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Design of the Measurement Tools for the SDGs in the Technology-Based Biotechnology Spin-Off Biohogar R&D

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Abstract: ***This article addresses the problem of the economic use of co-products or residues generated in coffee and cannabis crops in Cauca, Colombia. The impact on the social, productive, and economic contexts of the two productive chains is analyzed, highlighting the conditions of multidimensional poverty among coffee-growing families and the impact on the environment due to the generation of crop residues. A sustainable solution is presented through a technology-based Spin-Off company, Biohogar R&D, which transforms waste into bioconstruction materials, promoting sustainable development and compliance with the Sustainable Development Goals (SDG) and identifying their associated KPIs.***
Keywords: SDG, KPI, industrial use, coffee, cannabis, bioconstruction materials, technology transfer.

I. INTRODUCTION

The Cauca department boasts exquisite richness in its soils, topographical variety, and climates (1), making it an ideal location for a variety of crops. Coffee cultivation involves approximately 90,897 coffee growers covering an area of 93,000 hectares (2). This crop represents 9.96% of the national coffee production, generating approximately 65,500 rural jobs (3). The coffee production chain refers to all stages involved in the coffee production, processing, and marketing process, procedures that allow for the traceability of the product reaching the end consumer. In Cauca, there were 3,614 individuals registered as small and medium-sized cultivators, producers, and distributors of medicinal cannabis as of 2021 (4), under its four types of licenses for cultivation and production (5).

Agricultural production in Cauca also generates a large amount of waste derived from the two production chains, elements that reduce the purchasing power of farmers as they lack the capacity to utilize them on an industrial scale. In the coffee farming social context, 70% of the 90,897 (6) families exhibit a high Multidimensional Poverty Index (MPI), with a broadened 46% (7). The remaining 30% consists of high-quality coffee, reducing their access to education, healthcare, public services, balanced and quality nutrition, decent housing, access roads, and income. Consequently, there is a high migration towards illicit crops (8). Within the coffee production sphere, the low technology transfer diminishes its competitiveness. In the coffee circularity, approximately 5% of the biomass is used in the production of the beverage (9), resulting in the generation of waste or by-products, which can account for close to 90% of the total production, making this percentage potentially usable biomass.

As for cannabis cultivator families, within the social context, 507 km² were identified in the Cauca department, spanning 36 of the 42 municipalities in Cauca (10).

In the cannabis production context, from seed acquisition, cultivation, raw material extraction, to the transformation into cannabis-derived products (11), there is a significant environmental impact. The deforestation to plant cannabis contributes to deforestation in the department. In terms of circularity, only 30% of cannabis is used as raw material, while the remaining 70% is considered a co-product or usable biomass (12). Due to the intensive use of these crops, large quantities of waste are generated, affecting soil and water quality, stemming from the high ecological footprint.

The Popayán University Foundation, in collaboration with the Technological Innovation Coffee Park (PCTI Tecnicafé) and the medicinal cannabis derivatives production company Canatural S.A.S, through research, development, and innovation projects, achieved the production of bioconstruction materials, resulting in the technological biotechnology spin-off company "Biohogar R&D."

This sustainable business model, known as "Spin-off Alianza Estratégica" (Decree 1556 5/Aug/22) (13), can be understood as "the ability of a society to meet people's basic needs without harming the ecosystem or causing damage to the environment" (14).

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To ensure social immersion in the regions served by "Biohogar R&D" and its respective technological transfer in value addition to the two production chains, it is imperative to develop a methodology that allows for the evaluation of the effectiveness of the spin-off's strategic business units (UEN), their projected achievement of the Sustainable Development Goals (ODS), and the definition of Key Performance Indicators (KPIs), which are values that assess the performance of business or sustainable development objectives (15).

