strategic Guidelines

Considering the realities and challenges identified, the following strategic guidelines are aimed at uncovering the island's social potential:

1. **Governance and civic engagement for a sustainable future.** This guideline advocates for the establishment of a collaborative alliance aimed at fostering connections among citizens and incorporating all interest groups and collectives. Realizing this alliance entails several key steps. Firstly, assembling a core working group comprising actively engaged actors. This group would define the objectives and identify eligible interest groups and stakeholders. To ensure inclusivity, the next step involves identifying the island's diverse needs. This necessitates a dual approach: traditional surveys and active fieldwork within communities. Transparency remains a core principle, achievable through a readily accessible database showcasing the actions, outcomes, and achievements of these groups. Effective communication is pivotal to ensure broad citizen outreach. Finally, this alliance is tasked with consolidating existing sectoral plans and strategies, many of which need better integration and adaptation to our unique context.

2. **Shifting the demographics to rejuvenate La Palma and reinforce intergenerational and intercultural exchanges.** The future vision for La Palma is brimming with youth, diversity, and connections. To illustrate, let's consider this question: Why are Swedish multinational companies so successful in selling furniture? This analogy, borrowed from Juan Serantes, emphasizes an important insight. Swedish companies thrive because customers not only purchase their products but also actively engage in assembling them, fostering a unique connection. Similarly, revitalizing La Palma entails active engagement with its young residents, soliciting their input, understanding their aspirations, and aligning projects with their desires. Additionally, the

creation of communal spaces for dialogue and interaction can be a catalyst for demographic transformation. These spaces would support collaboration, networking, digital nomads, festivals, and diverse cultural and artistic activities.

3. **Investing in an education that leads to social transformation.** Education needs to be aligned with the potential of the island as well as integrating innovation and sustainability. This guideline advocates for cross-cutting projects across all educational levels that focus on ecology, society, and local content. These projects should cultivate critical, innovative, and creative thinking among students. This represents an initial step toward more comprehensive reforms, such as curriculum updates, to better align educational content with future economic sectors. Furthermore, highly educated individuals whose qualifications are not recognized need to be offered support. This particularly concerns migrant communities, necessitating tools for validating their qualifications to improve their career opportunities while enriching La Palma's professional landscape. Additionally, higher education should diversify beyond traditional sectors, such as tourism and agriculture, to align with emerging job opportunities.

Conclusions

In conclusion, the proposed guidelines seek to address key challenges such as a generational gap, youth migration, and limited trust in political processes. By fostering inclusive governance, bridging demographic divides, and transforming education, La Palma aims to create a vibrant and inclusive society where citizens actively participate, cultural values are preserved, and a shared vision drives social initiatives.

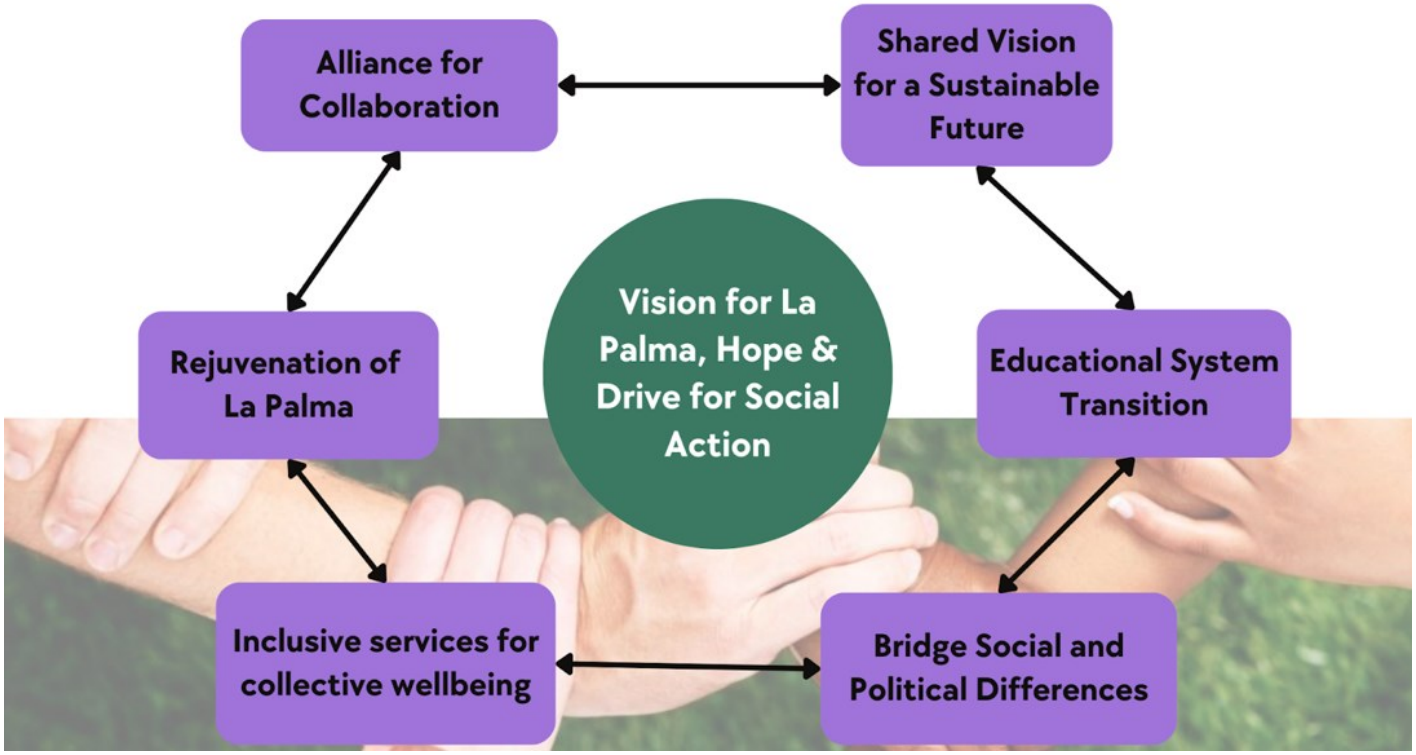


Figure 21. Social Domain strategic guidelines integration. Own elaboration.

THE LIFE DOMAIN

> ***The Domain of Life provides the basis for appropriate behavior in the biosphere with respect to other forms of life. The underlying premise is that the adaptive success of our species and its quick propagation almost everywhere on Earth comes at the expense of many other forms of life. The destruction of individual animals, species, habitats and whole ecosystems—a trend now reaching ominous proportions—is a deep cause for alarm. Complex, self-organizing, living systems—brains, societies, and ecosystems including rainforests, coral reefs, and industrial economies alike—depend on their very complexity, their internal variety, for long-term viability. Lasting stability in all such systems, science tells us, is in fact a direct function of complexity, of an inherent redundancy, which allows for the emergence and reemergence of different configurations in response to changing events. Monocultures, by contrast, are brittle in principle—the antithesis, in this context, of vibrant life. On this point, contemporary science seems to converge with the intuition of many of the world's ancient wisdom traditions, which insist on the uniqueness and fundamental sacredness of all forms of life. Thus we all must work to ensure that the essential diversity of all forms of life in the biosphere is maintained.***
>
> – Sustainability: Definition and Five Core Principles, A New Framework (2015)

To do so, we must assume responsible stewardship for our planet's web of life, harvest species only to their regeneration capacity, conserve the variety of the existing gene pool, and shape land use patterns to reduce human encroachment on other forms of life and enhance biological diversity in areas of human habitat.

Current State and Key Challenges

La Palma is a uniquely special island with a wealth of species biodiversity in fauna and flora, including many that are endemic and among the whole world can only be found in La Palma (Figure 22). The island is home to many niche ecosystems with different elevation, climate, soil type, and more that sustain this diverse life, and because of this more than 50% of the island is currently protected territory. The rich terrestrial ecosystem diversity of La Palma contributes to the healthy soil (especially carbon and nitrogen) and the freshwater aquifer volume and quality (high elevation plants performing horizontal rain capture, and all the native plants reducing soil erosion and preventing runoff with their root systems). The marine ecosystem is somewhat less diverse and rich, but still very important. Protecting and stewarding this life in turn allows all forms of life to occur and to thrive. The life domain of the biosphere has particularly important connections with agriculture, tourism, land use, and the local economy, and really plays a role in all aspects of life on La Palma.

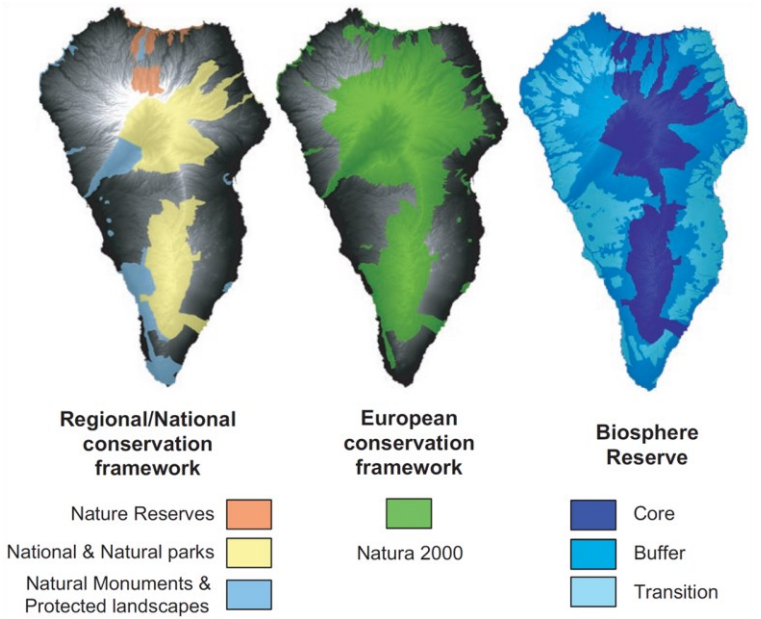


Figure 22. Image adapted from "An island view of endemic rarity – Environmental drivers and consequences for nature conservation." Diversity and Distributions (2017).

The people of La Palma have historically lived in harmony and balance with nature, and many still do. However, there are challenges today that are sometimes directly obvious, or others that can be seen through more complex relationships in the whole system model. For example, there is a positive connection between ecosystem health and conscious ecotourism where tourists come to visit "La Isla Bonita". There is also a positive connection between conscious ecotourism and ecosystem health because the right kind of tourists are responsible stewards of the ecosystem during their stay. Considering these two facts together in the system model shown in Figure 23, a compounding effect is observed in the way of a reinforcing loop (R1). The direct negative impacts of invasive species are well recognized in how they harm native and endemic biodiversity, or ecosystem health. When ecosystem health is strong, there is an inherent resilience against invasive species that decreases their spread. Alternatively, when the ecosystem health is reduced by invasive species, then the inherent resiliency of the native ecosystem against invasive species is also reduced, and invasive species are more able to flourish (R2). Similarly the impacts of climate change negatively impact ecosystem health but can be mitigated by ecosystem health (R3). Ecosystem health and water availability are connected in a reinforcing loop (R4) that can be understood noting the fundamental importance of water for sustaining life and by examining native plant capture of horizontal rain and the importance of root structures for soil retention and water filtration into the aquifer.

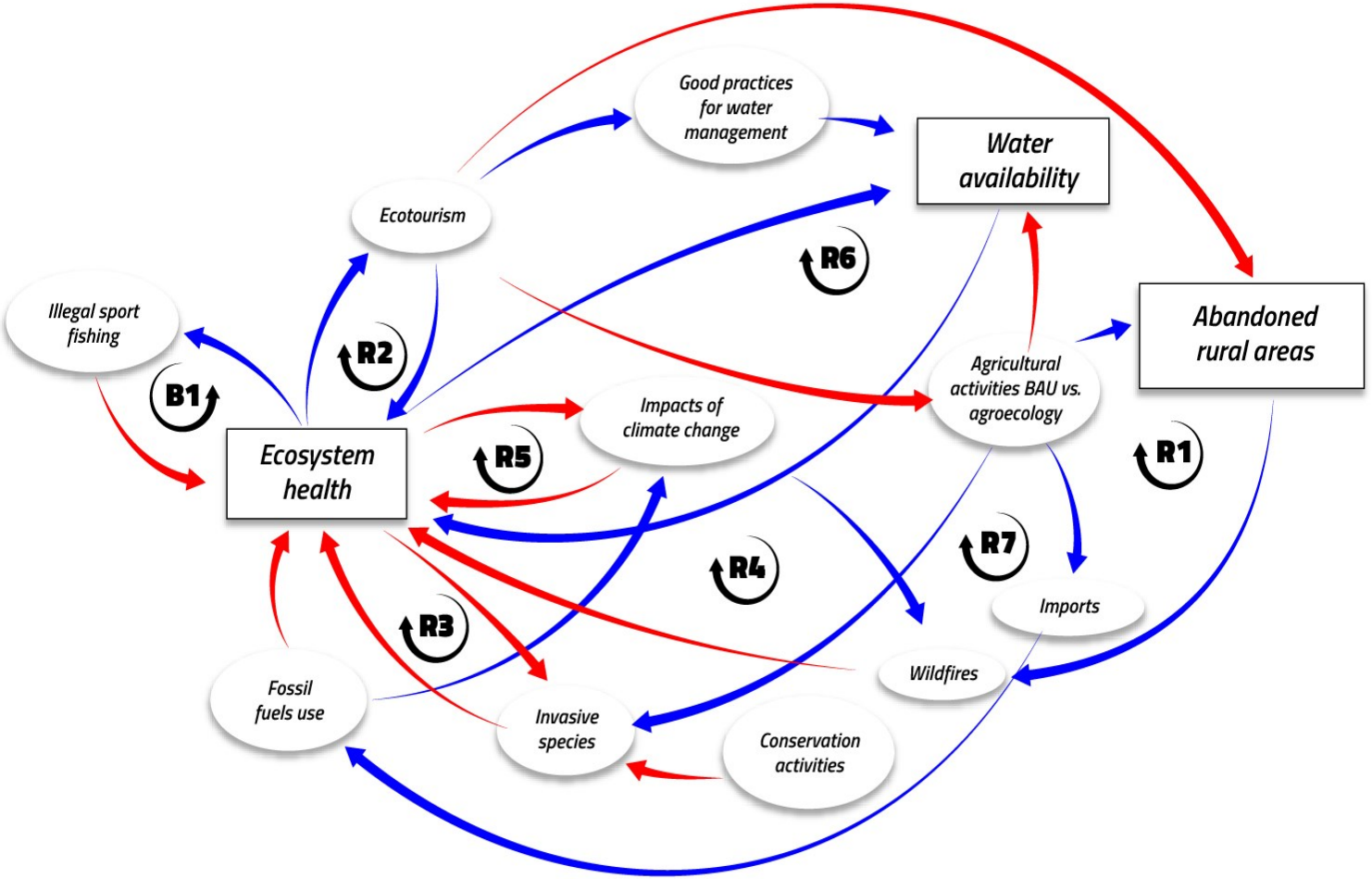


Figure 23. CLD of La Palma through the lens of the Life Domain of Sustainability. Own elaboration.