Contextualization of the technological biotechnology spin-off "Biohogar R&D"

For the transformation of materials in construction, there are two SBUs: SBU No.1: Engineered woods; coffee agglomerates. SBU No.2: Bioconstruction materials (BTC: Compressed Earth Block, BTC Coffee: Compressed Earth Block with Coffee, BCC: Solid Compressed Hemp Block, LEGO-style, SPANISH TILES: Spanish-style tiles, CEMENT: Mortar type; INSULATOR: Waterproofing and sealant). In these two strategic business units, 70% of the total coffee biomass residue and 60% of the total cannabis waste are utilized. Two types of returns are achieved in this stage: 1st Return - waste monetization, and 2nd Return - supply chain, generating employment opportunities. These are essential elements within a bio economy model in the regions. For the application and use of the products, there is SBU No. 3: Architecture and architectural construction (Bioclimatic design and construction systems). In this SBU, the transition from a biomaterial (non-melted material) to a geomaterial (rock) occurs, resulting in environmental conservation and the preservation of the region's water resources. For technology transfer to the environment and sub regions, SBU No. 4 is assumed: Biohogar academic (R&D&I: Research, development, and innovation); certification in circular economy, training, and continuous education (courses, workshops, diplomas).

Referential Framework:

1) APC Colombia, the Presidential Agency of International Cooperation (Colombia): In its South-South cooperation project lifecycle format, for sustainable cities and communities, assigns added value to each SDG and classifies them with different types of items.

2) Advanced Sustainability Assessment Tool: Based on the FFBB Methodology Guide, it provides a detailed methodological guide, implementation guide, positive monitoring guide, and goal balance action guides.

3) The thematic guide "Innovation for Sustainable Lifestyles" by the United Nations Environment Programmed (UNEP) in collaboration with the University of the Andes, addresses the environmental challenges the world faces in adopting habits for a sustainable lifestyle.

4) On the Argentina.gob.ar website, under the National Biodiversity Strategy, the term biodiversity is discussed.

5) Decree 1556 of 2022 regulates Law 1838 of 2017 regarding the creation and organization of technology-based companies (Spin Off) to promote science, technology, and innovation in Higher Education Institutions (HEIs). It defines technology-based companies (spin-offs), their types, and participation.

Cannabis: An annual and dioecious flowering herb. Generally, the staminate (male) plants are taller than the pistillate (female) ones but less robust. The stems are erect and their height ranges from 0.2 to 6 meters. However, most plants reach a height of 1 to 3 meters. The length of the branches, as well as the plant's height, depends on environmental and hereditary factors, as well as the cultivation method (16,17). Dioecious: Male and female flowers are on separate plants (17). Circular economy: an economic system of exchange and production aimed at increasing resource efficiency at all stages of the product life cycle (18). Usable biomass: From its potential for use as an energy resource, it encompasses all organic matter that, based on its physical and chemical characteristics, can be converted into biofuels through various processes and technologies (19). Bio economy: It is the production, utilization, and conservation of biological resources, including related knowledge, science, technology, and innovation, to provide information, products, processes, and services in all economic sectors, aiming for a sustainable economy (20). Bio construction: Sustainable materials are those that require low energy in their manufacturing and whose use in the construction of a dwelling, due to their intrinsic qualities, avoids pollution, respects the health of its inhabitants, and are biodegradable, reusable, or recyclable (21). Residue: Solid, semi-solid, liquid, or gas material that its generator or possessor must or needs to dispose of, and which can or should be responsibly valorized or treated, or alternatively, managed by suitable final disposal systems (22). Sub product: These are the incidental results when manufacturing primary products. They can result from the cleaning of primary products or from the preparation of raw materials before their use in the manufacturing of primary products, or they can be waste left behind after the processing of primary products (23). Strategic Business Unit (SBU): A business unit for manufacturing and marketing one or more related products, targeted at very specific markets that require a narrow product offering, much like a specialized area for those markets and products (24).

a) General objective

- Design the SDG measurement tools in the biotechnology-based Spin-Off “BIOHOGAR R&D”

b) Specific objectives

- Design the strategic projection mapping of the SDGs for 10 years for the “Biohogar R&D” Spin-Off
- Define indicators that allow measuring the management and performance of the “Biohogar R&D” Spin-Off in the SDGs.
- Design a table of indicators that provides information on compliance with the SDGs

II. METHODOLOGY

In the following diagram, Figure -1, the sequence in which all the processes that influence the creation of indicators measuring the impact of the SDGs on the "Biohogar R&D" spin-off is presented.