La Palma today has more abandoned agricultural space (7,645.07 ha) than the amount of cultivated agricultural space currently in use (6,314.26 ha). Meanwhile among the cultivated agricultural space, more than 70% (4,435.51 ha) is being used for the monoculture of only three crops: bananas (2,675.07 ha), avocados (1,077.79 ha), and grape vines (782.65 ha). The whole agricultural surface area of La Palma, including the abandoned and active spaces, totals 14,727.99 ha, which is just over 20% of the total surface area of the insular territory of the entire island of La Palma (70,720.77 ha).

Compared to the terrestrial biodiversity of >1,000 native species of vascular plants in La Palma, including >200 endemic species, the use of vast agricultural space to cultivate only three types of plants is clearly unbalanced in its lack of diversity. Understandably there is also an impact of monoculture agriculture on other terrestrial biodiversity that relies upon ecosystem health for its livelihood, including the >2,000 native species of mushrooms, lichens, and fungi in La Palma, with >80 being endemic, and the biodiversity richness of >3000 native species of terrestrial animals in La Palma, with >900 being endemic. Some ecological agriculture is practiced in La Palma, which can have reduced negative impacts or even generate positive impacts that facilitate a rich and thriving ecosystem, but this is still an overwhelming minority of the total agriculture.

More complex reinforcing loops emerge in the system with regard to abandoned rural areas. One starts with the positive connection between ecosystem health and conscious ecotourism, leading to a negative connection between conscious ecotourism and abandoned rural areas, a positive connection between abandoned rural areas and wildfires, and the negative connection between wildfires back to ecosystem health (R5). Managing the risk of wildfires is an important challenge that was historically mitigated by human stewardship of the land beside the forest, the so-called buffer zone. While many parts of the forest are protected areas, the abandonment of rural housing and agricultural properties in the buffer zone has created a hazardous liability with increased proliferation of invasive species and additional risk of wildfires. The impacts of climate change today also increase the risk of wildfires in La Palma, which are becoming much

Figure 24. NASA (2023) [La Palma smoke] Retrieved July 15th 2023.

larger in scale than in past decades and centuries, and the occurrence of wildfires in turn reduces ecosystem health and forms another reinforcing loop in the system model (R6) since the impacts of climate change were already shown to be inversely connected to ecosystem health. There is an opportunity to leverage conscious ecotourism and a shift from agricultural activities in monoculture plantations (business as usual or "BAU" in the diagram) to agroecology to reduce the amount of abandoned rural areas and manage the risks of wildfires in reinforcing loops R5 and R6.

The seabed of La Palma, although a relatively small marine surface area (16,355 ha), is very diverse and has the capacity to host a great biodiversity because volcanic seabeds allow many species to settle. Over 1,000 species of marine life are present in the immediate zone of La Palma's ocean waterway, and more >10 of those are endemic.

The situation of La Palma's marine ecosystem health is somewhat complicated due to differences that exist between what written protections are in place and the reality of what actually occurs. For example, well-documented overfishing in the Canary Islands in the past led to new protective regulations, but there is still ongoing sport fishing without catch reporting and also fishing happening in marine protected areas. The policies made at the regional or national level do not take into account the individual differences between each of the Canary Islands, and they are not equally applicable or equally enforced. While illegal sport fishing relies on ecosystem health to provide large enough and diverse fish to hunt, the practice negatively impacts ecosystem health in a way that has demonstrably harmed fishing over the past decades. This is an example of a balancing loop that exists in the system (B1).

There is also known to be prohibited but accepted municipal wastewater outflow into the ocean from La Palma, even in protected areas, along with significant risk of agricultural runoff of fertilizers and pesticides because plantations are mostly located near the coast where the land is flatter and more desirable for mass agriculture.

La Palma operates some educational and scientific centers, but these are generally limited in their scope and size. Much of the non-government research and scientific studies that take place in La Palma is conducted by universities from other islands or mainland Spain and abroad. Public outreach and education is very regional across the island, with great success around focal points but without comprehensive coverage.

Members of the public have reported not understanding the reason for or value of policies that are put in place to protect ecosystem health that they may perceive as challenging economic growth and societal development. However, La Palma continues to demonstrate unique opportunities to study astronomy, volcanology, ecosystem evolution, Earth's magnetic field, many aspects of terrestrial and marine biodiversity, and so much more that would benefit economic growth and societal development while maintaining or improving ecosystem health.

Figure 25. Marine ecosystem from La Palma. Oceanologico La Palma (2020).

Shifting from a zero-sum (win or lose) to non-zero-sum (win and win) mentality of sustainable use and management has to include support and collaboration from all sectors and types of people across the community.

Desired State

During the GSF program 2023, fellows worked with local stakeholders to understand and reflect a collective vision for a "dream" La Palma that builds on the successes of La Palma today and informs strategies to overcome the challenges that also exist.

> ***"La Palma is the model island of sustainability with minimal harmful impact on ecosystem health and biodiversity, where people are living in balance and harmony with nature, on land and in the sea, and only take resources within the regenerative capacity of the ecosystem."***

This requires development of a better understanding of the true carrying capacity of La Palma according to the whole systems approach of the Sustainability Laboratory, and implementation of new policies and practices based on that information.

Strategic Guidelines

1. **Sustainable use and management of biodiversity.** The biosphere reserve should interact with all sectors of society, including business, government and critical infrastructure, to create science-based policies with the participation of the community, public, private and non-profit sectors. The community figures within the biosphere reserve network should bring together all these sectors in a comfortable and transparent way, so that dialogue can flourish in order to create indicators for all the actions to be carried out in La Palma. All this should be approached taking into account the actual carrying capacity of La Palma, which can be calculated with the whole systems approach of the Sustainability Laboratory.

2. **Managing invasive species threats by creating resilience.** La Palma should preserve the health of its unique ecosystem by protecting endemic species and creating resilience against external pressures (microorganisms, plants and animals). There should be a whole island assessment to establish the current situation of invasive species according to key indicators (e.g. population or distribution) that can then be continuously or periodically monitored during reduction, removal, and other mitigation measures. There needs to be an increased awareness among the population that will come from citizen education, and engage community participation in conservation and restoration projects. The animals that have been introduced to La Palma for the sake of sport hunting, or pets like cats that roam freely, should be considered as invasive species when evaluating their origin, propagation, and impact on the local ecosystem.

3. **Protect, value and use the marine ecosystem of La Palma according to sustainable principles.** La Palma should restore its marine environment to a healthy state, allowing its use for tourism, recreation and sustainable artisanal fishing. The marine ecosystem of La Palma should be protected, valued, and used according to sustainability principles of not exceeding the regenerative rate and carrying capacity. Single management plans with diverse boards that bring together professional fishermen, sport fishermen, government administrations and technical experts to promote a space of trust, transparency and agreement to manage the marine ecosystem resources of the island as is done for the terrestrial environment. New policies and enforcement mechanisms could be required. To make informed decisions, there is a strong need to obtain more knowledge by attracting research and conducting technical analyses. The true carrying capacity and regeneration rates of the fish stocks and marine ecosystem, the volume of fishing activities, and thus the maximum sustainable yield is not known today, and it should be evaluated. Meanwhile, illegal fishing

inside the marine reserve area, unregulated sport fishing practices, and water pollution all need to be ceased. In order to change these habits and practices of Palmeran society, public awareness campaigns and educational programming can be crucial to achieve community understanding, support, collaboration and compliance.

4. **Plan and prepare to strategically adapt to climate change.** La Palma should have a resilient ecosystem rich in diversity with endemic species and functional redundancy that will be able to withstand the pressures that come in the future with the impacts of climate change by preserving the biodiversity of species. The massive land lots that are currently abandoned agriculture areas should be developed for ecological agriculture or "agroecology" and eco-tourism that are already beginning to be used in La Palma. This will create regenerative agriculture and well curated horticulture spaces that form a barrier to reduce the impacts of climate change like wildfires in times of drought and high heat. La Palma also has an opportunity to connect schools, climate change laboratories (as in Fuencaliente), and global partners to collaborate on knowledge creation, information sharing and action on climate change. In the relatively small island of La Palma there is a model of the whole world, from sea level to mountains, and drylands to cloud forest. There could be a new climate change study and information center built to connect the public and tourist populations with scientists and specialists to promote citizen science, public participation, and increase innovation in La Palma.

5. **Creating synergistic collaborations or new institutions to develop research studies and innovations that are unique to life on La Palma.** La Palma should celebrate its unique biosphere and use it to develop a sector of interconnected ecologically conscious scientists locally and abroad. It can be a center for scientific discovery and innovation. To do this, La Palma should bring together

and network some of the many excellent initiatives and centers that already exist but that operate relatively exclusively. For example, there are already the world-renowned astronomical observatories and laboratories, the biosphere reserve and biosphere communities, agroecology centers, and so many foundations and projects. Implementation of the law of the sky has minimized light pollution in defense of a clean sky, not only improving astronomical observation but also protecting nocturnal biodiversity and attracting specialists to La Palma to study these fields. Another special aspect of La Palma is its place in Earth's magnetic field, the connection of volcanic activity with electromagnetism, and the effect these have on terrestrial and marine geological and biological diversity. These are new areas with opportunities for La Palma to lead the world in research, understanding, and innovation unique to La Palma.

Conclusions

La Palma is and should be so much more than an island: a true world biosphere reserve that protects its marine, terrestrial, and sky ecosystems. Evaluating the carrying capacity of the biosphere with whole systems dynamics according to the principles of the Sustainability Lab will inform the development of new projects and policies with positive impacts. Leverage points that emerged from analysis of the system causal loop diagram to improve the Domain of Life include making responsible use of abandoned rural areas by promoting conscious ecotourism and agroecology, increasing capacity with more conservation jobs and removing invasive species, and managing illegal sport fishing and other harmful practices in the marine ecosystem. Each of these will be benefitted by investment in Science, creating a collaborative co-management of land, sea, and sky for sustainable development and use, and improving public education and outreach.

THE MATERIAL DOMAIN

> ***The Material Domain constitutes the basis for regulating the flow of materials and energy that underlie existence. It examines infrastructure & resources: energy, water, waste, transportation and communications. The underlying premise is that all the physical processes which provide the basis for human existence are subject to the primary laws of physics, for example, the first law of thermodynamics, which addresses the fundamental conservation of energy in the universe, and the second law, which stipulates the direction of energy events. These laws prescribe the ultimate limits of possibilities in physical systems and, therefore, underlie the productive potential in the use of resources.***
>
> ***The second law underscores the ultimate increase of entropy and disorderliness in all physical systems. At the same time, there are clearly cosmic processes which work to create and increase order, at least temporarily. With the appropriate intention, it could be reimagined, redesigned and reconfigured in order to deliver an enduring, regenerative advantage for all.***
>
> – Sustainability: Definition and Five Core Principles, A New Framework (2015)

With the principles of the Material Domain in mind, there are many opportunities for La Palma.

Current State and Key Challenges

La Palma has a great wealth of resources and potential related to the material domain. However, the energy, water, waste & transportation systems have been established and evolved over time as unique solutions to solve immediate needs. La Palma, being a small island with many resources, has the opportunity to rethink this approach, and utilize new developments in energy, water, waste, transportation and communications infrastructure to better meet the needs of the people of La Palma while preserving the natural beauty and resources of the island.

With resources managed in their current state (Figure 26), which we'll call Business as Usual (BAU), as the island's ecosystem health improves, the economic activity of the island improves, but then this increases both the quantity of wastewater discharge (B1) as well as the demand for energy, water and waste management (B2), which, in their current BAU state, increases risks and negative ecosystem biophysic alterations, thereby damaging the ecosystem health and negatively impacting economic activities. This is a balancing loop that will hold back La Palma's economic growth, but could be mitigated by replacing BAU infrastructure with sustainable, ecosystem enhancing energy, water, waste management and wastewater discharge management.

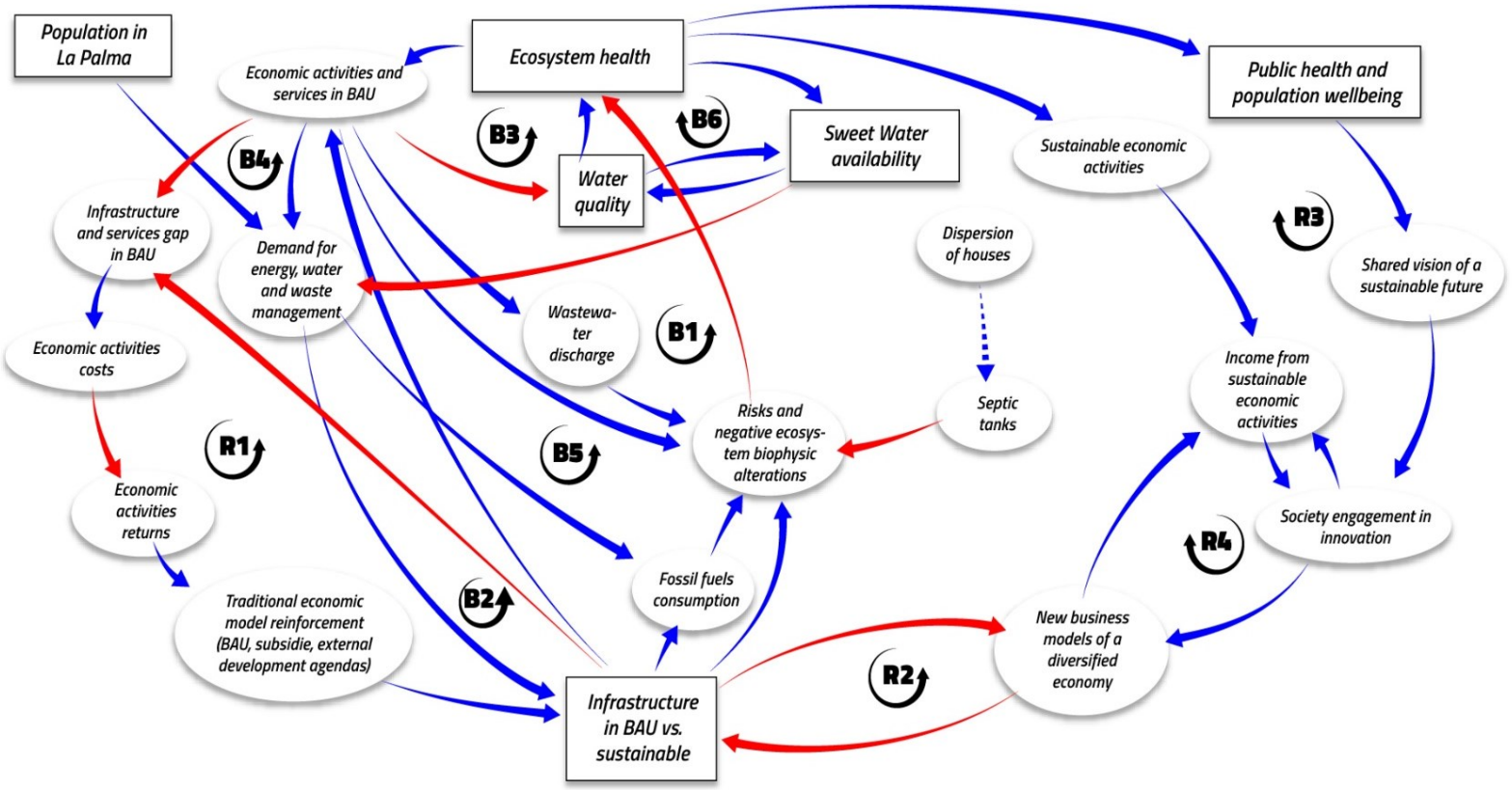


Figure 26. CLD of La Palma through the lens of the Material Domain of Sustainability. Own elaboration.

A second set of balancing loops are B3, B4, and B5. As Ecosystem Health improves, economic activities in BAU improve, but water quality declines (B3), thereby negatively impacting economic activities, and again, the Island is stuck in a state of stagnation. As Economic Activities in BAU increase, there's an increasing gap in infrastructure services in BAU B4 & B5, which leads to increased cost for all economic activities, a decline in profits, and a corresponding decline in traditional economic model reinforcement. That leads to a further investment in BAU infrastructure, decline in ecosystem health, and decline in economic ecosystems. Again, stagnation.

Improving Ecosystem Health will improve the availability of sweet water (fresh water), which reduces the need to use incremental energy to discover and drill new wells (R6), which then reduces the need for fossil fuel, and which increases ecosystem health. This illustrates the vital link of maintaining the reserves of sweet water in La Palma in order to increase the carrying capacity of the island.

R1 shows the link between infrastructure in BAU vs sustainable and the profitability of economic activities. As more infrastructure is put in BAU, there's less of a BAU infrastructure gap, so economic activity costs go down and profitability goes up, thereby providing incentive to invest more in BAU. But as we've seen in the other loops, investing in BAU infrastructure comes at a huge cost to Ecosystem health, which, in the end, migates any long-term economic gains for La Palma. Additionally, R2 shows that increasing investment in BAU infrastructure, which in isolation seems like a good idea, will also reduce the potential for new business models of a diversified economy, which has significant long-term negative effects.

Looking to the right of the CLD helps to highlight a path forward. By reducing infrastructure in BAU vs Sustainable, we reduce risks and negative ecosystem biophysic alterations, and improve La Palma Ecosystem Health. This increases public health and population well-being (R3), which inspires the population to share a vision for the island, promotes civic engagement and supports more investment in sustainable infrastructure, which continues to reinforce ecosystem health, and, as shown above, increase economic prosperity in La Palma. Additionally, Income from sustainable economic activities, such as community energy projects, will engage society in innovation and encourage new business models of a diversified economy (R4).

The most immediate risk to La Palma, as shown through the Material CLD, is maintaining an siloed perspective on infrastructure development, and continuing to pursue the current BAU choices for energy, water, waste and wastewater management. These practices, which for each may make sense on their own, combine to create an artificial cap on economic development for the island, for each chips away at the Ecosystem health of the island, which is the keystone to the island's future. Focusing on protecting and enhancing La Palma's Ecosystem health, or Carrying Capacity, is critical to the future economic and societal success of La Palma.

Strategic Guidelines

As mentioned in prior sections, the first priority is to invest in developing an integrated strategic plan for energy, water, waste, transportation and communication. In their current iteration, the infrastructure for each is independent from the others. This siloed approach to infrastructure is very common to communities which have been around for decades, as the need for each resource has evolved over time.

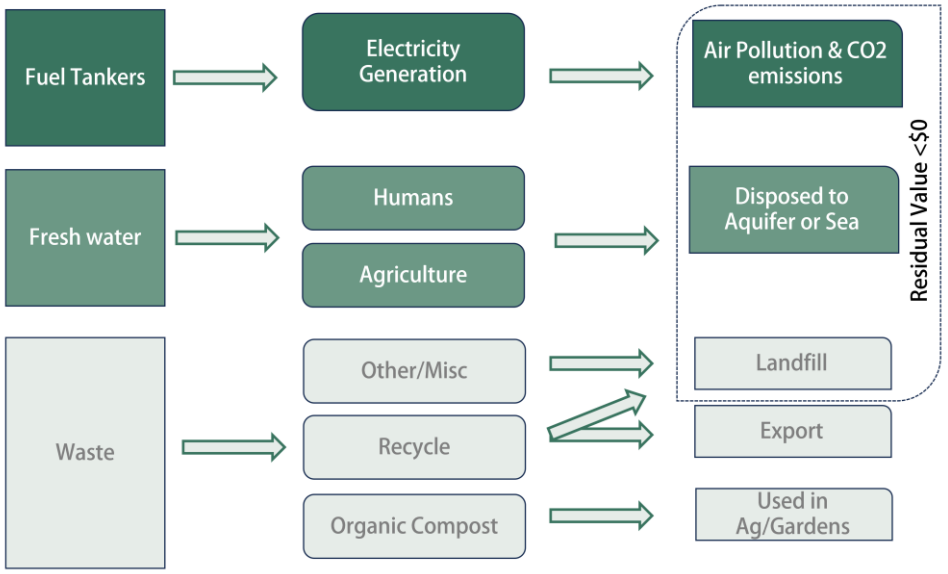


Figure 27. Infrastructure in Silos. Own elaboration.

With siloed infrastructure, La Palma is depleting its natural resources as a part of everyday life (Figure 27). Electricity is generated from fossil fuel that is transported to the island by boat. Water is used one time then discarded, and waste is mostly sent to landfill on the island. This linear use of materials is not only depleting these natural resources from the island, they are contributing to destruction of the island biosphere by turning land into landfill, marine environments into wastewater receptacles, and urban areas into polluted and noisy communities.

The 2021 volcanic eruption gives us the opportunity to step back and re-evaluate the current state, and to use redevelopment funds to invest in a more modernized, efficient infrastructure system which will serve the island for the next 100 years.

1. **Water.** Water infrastructure takes into account water extraction, water transport, and water treatment (potable and industrial).

   La Palma is known for having an abundance of water, especially as compared to the other islands of the archipelago. This is both a blessing, and a detriment. Centuries of local water management rights have resulted in a complex network of wells and pipes that transport water from the aquifers in the center of the island, to communities, agriculture and industry across all areas.

   While this has worked very well for most of La Palma's modern history, demands of population growth, the expansion of agriculture, which uses almost 88% of the island's total water consumption (Consejo Insular de Aguas de La Palma, 2021) and is mainly based on banana monoculture, plus climate change impacts are putting current infrastructure and critical resources at risk. According to information provided by the experts, 40% of the existing wells are now dry, the baseline freshwater aquifer is being infiltrated with sea water infill from the bottom, and annual rainfall levels are decreasing. The latter is clearly reflected in the ponds built for water collection, whose average filling capacity was at 52% in July 2023 (Consejo Insular de Aguas de La Palma, 2023).

We know that it is not only low rainfall that is the cause of this, but also technical problems related to the dams themselves, such as leaks. With the current water extraction and use structure, La Palma is at risk of running out of fresh water, and, at the minimum, experiencing significant increases in water costs due to the higher costs of drilling to find and extract water from new aquifers. Whereas other islands have invested in desalination, the perception has been that La Palma has plenty of water, so at the moment, it seems that a desalination plant has not been prioritized.

Water treatment on the island consists of six wastewater treatment plants (WWTP) based on the coasts. In all of them, only primary and secondary treatment is carried out, in which solid objects are filtered from the water (iAgua Data, 2023). In the absence of tertiary treatment, reuse of the water is not possible, so the remaining filtered water is piped to the ocean. Additionally, there are 14 unauthorized sites around the island where completely untreated water is being drained to the ocean (Consejería de Transición Ecológica y Energía, Gobierno de Canarias, 2022).

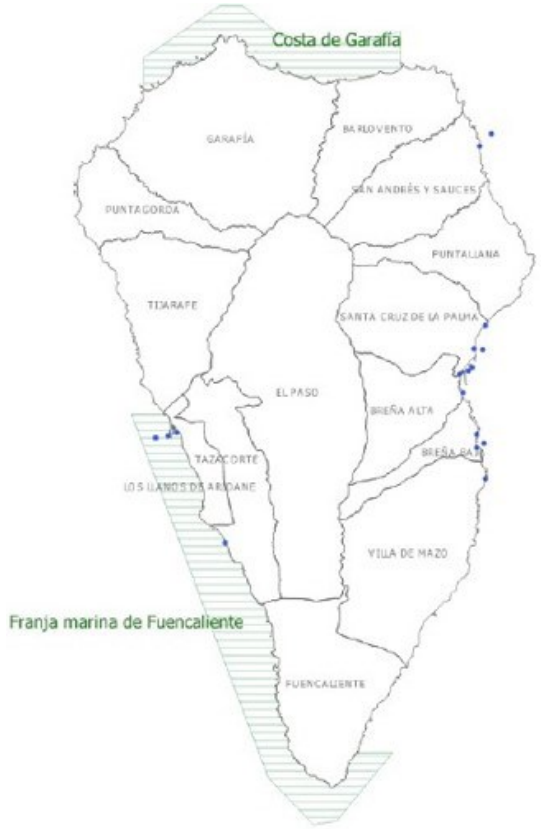


Figure 28. Wastewater discharge points on La Palma. Consejería de Transición Ecológica y Energía, Gobierno de Canarias (2022)

These water streams are primarily agricultural run-off, and are high in both pesticide and fertilizer residue, are not regulated and are not permitted (Gobierno de Canarias, 2021). Any untreated water sent to the ocean puts the marine ecosystem at risk. As mentioned in the "Life" section above, damaging our marine ecosystem is damaging the biodiversity of La Palma, and ultimately damaging the quality of life on this island.

What's missing entirely from the water infrastructure of La Palma is the second-pass use of water. Rather than dumping water into the ocean, a well designed water treatment plant could use the output from the water treatment plants as a source of industrial and agricultural water, and significantly reduce the rate at which water is extracted from the island's aquifers.