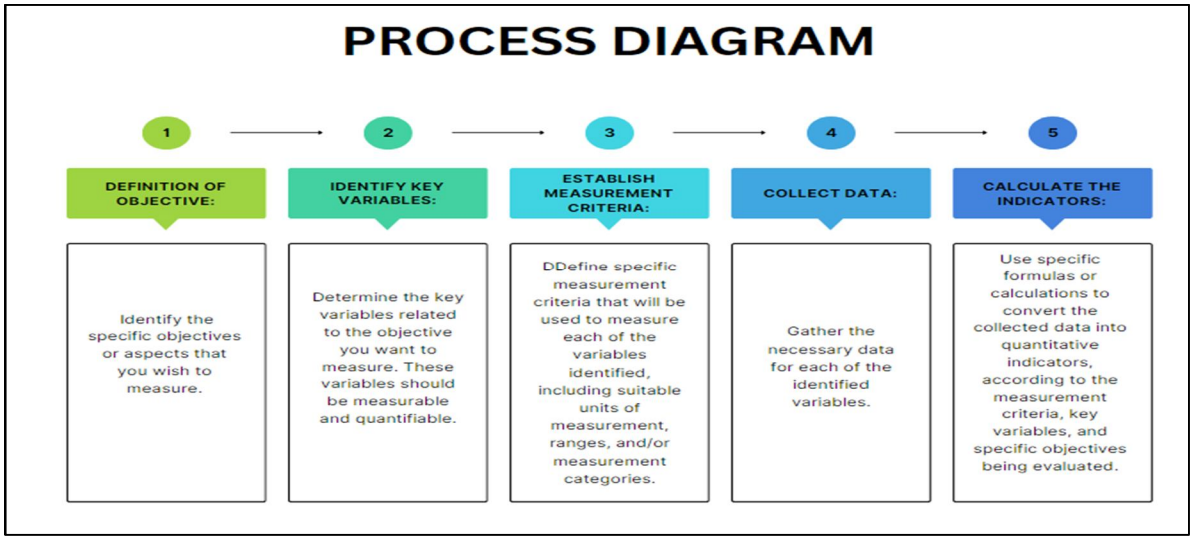


Fig -1 Own elaboration in Canva app, source: "The Balanced Scorecard: Translating Strategy into Action" by: Robert S. Kaplan y David P. Norton; "Key Performance Indicators: A Practical Guide" by: David J. Anderson; Website American Productivity and Quality Center (APQC).

In the following diagram, Figure #2, you can see the step-by-step sequence of processes that influenced its individual development to identify each indicator measuring the impact of the SDGs on the "Biohogar R&D" spin-off. This diagram serves as an example from the author Kaplan et al., providing guidance for applying their methodology.