2. **Water Electricity.** The Electricity on La Palma by 2022 was generated 88.9% from diesel duel, 8.2% wind energy, and 2.7% solar energy (La Palma Renovable, 2023). Therefore, approximately 90% of the electricity on La Palma is generated by the power plant on the coast adjacent to the town of Santa Cruz de La Palma. This is a 30 MW plant (Red Eléctrica, 2023) that uses diesel fuel brought in by ship to generate electricity, which is then distributed throughout the island by the electrical grid. The power plant and grid are owned and operated by the multinational firm Endesa.

   La Palma has a portfolio of natural resources on the island itself which are for the most part untapped for electricity generation. These include onshore wind, solar, geothermal, tidal, water, waste-to-electricity, and elevation change. Electricity generation technologies have evolved significantly since the Endesa power plant was brought on line, and La Palma would be an ideal place to incorporate several of these into the grid. Any implementation must consider the biosphere health and natural beauty of La Palma. We must ensure the

technologies chosen enhance the La Palma experience rather than damage it – fields of solar panels or acres of wind turbines would not be a good choice for La Palma. Rooftop solar would be a great fit. Additionally in the island there is energy infrastructure currently inactive, which is the case of a hydroelectric power plant which represents an opportunity to generate clean energy for as long as the galleries are used as a water source, for example.

La Palma's largest contributor of CO2 emissions is by far the Endesa Power Plant, and finding ways to increase the percentage of clean energy on La Palma would go a long way toward reducing air pollution as well as CO2 emissions.

Once new, clean and inexpensive electricity sources are in place, La Palma can look at electrifying infrastructure currently powered by oil and gas. A whole-island shift to electric vehicles, heat-pump HVAC, and industrial processes would improve the quality of life on La Palma, including reducing noise and air pollution caused by gas-fueled vehicles. With sufficient clean energy, La Palma could invest in a desalination plant that would reduce the pressure on the water infrastructure and allow more complete water treatment.

3. **Waste Management.** For decades, selected canyons on La Palma have been filled with waste, and the current landfill is at capacity. This means that new canyons are going to have to be found and filled, which is yet another hit to biosphere health. While programs such as La Palma Orgánica are creating communities to collect and convert their organic waste into compost, there's a long way to go. And while La Palma recycling levels are higher than the average for the islands as a whole, they are far below the targets set by the state law, which is to reach

55% recycling of municipal solid waste by 2025. Right now La Palma is, approximately, below 20% (Gobierno de Canarias, 2021).

Given the small size of the island, the climatic conditions and the geophysical characteristics of La Palma, there many opportunities to develop innovative and integrated infrastructure solutions that turn waste streams into valuable assets, reduce negative biophysic alterations to the island, improve air and water quality, enhance economic prosperity and encourage society engagement in the process.

Desired State

To most effectively design for the future, we need to conduct a baseline on what we already have in each of the resource areas. From our 3 weeks on La Palma hearing from local stakeholders and experts, we've discovered many areas of opportunity, but to be done correctly, La Palma needs to conduct a more thorough evaluation of resources available on the island, as well as innovations in infrastructure developed and deployed in similar environments.

Water, Waste, Electricity choices improve or damage the quality of life on La Palma. The ability to create an affordable, innovative, resilient, scalable and sustainable infrastructure will require a long term view – 20-50 years — and require broad public, private and international partnerships.

> ***"La Palma energy, water, and waste systems are an inspiration to residents and visitors. The infrastructure minimizes the extraction of natural resources, has minimal ecological impacts, and provides a foundation for innovation, resilience and community building."***

Strategic Guidelines

Achieving this vision is well within reach. Energy, water and waste solutions have evolved dramatically in the past 20 years, and being a small island, La Palma has the ability to take advantage of this in its next developmental phase. Some of the guidelines to put into place include the following:

1. **Holistic design and management in water, waste and energy.**

    - La Palma manages water, waste & electricity holistically, maximizing efficiency, and utilizing waste from one as input to another, so as to minimize the need to extract raw materials
    - La Palma has policies and capacity to serve as a lab for new technologies and processes in water, waste and electricity management
    - La Palma's innovation in renewable infrastructure is inspiring and world class. La Palma offers education in these innovative techniques, and attracts future leaders from around the world due to these opportunities
    - Citizens have a voice in their island, with direct connection to business and government. Suites of community apps (Next Door, ACT La Palma, Websites, etc) are fostered and promoted to get all residents online, interacting and "in the know"
    - Municipal permitting is streamlined, and consistent with sustainable goals for the island
    - Sustainable practices are added to school children curriculum, as well community involvement and marketing for understanding the systems of La Palma
    - Regulations are in place that require on site waste and water management as well as renewable energy

- Electricity
  - Endesa owns and operates the grid, and connects renewable energy from La Palma -owned organizations. Endesa is more profitable as the % of renewable energy increases. Need to develop a long-term decommissioning plan for the power plant
- Water
  - Wastewater is treated and reused. Trash and sludge are converted to electricity. Organic materials are converted to compost.

2. **Embracing Innovation in critical infrastructures and services.** La Palma's breadth of resources, coupled with their small size, provide a unique opportunity to create a 'living lab' of innovation on the island in terms of innovation. As decreed by the EU, Endesa must provide interconnection to their grid, which thereby enables local communities and organizations to deploy small-scale innovative solutions for electricity generation, add it to the grid, and accelerate the adoption of renewable energy on La Palma.

There are a few of these deployments happening today through the local NGO Renovable La Palma, but regulatory paperwork and grid internet approvals are hampering their deployment and frustrating the citizens of La Palma. As shared by Renovable La Palma, their biggest constraint is not funding, as there is a wealth of funding for innovative and community-based energy projects, their biggest hurdles are government and grid approvals.

In addition to greening the grid, community-scale deployments provide economic benefit to the citizens of La Palma directly by reducing their own electricity costs, and/or providing a new source of income for excess electricity generation.

Innovation opportunities are also abundant for water infrastructure. As fresh water around the world gets more scarce due to changing weather patterns, new technologies as well as international funding sources are available to help mitigate the impact to humans. Water treatment and reuse is an obvious first target for La Palma, which would significantly reduce the pressure on the island's aquifers, and potentially allow aquifers to replenish rather than continually deplete, which is the current state.

La Palma's small geographic size, small population, and diversity of terrain make it an ideal laboratory where innovation sites could pop up across and around the island. As with the Astronomical research on La Palma, findings should be documented and shared broadly to help advance the deployment of effective solutions, and position La Palma as a global innovator.

3. **Developing infrastructure for international talent sourcing:** Investing in La Palma as a global innovator has many more benefits than just advancing technology. International experts, both established and emerging, seek out hubs of innovation where they can advance their expertise and reputations. Attracting experts, publishing results, and benefiting both local and global communities will increase the attractiveness of La Palma as a place to invest, and provide more funding and resources for more projects.

   It will require an investment infrastructure to support this innovation and the training of youth to become a part of it. There is significant talent on the island that is looking for inspiring, challenging, and La Palma-

benefiting work, and helping to build the future of La Palma would make La Palma a desired destination to build a career. This could not only attract top talent from abroad, but provide a source of jobs for current residents and their families. Many overseas Palmerans could be attracted to return home.

4. **Leveraging existing technologies towards community sufficiency:** Aligning vision, education and awareness with innovations in energy, water and waste management doesn't need to be cutting edge or high risk. A look around the world will yield hundreds of examples of solutions that could work on La Palma today. On La Palma itself, two organizations have started down this path. La Palma Renovable develops projects that promote sustainable energy while at the same time building a shared community to both run and deploy electricity generated sustainably. La Palma Organica has collected over 22,000 kilos of organic waste, which is transformed into organic compost and shared back to local residents. These are only 2 of what should and could be hundreds of projects in the works on La Palma which help not only to solve a problem, but also to bring the community together.

Conclusion

La Palma is in the enviable position of having a wide variety of resources, a passionate community, a comparatively small population and a reputation for scientific excellence. Adding energy, water and waste infrastructure that is a showcase of best practices, environmental sustainability and community engagement is a natural next step for the island. With focused and thoughtful choices, pilot projects, and partners, La Palma could establish itself as a leader in infrastructure innovation and biosystem preservation.

THE ECONOMIC DOMAIN

Economies consist of markets where transactions occur, and guiding frameworks by which transactions are evaluated and decisions about economic commitments are made. Often treated as though they reflect an independent, objective reality, such frameworks ultimately represent human constructs rooted in values, biases, and dominant interests and concerns. These latter factors determine the adoption of the underlying economic perspective: whether focused on short-term, linear and narrow objectives, or on long-term, comprehensive, eco-sensitive cycles of return.

The accounting framework presently used to guide our economy grossly distorts values. Inadequate measurements—and the regulations and subsidies that often accompany them—drive markets and continue to fuel the destructive effects of the economy as a whole.

The economic domain's main principle is "Adopt an appropriate accounting system to guide the economy, fully aligned with the planet's ecological processes and reflecting true, comprehensive biospheric pricing."

– Sustainability: Definition and Five Core Principles, A New Framework (2015)

Current State and Key Challenges

The economy of La Palma follows a traditional model based on specialization in the agricultural export sector, relatively widespread tourism, and a significant contribution from the public sector. However, this economic structure presents significant challenges, including high unemployment levels and unattractive job opportunities for new entrants in the labor market, which impacts territorial planning and limits long-term opportunities.

According to data from the collaboration between INE-ISTAC in 2021, La Palma represents only 0.1% of the Spanish economy, with a GDP per capita of 16,024 euros per person in 2020. In the insular context, La Palma contributes 3.6% to the Canarian economy, equivalent to 1,378,986 million euros in 2020, but it faces an unemployment rate of around 35% (INE-ISTAC, 2021).

The main economic activities on the island encompass agriculture, services, and a gradual decline in industry, construction, and services, including tourism. Overall, there was an increase in the average annual rate in Agriculture, Construction, and Services in 2017, which then decreased in the following years.

Specifically, in the case of Agriculture, there was a 97% increase in economic gains and an increase of 573 people in the workforce in just 10 years. This resulted in a total Gross Value Added (GVA) of 97.2 million euros in 2019, with a total workforce of 2,165 people, representing a significant share of Canarian agriculture (12.67%) (INE-ISTAC, 2021).
On the other hand, Industry and Construction experienced a decrease in both GVA and labor occupancy. In the case of Industry, there was a 39% reduction in GVA and a decrease of 3.72% in the workforce between 2010 and 2019. Construction also witnessed a reduction of 31.3% in GVA and a decrease of 8% in labor occupancy during the same period (INE-ISTAC, 2021).

Regarding Tourism, there was a decrease in the number of international tourists, cruise ship visitors, accommodations, and overall spending by international tourists over an 11-year period. There was a 41% decrease in the number of tourists received, a reduction of nearly 50% in spending generated by tourists, as well as a 59% decrease in hotel overnight stays and an almost 70% decrease in the rental of tourist apartments (INE-ISTAC, 2021).

The main dynamic that characterizes the current economy of the island of La Palma informed a CDL creation (Figure 29). Starting with the concept of sectoral specialization in the center of the diagram, which occurs when a region focuses on the production of a reduced range of products and/or services, in order to increase its efficiency. The specialization of the Palmeran economy revolves around agriculture, however the phenomena outlined in the diagram can apply to other sectors, like tourism.

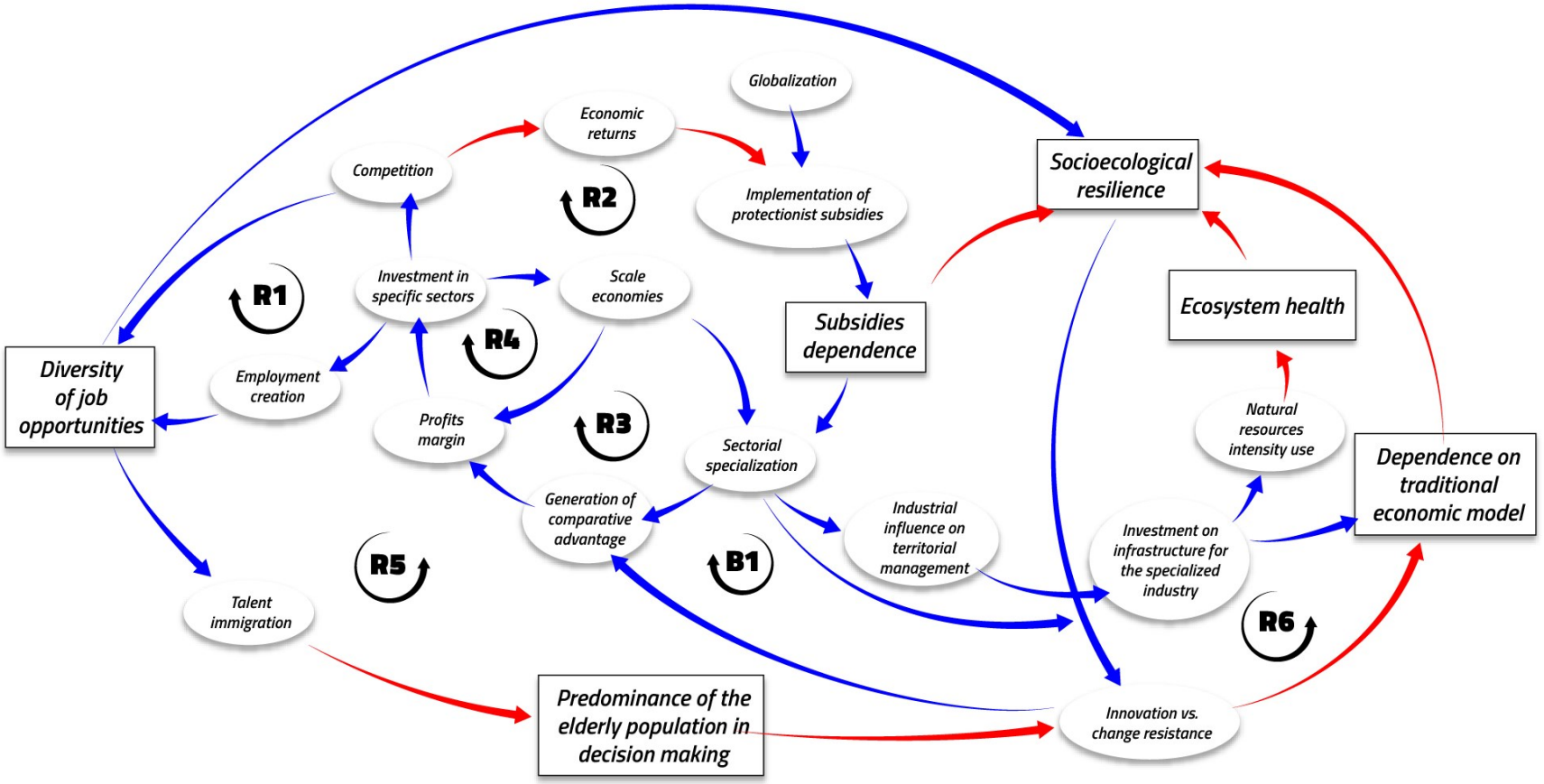


Figure 29. CLD of La Palma through the lens of the Economic Domain of Sustainability. Own elaboration.

Shortly after increasing the levels of specialization in an economic sector, a comparative advantage is generated since efficiency increases in the short term, making production cheaper and generating positive profit margins (R3). These profit margins invite investment in the same sector. This initial investment helps companies achieve economies of scale, since they can reach new levels of production as the costs per unit produced fall (R4).

In the medium term we see an increase in jobs related to the sector, and along with this, new companies also decide to start in the sector to participate in the profits that are created in the short term. All the above explains the performance of banana production on the island. However, in the long term two phenomena begin to occur. Due to the law of diminishing marginal returns, profits decrease when distributed by many companies and due to the effects of globalization, it becomes necessary to implement subsidies to protect an industry that is now the livelihood of many Palmeras families. Subsidies can be a good strategy in the short and medium term, but in the long term, they create dependency as companies adjust their baseline to this new situation. Here you can clearly see a cycle of reinforcement, in which the variables reaffirm an existing situation (R2).

> ***"An additional example of the dependencies that are created in economic processes and specifically in agriculture is the use of pesticides and fertilizers. Similar to subsidies, these tools help reduce costs (in the case of subsidies through customs incentives) and thus increase profit margins. But in the long term the use of these tools becomes essential, and any company that does not use them will have a competitive disadvantage that is very difficult to overcome."***

This is what is known as "Path Dependence" (Figure 30) which is a concept in social sciences that recognizes that events or decisions made in the past dictate the range of possibilities today. This applies much more to activities that require large investments in infrastructure.

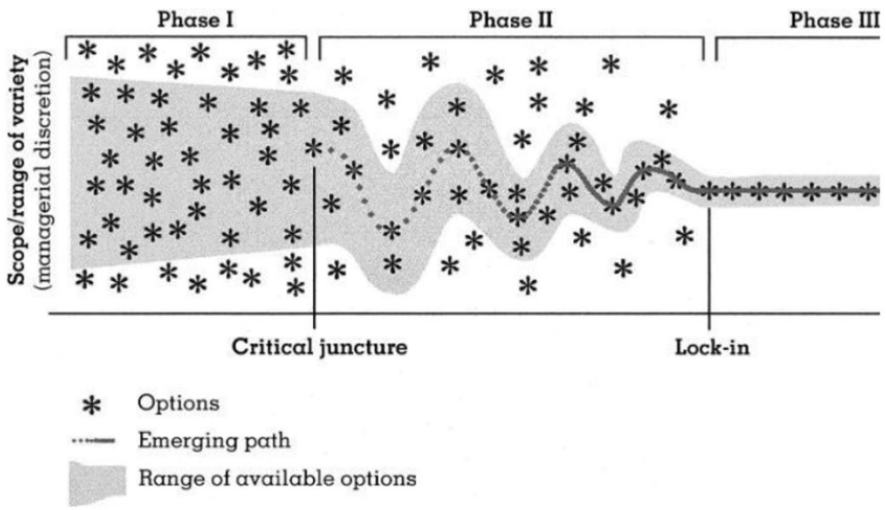


Figure 30. Path dependence phases. Organizational path dependence: Opening the black box. (2009)

Continuing with the long-term effects, competition and job creation have an impact on the composition of the labor market. The labor supply is adjusting to the existing trend, which is the specialized industry, and the occupational variety is decreasing. Currently, compared to the other archipelago islands, La Palma has around 70% of the banana agricultural workers and its average production rate is significantly less (Ortega, 2022).

In the case of La Palma, this has a great influence on the emigration of talent (talent recently graduated from educational institutions), which in turn accelerates the process of aging population (R5).
It should be noted that the aging population is a problem that the vast majority of European countries experience, and even though La Palma has typically experienced a steeper index in the past decades when compared to Spain, it is about the same rate in recent years, as depicted in the below chart (Figure 31), which displays the rate of aging in the Canary Islands vs Spain.

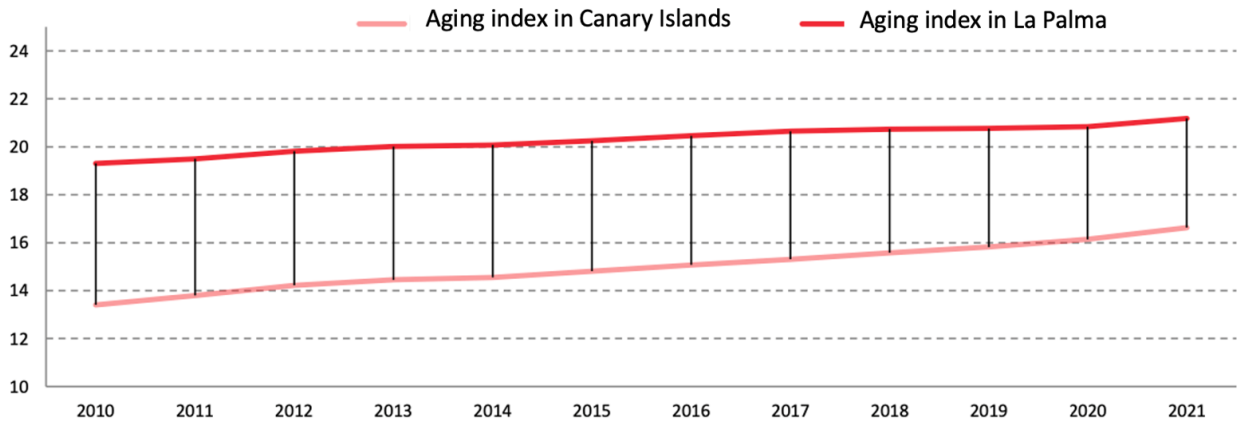


Figure 31. Aging index 2010 - 2021 in Canary Islands and La Palma. La Economía de La Palma en gráficos (2021)

Resistance to change is a common characteristic that comes with age, and regardless of whether there are exceptions to this rule, the general trend is opposition to change results in a diminished capacity for innovation. The next figure (Figure 32) is a graph from a study analyzing the correlation between age and workers propensity to Innovation. Unfortunately, the most powerful tools against path dependency are the abilities to receive and adapt to change and innovate, so this is another variable that reduces the ability to change direction on the island of La Palma.

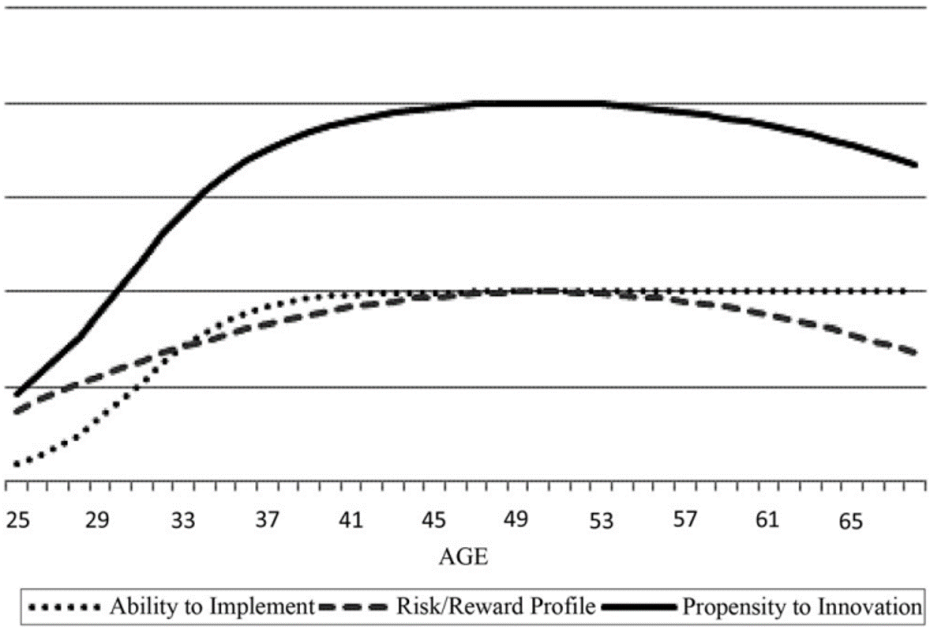


Figure 32. Resistance to change. The multi-dimensional nature of resistance to change (2011)

As we mentioned earlier, investment in infrastructure plays a key role in the development of path dependency. Specialized economies tend to ensure their future growth and thus the representation and/or influence that the industry has in decision-making about the territory grows. Future decisions will tend to favor or protect these industries, but also limit the emergence of other industries, and even (in the case of Tourism), deteriorate the situation of the population in the long term (B1).

Tourism as a tool for economic prosperity has proven to be very successful, but the key to this premise lies in our definition of success. The Tourism Led Growth Hypothesis, is a well studied hypothesis, and it tells us that indeed economic gains are to be expected from investments in tourism but these are experienced at a diminishing rate. In the long run the contribution from tourism becomes minimal and in some cases it becomes a hindrance for other types of economic development. A recent initiative by The Sustainability Laboratory, Institute of Tourism and Sustainable Economic Development (Tides) from Universidad de Las Palmas de Gran Canaria and Knowledge SRL, developed a system dynamics model to dissect the intricate relationship between tourism and sustainability in the Canarian archipelago. Although the results of this model are based on data collected on tourism activity of the size of Tenerife and Gran Canaria, the insights (Figure 34) show that conventional mass tourism (BAU tourism) tends to reduce the GDP of this economic activity.

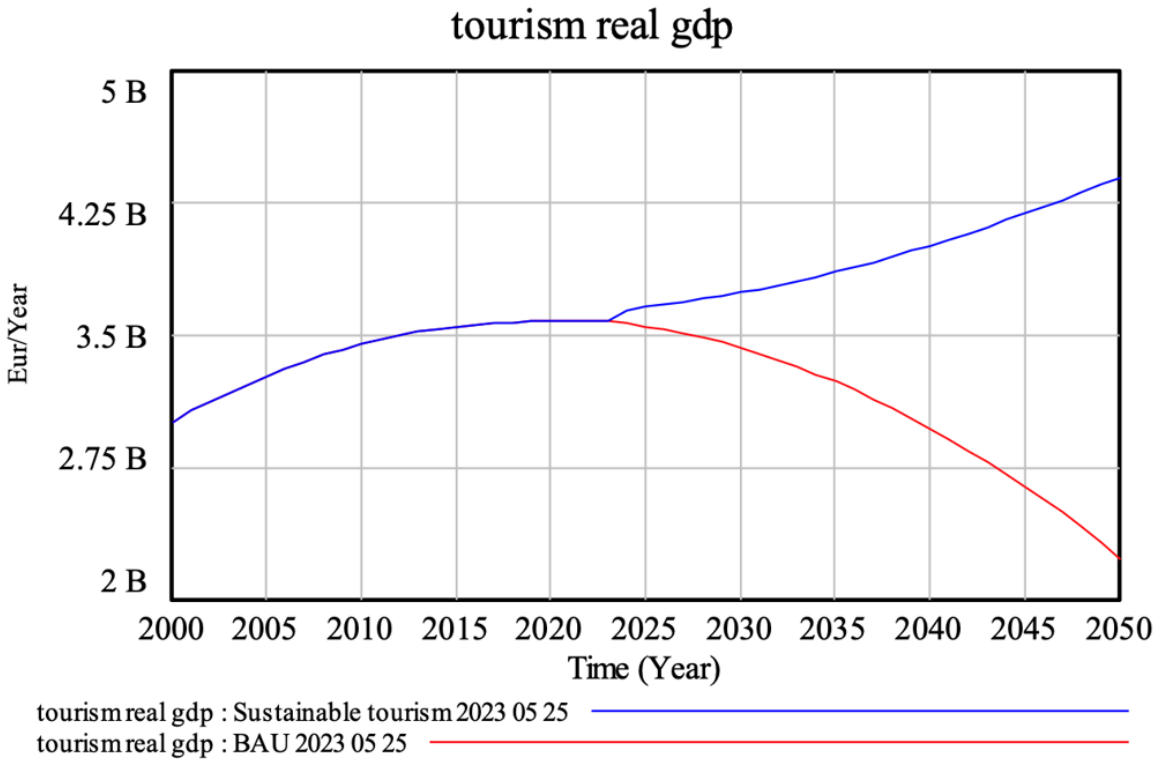


Figure 33. Tourism real GDP performance for sustainable and BAU tourism.