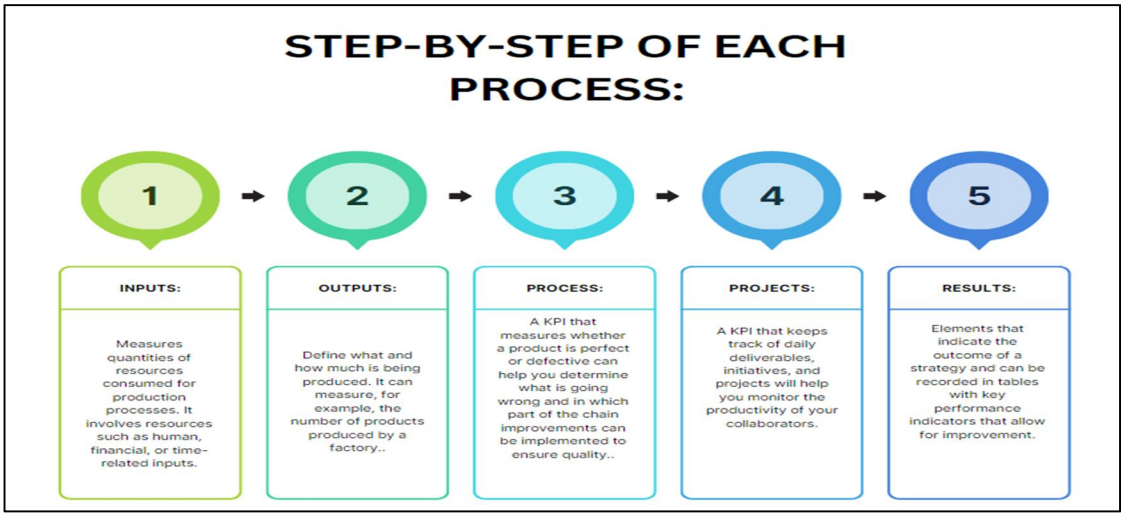


Fig-2: Own elaboration in Canva app, source: "The Balanced Scorecard: Translating Strategy into Action" by: Robert S. Kaplan y David P. Norton; "Key Performance Indicators: A Practical Guide" by: David J. Anderson; Website American Productivity and Quality Center (APQC).

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An Excel document was created as a management tool for Key Performance Indicators (KPIs) for each of the SDGs associated with Biohogar R&D. The Excel workbook contains three tabs. The first tab: Graph Presentation, represents bar charts of the KPI scores. The second tab: General Profiles, is an editable page for entering data from the strategic business units (SBUs) of the Spin-Off. The third tab: Scores, is an editable page for entering quantified data. Image 1 illustrates the division of tabs in the Excel document.

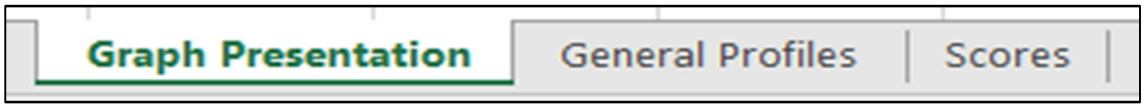


Image -1: Source: Own elaboration; Excel

In image 2, you can see the objectives associated with the management and evolution of the Spin-Off.



Image -2: Sustainable development goals; Source: ONU

The only SDG not directly linked to Biohogar R&D is number 14.

III. ANALYSIS AND RESULTS

Quantitative criteria for defining the measurement strategies of the impact that the sustainable development objectives have on the Biohogar R&D spin-off:

Next, the quantitative variables are chosen for each of the SDGs that directly impact Biohogar.

❖ 1° SDG NO POVERTY:

1) Eradicate poverty in at least half of the coffee and cannabis farming families in the Cauca department who currently sustain themselves with less than a minimum monthly wage (SMMLV)

a) Average household income.

2) Ensure that all families have equal rights to economic resources, as well as access to basic services, property, and other assets, including appropriate new technologies.

a) Number of families with internet access.

b) Number of families with access to private property.

c) Number of families with access to a Wi-Fi network.

d) Number of families with access to a computer.

3) Promote family resilience and reduce their exposure and vulnerability to extreme weather events related to climate and migration to illicit crops.

a) Number of families residing in homes with high exposure to winter and heatwaves.
b) Number of families residing in homes with high exposure to landslides, collapses, avalanches, etc
c) Number of families exposed to areas with a migration to illegal crops.

❖ 2° SDG ZERO HUNGER:

4) Ensure that all families have access to healthy, nutritious, and sufficient food throughout the year.
a) Number of families with access to food.
b) Number of families with access to sufficient food.
c) Number of families with access to healthy food.