Source: Whole System Modeling of the Relationship Between Tourism Activity and Carrying Capacity in The Canary Islands (2023).

The same study (Figure 34) shows how conventional tourism (BAU tourism) has a direct relationship with an intensification of use and extraction of natural resources that in turn would exacerbate the current problems that we touched on in the previous domains. Once large resorts are built, this decision commits the island to a certain direction and will also bring with it all the undesirable characteristics that are associated with tourism, in this case, a decrease in carrying capacity and population welfare.

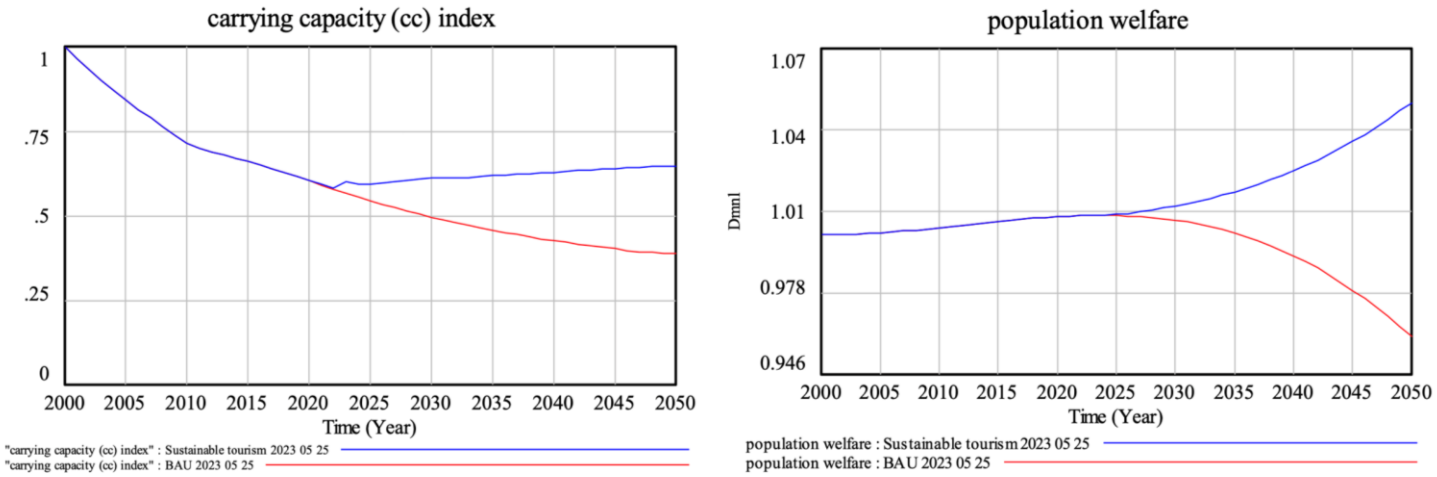


Figure 34. Carrying capacity index and Population welfare performance for sustainable and BAU tourism. Whole System Modeling of the Relationship Between Tourism Activity and Carrying Capacity in The Canary Islands (2023).

That is why it is key to redefine success in a new way that goes beyond traditional performance indicators and co-create an innovative tourism product. This is where La Palma has the opportunity to be a laboratory, where innovative ideas for sustainable or regenerative tourism are tested in an agile way.

Desired State

> ***"An economy in which the central axis is diversification and innovation. In which there are quality jobs for inhabitants of all ages and in which the natural environment, culture and identity of the island are preserved."***

La Palma has the choice to bet on the Tourism Growth Led Hypothesis similarly to some of its neighbor islands (e.g. Tenerife or Gran Canaria) or could opt for an alternative path. All the variables highlighted previously help us create an image of our starting point for our recommendation for La Palma.

Strategic Guidelines

1. **Building a diversified and innovative economy.** A diversified economy that does not depend solely on a particular sector, develops science and technology sectors, and simultaneously promotes innovation and scaleup of new of new business sectors.

i. **Comprehensive Economic Analysis**: To make informed and strategic decisions, La Palma should conduct a comprehensive economic analysis of its existing sectors and potential new industries. By thoroughly evaluating the strengths, weaknesses, opportunities, and threats of the economic landscape, policymakers can identify areas that are ripe for investment and innovation. This analysis will provide the necessary data to prioritize strategic steps, such as incentivizing certain industries or directing funding towards specific infrastructural or educational initiatives. Furthermore, regular updates to this analysis can help ensure that the strategic guidelines remain relevant and effective over time.

ii. **Creation of an Incentive Structure for New Industries:** To foster a diversified economy in La Palma, establishing an incentive structure for emerging industries is crucial. By implementing results-based financing models, the region can boost economic incentives while simultaneously championing sustainable and environmentally friendly practices. This approach would encourage entrepreneurs and established businesses alike to venture into innovative sectors, promoting diversification and long-term stability in the local economy.

iii. **Investment to Stimulate Public-Private Partnerships**: Stimulating investment in public-private partnerships is integral to aligning economic development with La Palma's vision of diversification and innovation. By encouraging collaborations between public institutions and private enterprises, the region can establish research centers and innovation hubs that act as catalysts for growth and development. These partnerships can facilitate knowledge exchange, drive investment in cutting-edge technologies, and contribute to the creation of a thriving and innovative economic ecosystem.

iv. **Development of Advanced Technical Education Programs**: In order to prepare the workforce for the demands of a diversified and innovative economy, La Palma must prioritize the development of advanced technical education programs. By focusing on emerging sectors such as renewable energy, biotechnology, and information technology, these educational initiatives will equip individuals with relevant skills and expertise. This in turn ensures that the workforce is ready to contribute effectively to the growth of new and varied industries.

v. **Business Incubator Programs**: To further stimulate innovation and foster entrepreneurship, La Palma should establish business incubator programs designed to support new innovators. These programs can offer resources, mentorship, and funding to startups and small businesses, thus increasing their technical and implementation capacities. Specialized incubators, such as those focused on climate change and sustainability, can create a nurturing environment where businesses dedicated to solving global challenges can thrive and scale up.

vi. **Valorizing Existing Economic Activities for Sustainable Growth**: La Palma can significantly enhance its economic landscape by capitalizing on and valorizing its existing economic activities. For instance, the island's rich banana plantations offer opportunities beyond primary production. By creatively utilizing crop waste, secondary and tertiary industries can be developed. One such example could be transforming banana waste into lucrative products like vegan banana leather, tapping into the growing sustainable fashion market. This approach not only maximizes the value derived from primary industries but also aligns with the principles of sustainability by converting waste into valuable products. By fostering such practices, La Palma can ensure that its traditional industries evolve and contribute to a diversified and sustainable economy.

By explicitly integrating these additional considerations, La Palma's strategy can be more comprehensive and effective in building a diversified and innovative economy.

2. **Sustainable agriculture that promotes food security.** An economy that rewards crop diversification, sustainable agricultural practices, local consumption and food security.

    i. **Assessing the Ideal Product Mix for La Palma**: In order to optimize and diversify its agricultural sector, La Palma should conduct a thorough assessment to determine the ideal product mix that aligns with the region's resources, climate, and market demands. By analyzing factors such as soil quality, climate conditions, water availability, and market trends, the region can identify a combination of crops and agricultural products that can be sustainably cultivated and have strong market potential. This strategic approach ensures that the agricultural practices are not only sustainable but also economically viable, contributing to food security and a resilient economy.

    ii. **Transition of Financial Incentives towards Agroecology and Self-Sufficiency**: To foster sustainable agriculture and food security in La Palma, there should be a strategic shift in financial incentives towards promoting agroecology and self-sufficiency. By reallocating subsidies and incentives to support environmentally-friendly farming practices, the region can encourage farmers to adopt methods that are in harmony with the local ecosystem. This transition not only prioritizes long-term agricultural sustainability but also positions La Palma as a region that is actively working towards achieving self-sufficiency in food production.

    iii. **Product Differentiation Strategy Rooted in Market Niches:** La Palma can enhance its agricultural sector by implementing a product differentiation strategy focused on catering to specific market niches. By identifying and developing unique, high-quality products that resonate with specific consumer segments, the region can carve out a distinctive place in the market. For instance, organic, locally-sourced, or specialty crops can be promoted, creating a niche market that appreciates and supports the sustainable and unique offerings of La Palma.

iv. **Educational Campaign: Producer and Consumer**: An educational campaign aimed at both producers and consumers is essential for promoting sustainable agriculture and food security. By educating farmers on the benefits and techniques of sustainable agriculture, they can be empowered to make informed decisions that enhance productivity and sustainability. Simultaneously, consumer awareness campaigns can highlight the importance of supporting local agriculture and choosing sustainably-produced products, thereby fostering a culture of local consumption and appreciation for sustainable practices.

v. **Development of Pilot Programs that Demonstrate the Potential**: La Palma can further substantiate its commitment to sustainable agriculture by developing and implementing pilot programs that serve as a proof of concept (PoC) for the feasibility and benefits of sustainable practices. These pilot programs can test and showcase innovative agricultural practices, technologies, and business models that align with the goals of sustainability and food security. Additionally, the region can introduce incentives and support for farmers participating in these pilots to adopt sustainable agricultural practices and obtain relevant certifications. By visibly demonstrating the potential benefits and success of such initiatives, coupled with the incentives and certifications, these pilot programs can serve as a catalyst for widespread adoption and support, reinforcing La Palma's commitment to sustainable and certified agricultural practices.

By meticulously executing these steps, La Palma can work towards building an agricultural sector that is sustainable, diverse, and secure, ultimately contributing positively to the local economy and environment.

3. **Creating an environment that favors the residence in La Palma and reduces emigration of the working population.** Diversified job opportunities that extend beyond the sectors of agriculture and tourism,as well as provide affordable housing and attempt to incorporate cultural/leisure/recreational activities, that on par with the rest of the Canary Islands to keep and retain talent on the island.

    i. **Comprehensive Assessment of Skills (Present and Future) and Create a Plan for Necessary Activation**: A comprehensive assessment of the current and future skills needed in La Palma is crucial for strategic planning. By understanding the skills gap and anticipating future demands, policymakers can create targeted educational and training programs. This proactive approach ensures that residents are prepared for emerging opportunities, thereby retaining and nurturing talent on the island.

    ii. **Establish Specialized Educational Institutions and Programs**: To foster a skilled and competitive workforce, La Palma should establish specialized educational institutions and programs, including postgraduate and doctoral research opportunities. By offering tailored courses aligned with the region's strategic sectors, these institutions can ensure that the local workforce is equipped with the necessary skills and knowledge. This would not only enhance job opportunities but also make La Palma an attractive place for academics and professionals.

    iii. **Develop Research and Innovation Centers**: La Palma can stimulate economic diversification by developing research and innovation centers. These centers can act as hubs for pioneering work in various fields, attracting researchers, entrepreneurs, and professionals. By focusing on innovation and offering incentives for research initiatives, La Palma can position itself at the forefront of scientific and technological advancements.

iv. **Attract Remote Workers and Integrate Talented Immigrants into Strategic Sectors**: La Palma can benefit from the global shift towards remote work by positioning itself as an ideal location for remote professionals. By offering incentives such as tax breaks, co-working spaces, and robust digital infrastructure, the island can attract remote workers and talented immigrants. Integrating them into strategic sectors such as technology, healthcare, and education can lead to a diversified workforce and stimulate economic growth.

v. **Implement Housing Subsidies for Young Buyers**: To make residing in La Palma more attractive, the implemenation of housing subsidies for young buyers can be a significant step. By providing financial assistance or incentives to young individuals and families, La Palma can ease the path to homeownership. This initiative would contribute to building vibrant communities and can be pivotal in retaining the younger demographic, ensuring a dynamic and sustainable population base.

By executing these steps, La Palma can create an environment that not only retains its current talent but also attracts a diverse and skilled population, thereby fostering a dynamic and thriving community.