5) Double agricultural productivity and income for coffee and cannabis producers through secure access to production resources, inputs, technical knowledge, and opportunities for value generation.
a) Number of families with access to production resources.
b) Number of families with access to production inputs.
c) Number of families with access to technical knowledge.
d) Number of families with access to opportunities for value generation.

6) Ensure the sustainability of food production systems and implement resilient agricultural practices that guarantee increased production and contribute to the maintenance of ecosystems while progressively improving soil quality
a) Number of families whose crops are rotated
b) Number of families that apply multi-crop use
c) Number of families that manage integrated pest management (IPM)
d) Number of families that make their contribution to the increase in the reduction of pollution of water resources derived from the use of fertilizers and pesticides

7) Increase investments in rural infrastructure, agricultural research, and technological development to enhance agricultural production capacity.
a) Number of families with access to infrastructure investments.
b) Number of families with access to resources for agricultural research.
c) Number of families with access to resources for technological development.

❖ 3° SDG GOOD HEAD AND WELL-BEING:

8) Ensure access to essential, high-quality, effective, and affordable healthcare services for all.
a) Number of families with access to essential healthcare services.
b) Number of families with access to quality essential healthcare services.
c) Number of families with access to effective essential healthcare services.

9) Achieve healthcare coverage, particularly protection against epidemiological risks.
a) Number of families with access to healthcare coverage.
b) Number of families within the local epidemiological planning system.
c) Number of families within the departmental epidemiological planning system.
d) Number of families within the national epidemiological planning system.

10) Substantially reduce air, water, and soil pollution. (25).
a) Percentage of coffee carbon footprint (% emissions inventory + % life cycle assessment).
b) Percentage of coffee water footprint (% water balance + life cycle assessment).
c) Percentage of cannabis carbon footprint (% emissions inventory + % life cycle assessment).
d) Percentage of cannabis water footprint (% water balance + life cycle assessment).
e) Percentage of variation in soil pH in the region.

❖ 4° SDG QUALITY EDUCATION:

11) Ensure that all heads of households have access to education services and successfully complete continuous education cycles equitably and with quality.
a) Number of heads of families successfully completing their training.
b) Number of heads of families with skill development in technical education.
c) Number of heads of families with a high level of social knowledge appropriation.

12) Ensure equal access for all men and women to acquire the necessary competencies for quality technical, professional, and higher education, including university education.
a) Number of heads of families with technical training before Biohogar.
b) Number of heads of families with technical training after Biohogar.
c) Number of heads of families with technological training before Biohogar.
d) Number of heads of families with technological training after Biohogar.
e) Number of heads of families with university education before Biohogar.
f) Number of heads of families with university education after Biohogar.

13) Substantially increase the number of young adults and family heads who possess the necessary competencies, particularly technical and professional skills, to access employment, decent work, and entrepreneurship. For this item, it is recommended to conduct a previous sociodemographic survey that includes the items of the KPIs to be measured.
a) Number of young individuals with technical competencies before Biohogar.
b) Number of young individuals with technical competencies after Biohogar.
c) Number of adult family heads with technical competencies before Biohogar.
d) Number of adult family heads with technical competencies after Biohogar.

14) Ensure that all family heads acquire the theoretical and practical knowledge necessary to promote sustainable development. In this item, sustainable diversity is discussed, and Biohogar requires social immersion in regions with ethnic and cultural diversity. The concept of sustainable diversity has been expanded within the holistic cultural, social, and economic context. (26).
a) Number of families with access to education for sustainable development.
b) Number of families adopting sustainable lifestyles.
c) Number of families assessing sustainable diversity and its social, cultural, and economic contribution to sustainable development.

15) Promote a culture of peace and non-violence in the preservation of historical memory.
a) Number of family heads with spaces for the exchange of experiences and knowledge related to the culture of non-violence.
b) Number of family heads participating in reports resulting from the exchange of experiences and knowledge related to the culture of non-violence.
c) Number of audiovisual and digital products resulting from the exchange of experiences and knowledge related to the culture of non-violence by families.