4. **Differentiating La Palma as the sustainable tourism island of the Canary Islands:** Ecotourism designed by the inhabitants of La Palma, which does not seek to mold the island to the demands of the traditional tourism market, but instead seeks to celebrate and transmit the essence of the island, and have a significant impact on the lives of the people. visitors.

    i. **Identify the Sustainable Tourist Profile and Establish an Aligned Brand**: To differentiate La Palma as a sustainable tourism destination, it is essential to first identify the profile of the sustainable tourist and create a brand that aligns with and promotes ecotourism on the island. This involves understanding the preferences, values, and expectations of visitors who are inclined towards sustainable travel. By crafting a brand that encapsulates the essence of La Palma's natural beauty and commitment to sustainability, the island can effectively position itself in the ecotourism market.

    ii. **Build Awareness and Develop Tools to Connect Tourists with Local Accommodation:** La Palma can focus on promoting decentralized tourism over mass tourism by building awareness and creating incentives that connect tourists directly with local accommodations. By developing tools and platforms that facilitate easy access to homestays, bed and breakfasts, and local inns, the island can ensure that the benefits of tourism are spread evenly across the community, contributing to a more inclusive and sustainable tourism model.

    iii. **Strengthen Special Interest Tourism:** There is an opportunity to tap into niche markets by strengthening special interest tourism in areas such as spiritual, scientific, agroecological, and volunteer tourism. By curating experiences that cater to these specific interests, La Palma can attract a diverse range of tourists who are likely to appreciate and respect the unique attributes of the island.

iv. **Prioritize Tourism that Preserves and Promotes Local Culture**: La Palma should prioritize tourism initiatives that not only preserve but also actively promote local culture. By integrating cultural experiences that contribute to boosting local incomes, such as traditional craft markets, culinary tours, and cultural festivals, the island ensures that tourism becomes a means of cultural exchange and economic upliftment.

v. **Evaluate Tourism Infrastructure Projects based on Sustainability Indicators**: All tourism infrastructure projects should be rigorously evaluated based on their contribution to the desired vision of sustainable tourism. This includes assessing projects against sustainability indicators that consider the carrying capacity of the island, ensuring that any development aligns with the long-term ecological and social health of La Palma.

vi. **Implementation of Biourbanism Concepts in Territorial Development:** Lastly, La Palma can integrate Biourbanism concepts in its territorial development, ensuring that the coexistence of nature and human beings is central to its planning strategy. This approach emphasizes creating urban spaces that are in harmony with the natural environment, enhancing the quality of life for residents and providing a unique and sustainable experience for visitors.

By meticulously executing these steps, La Palma can establish itself as a destination that offers a unique, sustainable, and enriching experience, differentiating itself within the Canary Islands and the broader tourism market.

5. **Safeguarding economy preventing economic shocks and building long-term resilience:** Robust preparedness for disasters ensuring a resilient economy that effectively mitigates risks and minimizes the impact of setbacks, creates stability and safeguards the well-being of the community.

    i. **Build Investor Confidence**: Fostering a resilient economy begins with building investor confidence. This can be achieved by ensuring stable governance, transparent regulatory frameworks, and implementing policies that support businesses. By showcasing La Palma's commitment to long-term stability and growth, investors are likely to be more willing to engage in ventures and activities on the island, thus contributing to a robust economy.

    ii. **Strengthen Disaster Warning & Monitoring Systems**: Resilience against economic shocks necessitates a strong emphasis on proactive measures, such as developing and maintaining advanced disaster warning and monitoring systems. By investing in technologies that can accurately predict and monitor natural disasters, La Palma can ensure timely responses and minimize potential damage, thereby securing the island's infrastructure and economy.

    iii. **Policies for Standard, Strong Insurance and Quick Restoration Measures**: To safeguard against unexpected setbacks, it is vital to have policies that encourage comprehensive insurance coverage and facilitate swift restoration. By promoting standard, strong insurance policies for businesses and property owners, the island can ensure quick recovery after any adverse events. Additionally, having mechanisms in place for speedy restoration and rehabilitation of affected areas is crucial for economic stability.

iv. **Promote Responsible Development in High-Risk Areas**: Conscious urban planning and responsible development in areas that are prone to natural risks can significantly contribute to long-term resilience. By implementing and enforcing building codes and zoning laws that limit or guide development in high-risk areas, La Palma can ensure that its growth trajectory is aligned with safety and sustainability considerations.

v. **Communication Measures**: Effective communication measures are paramount in ensuring that both residents and investors are well-informed about the island's resilience strategies and practices. Regular updates, clear guidelines, and transparent communication about the initiatives and measures being taken to safeguard the economy can build trust and demonstrate La Palma's commitment to resilience and stability.

By strategically implementing these steps, La Palma can create a framework that not only safeguards its economy against potential shocks but also builds a foundation for long-term resilience and prosperity.

Conclusion

In conclusion, La Palma's journey towards a diversified and resilient economy encompasses multiple facets, each significant in shaping the island's future. By strategically fostering a diversified economy, La Palma is laying the groundwork for innovation, scalability, and adaptability across various sectors. The emphasis on sustainable agriculture ensures that the island's natural resources are leveraged judiciously, promoting food security and agroecology. Creating an environment that encourages residency ensures a vibrant and dynamic community, fostering talent retention and inclusive growth. Prioritizing sustainable tourism allows La Palma to craft a unique identity that differentiates it within the Canary Islands and beyond, ensuring that the benefits of tourism are deeply woven into the community fabric.

Moreover, safeguarding the economy against shocks and building resilience is a capstone that ensures the long-term sustainability of all these efforts. By focusing on investor confidence, disaster preparedness, robust insurance, responsible development, and clear communication, La Palma is fortifying its economic structure against potential setbacks.

In essence, each strategic initiative is a piece of a cohesive puzzle that collectively strengthens La Palma's economic domain. By pursuing these initiatives with diligence and foresight, La Palma can position itself as a model for sustainable, inclusive, and resilient economic development.

GUIDELINES: INTEGRATION TOWARDS STRATEGIC PLANNING IN LA PALMA

GUIDELINES

The implementation of the overall strategic guidelines toward the sustainable development in La Palma should consider the timing and required conditions for the success of the system as a whole. In this section we describe briefly how each strategic guideline is interrelated with another one, building conditions for a structural change in La Palma.

The next visualization (Figure 35) shows the overall strategic guidelines at the bottom of the visual, those represent the first steps to be taken as enablers of the specific strategic guidelines per domain. In that visualization, the strategic guidelines per domain are categorized by short, medium and long term, although all of those guidelines can have specific actions in the short term, their full application and outcomes expected from each can only be happening in the timeterm indicated. The desired outcomes and the vision are at the top of the visual. Note that the interrelation between strategic guidelines finally ends nurturing conditions toward the desired outcomes, in this case: energy sufficiency, population well-being, socio ecological resilience and food security.

A next step for this work is identifying existing efforts to leverage each strategic guideline and promote the different stakeholders collaboration for designing specific plans and activating the required actions and investment in the short term.

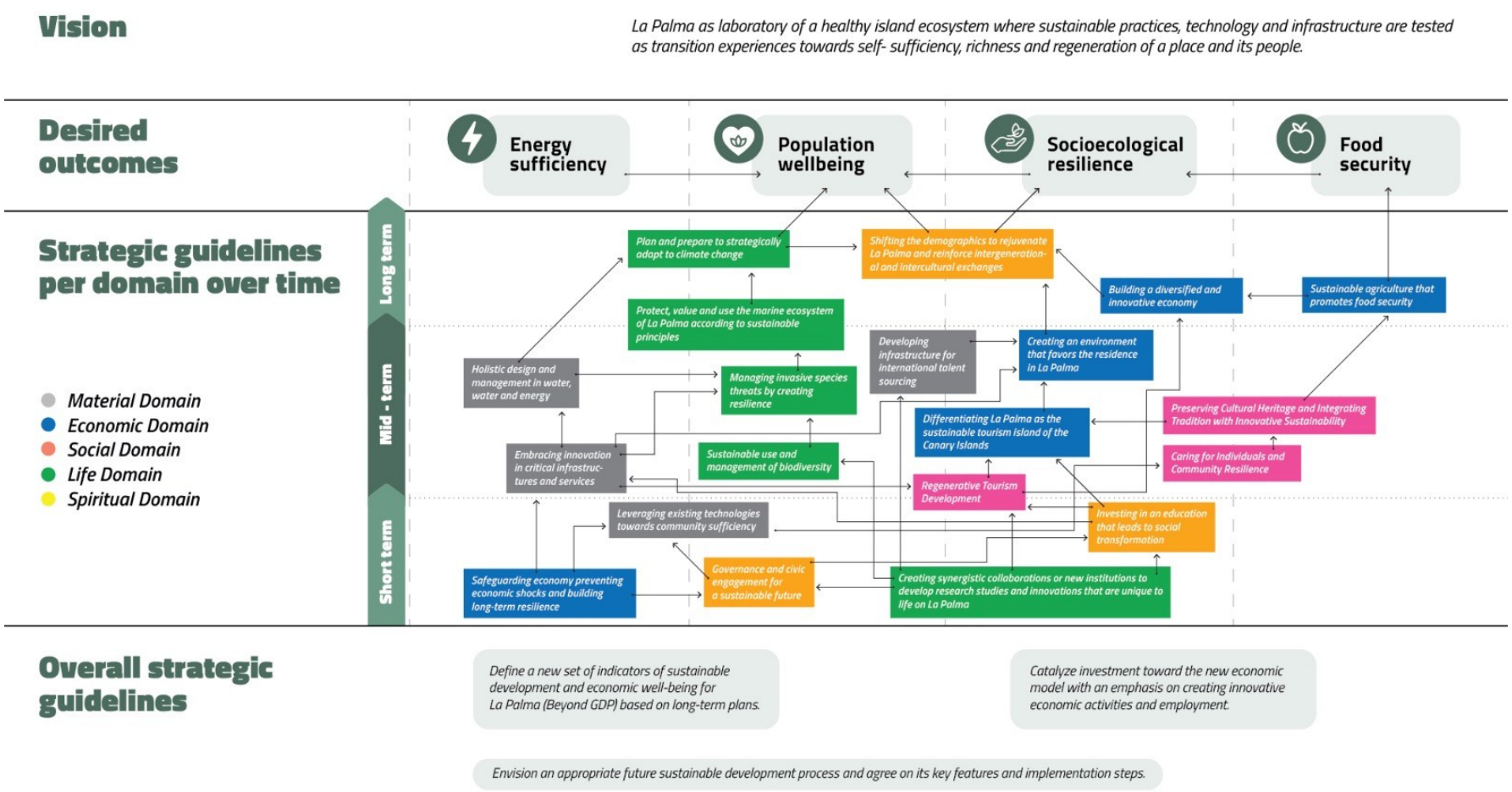


Figure 35. Domains' guidelines integration towards a strategic planning for La Palma. Own elaboration.

CONCLUDING REMARKS

CONCLUSION

To The Beautiful Island of La Palma

And The Spirit of Machuqueras

Our planet is in distress. Even the staunchest climate change deniers are realizing that humanity is at a turning point. We are called to decide: accelerating deterioration on one side or choosing the path of sustainability.

The latter presents, however, a deep transformational challenge. It calls for rethinking everything in our collective experience. The Island of La Palma is at a similar historical crossroad. The combination of the COVID-19 pandemic and the devastating volcano eruption opened many questions about the island's prospects, stimulating discussion about the direction of its future development, including questions about conservation, renewable energy, and other sustainability related topics.

In response, La Palma can commit to making sustainability an overarching goal. Many ideas can be developed under such a banner, and some have already been mentioned by my colleagues. If I were to highlight three priority items, I would emphasize the following:

- **Diversify the economy and support the formation of strong, local, community-based enterprises.**
- **Develop the appropriate facilities and programs to encourage conscious, eco-friendly tourism.**
- **Upgrade water infrastructure and management, while supporting development of family agro-ecology farms.**

And, of course, encourage synergies between these. La Palma can, and should, go well beyond paying the usual lip service to sustainable development. In committing to establishing the concept of sustainability as the organizing principle on the island, the La Palma community—citizens, businesses, and authorities-can collaborate in creating and announcing the "La Palma Pact," committing to a common vision, inclusive driving values, and an agreed direction for future development.

In taking such a bold step, La Palma can truly meet its destiny and open entirely new development and socio-economic opportunities. La Palma could declare itself a model for showcasing sustainability initiatives relevant for island ecosystems everywhere.

The island could position itself at the forefront of the world's sustainability agenda and, in collaboration with the appropriate international organizations and investment, it could establish a model laboratory for sustainability experimentation, research and innovations -- in science, technology, industry, governance, economic and community development, ecology, and the arts—integrating all relevant aspects of the human experience.

As every chef knows, the secret to great dishes lies with excellent ingredients. You have many of the necessary quality ingredients here: a unique location; a rich, diverse ecosystem; great people; strong tradition; and world class science/research institutions.

The Biosphere Reserve and the Institute for Astrophysics, for example, with their worldwide connections and prestige, could provide the institutional foundation for launching the island's model sustainability initiative. If this is pursued, the right kind of mechanism for integrating and managing all the related activities should be put in place and given the appropriate mandate and authority.

Such an initiative could later expand to include the whole Canaries archipelago as a model for a sane future for all -- An expansion that, with the right approach, might gain government support at all levels: the Canaries, Spain, and the EU. Above all, you should never lose sight of a simple truth: you have a real treasure here! Wild, unique, beautiful, and enriched with tradition, quality, and authenticity- Exactly what the world seems to be yearning for. Please don't turn the island into that which people everywhere are running away from.

Thank you.

Michael Ben Eli
Founder,
The Sustainability Laboratory
Global Sustainability Fellows, La Palma, July 28, 2023

REFERENCES

Adamou, A., & Clerides, S. (2009). *Prospects and Limits of Tourism-Led Growth: The International Evidence*. The Rimini Centre for Economic Analysis WP, 41-09.

Ben-Eli, M. U. (2018). *Sustainability: Definition and Five Core Principles, A Systems Perspective*. Sustainability Science, 13(5), 1337-1343.

Ben-Eli, M. U., León, C.J, Bassi, A.M., Armendáriz, V., Giraldo, N., González, M.M., Hernández, J.M., Blázquez, J., Lam-González, Y., Garzón, A. (2023) *Whole System Modeling of the Relationship Between Tourism Activity and Carrying Capacity in The Canary Islands.* The Sustainability Laboratory, Instituto de Turismo y Desarrollo Económico de las Universidad de Las Palmas de Gran Canaria and KnowlEdge Srl.