16) Ensure a continuous education model that emphasizes inclusion, diversity, and equity.
a) Number of families ensuring a transparent information model based on equity.
b) Number of individuals benefiting from technological transfer while ensuring diversity.
c) Number of families ensuring the implementation of a transparent information model based on equity and inclusion.

17) Promote a culture of efficient use of water resources, focusing on atmospheric and underground utilization:
a) Number of training sessions on atmospheric water resource utilization.
b) Number of training sessions on underground water resource utilization.
c) Number of training sessions on the purification of utilized water resources.
18) Contribute to reducing global per capita food waste in retail and consumer sales by half and reduce food losses in production and distribution chains, including post-harvest losses.

a) Number of training sessions on the utilization of waste from production chains.
b) Number of new co-products generated from the utilization of waste.
c) Number of individuals involved in increasing the recovery of utilized biomass tons.

19) Substantially reduce waste generation through prevention, reduction, recycling, and reuse policies.
a) Number of families benefiting from the implementation of protocols for the industrial use of biomass
b) Number of protocols implemented in the sub regions.
c) Number of circular economy certifications for producers.

20) Ensure that people worldwide have relevant information and knowledge for sustainable development and lifestyles in harmony with nature.
a) Number of creations and distribution of educational materials "Printed documents, videoconferences."
b) Number of training sessions on sustainable development.
c) Number of household heads trained in sustainable development.

21) Support developing countries in strengthening their scientific and technological capacity to advance towards more sustainable consumption and production patterns.
a) Number of families benefiting from technological transfer.
b) Number of families trained in models of Bio-sustainable production offer.
c) Number of families trained in sustainable production techniques.
d) Number of families trained in sustainable consumption models.

❖ 5° SDG GENDER EQUALITY:
22) Ensure the full and effective participation of women in social leadership processes.
a) Number of women with equal participation in all Biohogar processes.
b) Number of equal participations through various Biohogar activities.

23) Take actions that grant women equal access and rights to economic resources and natural resources.
a) Number of citizen participation conferences on family units.
b) Number of socio-economic networking spaces that increase women's participation per family unit.
c) Number of socio-business activities that ensure family parity.

24) Raise awareness about all forms of violence against all women and girls in both public and private spheres, including human trafficking, sexual exploitation, and other types of exploitation.
a) Number of families trained in raising awareness about forms of violence.
b)) Number of families trained in conflict management and resolution.

25) Enhance the use of information and communication technologies to promote women's empowerment.
a) Number of protocols for responsible technology use that promote gender respect.
b) Number of digital marketing training sessions.

❖ 6° SDG CLEAN WATER AND SANITATION:
26) Achieve universal and affordable access to safe drinking water for all.
a) Number of training sessions on watershed environmental management
b) Number of workshops on methodologies for developing and implementing community aqueduct projects in the region
c) Number of families trained in water resource management
d) Number of families trained in optimizing public service facilities.

27) Achieve equitable access to basic sanitation services for all.
a) Number of household heads trained in wastewater treatment.

b) Number of household heads trained in the design and construction of sanitary facilities.
c) Number of training sessions on wastewater management per family unit.

28) Ensure the sustainability of freshwater extraction and supply to address scarcity and substantially reduce the number of people without access to this vital resource.
a) Number of families benefiting from sustainable micro watershed management plans.
b) Number of families benefited from training in maintenance of hydraulic installations
c) Number of families benefited from harvesting and water management processes
d) Number of families trained in waste management and water polluting agents
e) Number of families benefiting from watershed reforestation plans

29) Implement integrated water resources management at all levels, including through cross-border cooperation.
a) Number of families participating in projects focused on the environment and proper use of water
b) Number of families benefited by interregional cooperation strategies.