Blanco-Montenegro, I., Montesinos, F. G., & Arnoso, J. (2018). *Aeromagnetic Anomalies Reveal The Link Between Magmatism and Tectonics During The Early Formation of The Canary Islands*. Scientific Reports, 8(1), 42.

Braun, W. (2002). *The System Archetypes, 2002*.

CEOE Tenerife y Gobierno de Canarias (2021). *La Economía de La Palma en Gráficos*.

Consejería de Transición Ecológica y Energía, Gobierno de Canarias (2022). *Censo de Vertidos Desde Tierra Al Mar 2021. Memoria Detallada Isla de La Palma*.
https://www.gobiernodecanarias.org/medioambiente/descargas/Aguas/Censo_vertidos_2021/01-MEMORIAS/La-Palma.pdf

Consejo Insular de Aguas de La Palma (2021). *Plan Hidrológico de La Palma. Ciclo de Planificación 2021-2027. Memoria (2021).* https://www.dropbox.com/sh/c4fw8py1qf53qkc/AABpMVuX166jjDjSINi4whmQa?dl=0

Consejo Insular de Aguas de La Palma (2023). *Volumen De Agua En Las Balsas de La Palma. Actualizado El* 05/07/2023. https://lapalmaaguas.com/volumen-de-agua-en-las-balsas-de-la-palma-actualizado-el-05-07-2023/

García Rodríguez, F. J., & Fernández Hernández, C. (2023). *La Palma: Una Isla de Oportunidades. Repensando El Futuro A Partir de la Crisis Volcánica.*

Gobierno de Canarias (2021). *Plan Integral de Residuos de Canarias* (PIRCAN) 2021-2027. https://noticias.juridicas.com/base_datos/CCAA/716700-d-160-2021-de-30-dic-ca-canarias-plan-integral-de-residuos-de-canarias-2021-2027.html

iAgua Data (2023). *Infraestructuras* - EDAR. https://www.iagua.es/data/infraestructuras/edar/comunidad/canarias-111

Irl, S. D., Schweiger, A. H., Medina, F. M., Fernández-Palacios, J. M., Harter, D. E., Jentsch, A., ... & Beierkuhnlein, C. (2017). *An Island View Of Endemic Rarity—Environmental Drivers and Consequences for Nature Conservation. Diversity and Distributions*, 23(10), 1132-1142.

ISTAC (2022) *Economía General*. Instituto Canario de Estadística.

Khan, A., Bibi, S., Ardito, L., Lyu, J., Hayat, H., & Arif, A. M. (2020). *Revisiting The Dynamics Of Tourism, Economic Growth, And Environmental Pollutants In The Emerging Economies—Sustainable Tourism Policy Implications*. Sustainability, 12(6), 2533.

La Palma Renovable (2023). *Datos De Energía en La Palma*. https://lapalmarenovable.es/energia-en-la-palma/

Meadows, D. H. (2008). *Thinking In Systems: A Primer.* Chelsea green publishing.

Red Eléctrica (2023). La Palma - *Seguimiento de La Demanda de Energía Eléctrica*. https://demanda.ree.es/visiona/canarias/la_palma5m/total

Ritchie-Dunham, J. L., & Rabbino, H. T. (2001). *Managing From Clarity: Identifying, Aligning, and Leveraging Strategic Resources*.

Smollan, R. K. (2011). *The Multi-Dimensional Nature of Resistance to Change. Journal of Management & Organization,* 17(6), 828-849.

Sydow, J., Schreyögg, G., & Koch, J. (2009). *Organizational Path Dependence: Opening The Black Box*. The Academy of Management Review, 34(4), 689–709

GSF Cohort 2023

GSF COHORT

Back Row (left to right) *- Mia Black (faculty) ● Carlos Taysen Cabrera Plata (Spain) ● Andrés Julián Gil Garcia (Colombia) ● Joyce Dickerson (USA) ● Alberto Gayá Vilar (Spain) ● Algis Vyshniauskas (Vienna) ● Marila Belén Sosa (Spain) ● Vanessa Armendariz (GSF Program Director) ● Michael Ben-Eli (Founder, The Sustainability Laboratory) ● Svetlana Dcosta (Canada | formerly India) ● Mwamibantu Muliri Dubois (Democratic Republic of the Congo)*

Front Row (left to right) *- Paula Clemente Abad (United Arab Emirates) ● Katrina Abigail C. Ceballos (Belgium|Philippines) ● Miriam Almenara Ramos (Spain) ● Karen Aguilar Chavez (México) ● Harrison Dearing (Denmark) ● Lee Frankel-Goldwater (Faculty) ● Jamilla Abu-Kaf (Israel) ● Ben Naman (USA) ● (Not pictured Lina Hymmen (Sweden))*

GSF Faculty 2023

GSF FACULTY

Michael Ben Eli
Founder, The Sustainability Laboratory | GSF Faculty

Vanessa Armendariz
Director, Global Sustainability Fellows Program | Faculty

Carlos Fernández-Hernández
Canary Islands Faculty

Carmelo J. León
Canary Islands Faculty

Bernard Amadei
GSF Faculty

Diego Barrera de Paz
Canary Islands Faculty

Andrea Bassi
GSF Faculty

Therese Bennich
GSF Faculty

Mia Black
GSF Faculty

Peter Dean
GSF Faculty

Lee Frankel-Goldwater
GSF Faculty

Matías González
Canary Islands Faculty

Constantine Malik
GSF Faculty

ACKNOWLEDGMENTS

THANK YOU

Our sincerests thanks to all our partners, friends, supporters, local experts, stakeholders, and faculty who made the GSF experience and this report possible. A special thank you to the 2023 GSF Cohort for their deep commitment, energy, and participation.

Envisioning La Palma

Developing A Sustainable Future for the Island

Global Sustainability Fellows Program, Summer 2023 – La Palma, 2023

Thank you to the people of La Palma for your contributions to the realization of the Global Sustainability Fellows (GSF) Program - La Palma, 2023

We would like to express our gratitude to everyone who participated, fully or partially, in the process of organizing, designing, developing, and executing the Global Sustainability Fellows (La Palma, 2023) program. We recognize the varying levels of participation, including the leaders of public and academic institutions, speakers, experts, people affected by the volcano, facilitators of activities and visits, informants, and support staff. At the risk of omitting some participants, we wanted to mention these contributions expressly and hope that you all, named and unnamed, understand that we are deeply appreciative of all your efforts and contributions. Thank you!

LOCAL PARTICIPANTS

- Aguiar Rodríguez, Ernesto
- Albert-Torres, Nuria
- Álvarez Pérez, Goretti
- Armas Domínguez, Jesús María
- Barrera de Paz, Alejandro
- Barreto Cabrera, Edvina
- Bermejo Domínguez, Juan Antonio
- Cáceres Rodríguez, Celsa
- Calderón Piñero, Eduardo
- Camacho Sosa, Raúl
- Castañeda Pérez, Ana Isabel
- Castillo García, Fátima
- Castillo García, Mary
- Concepción Francisco, Laura
- Costa, Zoe
- Cseko, Adrienn
- D'Armengol, Laia
- De León Ledesma, Javier
- Demetrio, Ronny
- Domínguez San Luis, Francisco
- Fernández Rodríguez, Antonio
- Folz, Philip
- García Álvarez, Esteban
- García Lázaro, Francisco
- García Rodríguez, César
- García Rodríguez, Francisco J.
- García Rodríguez, Oscar
- García Suárez, Ana María
- González Acosta, Tamara
- González Acosta, Verónica
- González Álvarez, Saray
- González Díaz, María Teresa
- González Gómez, Silvia
- González Leal, José Germán

(Local Participants cont'd)

- González Lorenzo, Carmen Nieves
- González Pérez, María Inmaculada
- González Vega, Begoña
- Hernández García, Andrés
- Hernández Martín, Raúl
- Hernández Piñero, Jorge
- Hernández Ríos, Iván
- Holander, Carolina
- Hosinsky, Anton
- Izquierdo Triana, Héctor
- León García, Carolina de
- López Galán, Miguel Ángel
- López Redondo, Francisco Javier
- Lorenzo Pérez, José Heriberto
- Lorenzo Rodríguez, Felipe
- Lorenzo Rodríguez, Rafael
- Medina Sánchez, Emma
- Mejías Reyes, Jezabel
- Montes de Oca, Alfonso
- Moreno Gil, Sergio
- Murias Aumente, Emilio
- Musicki Savic, Ana
- Nordio, Elena
- Ortega Rodríguez, Ariadna
- Padrón Fumero, Noemí
- Padrón Marrero, David
- Palomares Martínez, Ángel
- Palop Casado, Juan
- Paz Nacho, Hilda Marilú
- Paz Pais, Andrés
- Pérez Arencibia, Juan Carlos
- Pérez Carballo, Antonio
- Pérez Hernández, Eduardo
- Pérez Llamas, José Javier
- Pérez Martín, Julián
- Pérez Sánchez, David Antonio
- Rasi-Rügen, Martina
- Rebollo Morera, Raquel
- Rodríguez Fernández, Sergio
- Reyes Córdoba, Carlos J.
- Reyes Díaz, Fabián
- Riverol Rodríguez, Carmen
- Rodríguez Infante, Aarón
- Rodríguez Vassous, Mercedes María
- Rosa Arroyo, Nieves
- Rosario Martín, Azucuahe del
- Sánchez González, Ana Delia
- Sánchez, Francisco
- Sancho Morales, Vanessa
- Serantes Asenjo, Juan
- Serrá-Majem, Luis
- Suárez Lacalle, Cristina
- Varela Pérez, Antonia
- Viña Carrascoso, Dévora
- Yanes Marichal, Nieves
- Zapata Hernández, Vicente M.

In addition, we would like to thank the companies and staff that have collaborated in the provision of services, during the face-to-face phase of the program at the Agricultural Training School of Los Llanos de Aridane (La Palma) and in the visits, field trips and meetings held throughout the program.

PARTNERS & SUPPORTERS

We deeply appreciate the participation and commitment of all our partners, supporters, and friends, to making the 2023 Global Sustainability Fellows program possible.

- Matthias Bittner (Germany)
- Anne L. Dean (USA)
- Cabildo Insular de La Palma - Consejería de Medio Ambiente (Spain)
- Cabildo Insular de La Palma - Consejería de Turismo
- TIDES: Instituto Universitario de Turismo y Desarrollo Económico Sostenible (ULPGC)
- Cátedra UNESCO de Turismo y Desarrollo Económico Sostenible (ULPGC)
- Universidad de Las Palmas de Gran Canaria
- Universidad de La Laguna
- Cátedra de Turismo Cajacanarias - Ashotel Universidad de La Laguna
- La Palma, La Isla Bonita Canarias
- Fundación Reserva Mundial de la Biósfera La Palma
- Gobierno de España - Ministerio para la Transición Ecológica y el Reto Demográfico
- Gobierno de Canarias – Consejeria de Agricultura, Ganadería y Pesca
- Gobierno de Canarias - Presidencia del Gobierno
- Ader: Asociación de Desarrollo Rural, La Palma
- Cámara de Comercio Industria y Navegacion – Santa Cruz de Tenerife Delegación de La Palma
- Asociación Turismo Rural – Isla Bonita
- IAC Instituto Astrofísica de Canarias
- Foundation for the Support of the United Nations
- Malik (Switzerland)


ULPGC
Instituto Universitario de Turismo y Desarrollo Económico Sostenible

Tides


UNESCO
Organización as Naciones Unidas para la Educación, Ciencia y la Cultura
uniTwin
ULPGC Universidad de Las Palmas de Gran Canaria
Cátedra UNESCO de Turismo y Desarrollo Económico Sostenible


Universidad de La Laguna


Cátedra de Turismo CajaCanarias-Ashotel
Universidad de La Laguna


CABILDO DE LA PALMA


La Palma
La Isla Bonita CANARIAS


La Palma
RESERVA MUNDIAL DE LA BIOSFERA


GOBIERNO DE ESPAÑA
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
ORGANISMO AUTÓNOMO PARQUES NACIONALES


Gobierno de Canarias
Consejería de Agricultura, Ganadería y Pesca


Gobierno de Canarias
Presidencia del Gobierno


Gobierno de Canarias


CANARIAS 2030


Cámara
Santa Cruz de Tenerife
Delegación de La Palma


ader
ASOCIACIÓN DE DESARROLLO RURAL LA PALMA


ASOCIACIÓN TURISMO RURAL
- ISLA BONITA -


INSTITUTO DE ASTROFÍSICA DE CANARIAS


F S
U N


malik

Envisioning La Palma

Developing a Sustainable Future for the Island

*A Global Sustainability Fellows Program Report, Summer 2023 | November 2023

globalsustainabilityfellows.org
sustainabilitylabs.org

Envisioning La Palma. Developing a Sustainable Future for the Island

University Institute for Tourim and Sustainable Economic Development (Tides)
University of Las Palmas de Gran canaria
ISBN-978-84-09-57481-0

DOI: 10.5281/zenodo.10352507

(*) Note: This report expresses the ideas of The Sustainability Laboratory (New York), synthesized based on the information, debate, and analysis carried out within the framework of the GSF program - La Palma, 2023, by the faculty, team, and fellows.