30) Protect and restore water-related ecosystems, including forests, mountains, wetlands, rivers, aquifers, and lakes.
a) Number of families that work in sustainable production models and adequate use of water
b) Number of families trained in ecosystem protection
c) Number of families with training in reforestation and reestablishment of ecosystems

31) Support and strengthen the participation of local communities in improving water management and basic sanitation.
a) Number of families that participate in environmental management plans
b) Number of families that actively participate with a social and environmental responsibility plan

❖ 7° SDG AFFORDABLE AND CLEAN ENERGY:
32) Guarantee universal access to affordable and reliable energy services, improving infrastructure and technology to expand coverage of modern and sustainable services.
a) Number of family heads trained in the implementation of combined clean energy systems
b) Number of family heads trained in sustainable energy infrastructure
c) Number of heads of family who have appropriated sustainable technology processes.

33) Contribute to the increase in departmental coverage of improvement in energy efficiency.
a) Percentage of families benefiting from the implementation of individual bio-managers
b) Percentage of use of photovoltaic energy systems
c) Percentage of wind energy use

34) Facilitate access to new efficient and environmentally friendly renewable energy sources, promoting investment in energy infrastructure.
d) Increase in the development of pilot farms in the sub-region
e) Increase in the management of renewable energy investment projects in the sub-region

❖ 8° SDG DECENT WORK AND ECONOMIC GROWTH:
35) Achieve higher levels of economic productivity through diversification, technological modernization, and innovation.
a) Number of families with modernized work spaces.
b) Number of families with new members of the family nucleus on agricultural farms
c) Number of families with increased capacity acquired in co-product markets
d) Number of families trained in creating machines and/or applications that make it easier to carry out the work.

36) Promote the development of productive activities, job creation, entrepreneurship, creativity, and innovation.
a) Number of job creation by families with better conditions in the sector.

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b) Number of business creation by families through the different Biohogar products.
c) Number of generation of products or services based on knowledge management acquired by families

37) Progressively improve the efficient production and consumption of global resources and strive to decouple economic growth from environmental degradation.
a) Number of families trained in reducing emissions linked to deforestation and degradation.
b) Number of families trained in sustainable sources of work
c) Number of families trained in the preservation of natural resources

38) Generate full and productive employment, ensuring work for all men and women.
a) Increase in Biohogar activities that guarantee full and productive employment
b) Percentage of women with full and productive work derived from Biohogar
c) Percentage of men with full and productive work derived from Biohogar preservation of natural resources

39) Substantially reduce the proportion of young people who are not employed, not in education, and not receiving training.
a) Number of young people with incentives to access education.
b) Number of young people with access to technical and technological careers.
c) Number of young people included in Biohogar tasks and activities.

40) Develop and implement policies aimed at promoting sustainable tourism that creates jobs and promotes local culture and products.
a) Create models of agro-tourism farms.
b) Establish specific areas for sustainable environmental tourism.

❖ 9° SDG INDUSTRY, INNOVATION AND INFRASTRUCTURE:
41) Develop sustainable infrastructure in line with the production process to support economic development with equitable and affordable access for all.
a) Create architectural designs according to the region's climates and needs.
b) Develop bioconstruction materials.

42) Improve infrastructure and adjust industries to make them sustainable, using resources more efficiently and promoting the adoption of clean and environmentally rational industrial technologies and processes, and ensuring that all participants take measures according to their respective capacities.
a) Increase in the transfer of infrastructure maintenance and improvement process models
b) Increase in the development of bio-sustainable production processes including all GMP practices
c) Increase in sustainable energy management plans.

43) Increase the technological capacity of industrial sectors by promoting innovation and substantially increasing the number of people working in the field of research and sustainable development linked to Biohogar.
a) Number of mechanisms for exchanging new inter-institutional technologies.
b) Number of knowledge transfer processes in innovation to productive chains.

44) Facilitate the development of sustainable and resilient infrastructure in developing countries with increased financial, technological, and technical support to the country.
a) Encourage the exchange of knowledge and technologies through international cooperation projects
b) Encourage mobility processes that facilitate the exchange of knowledge between regions
c) Increase economic investment processes between regions.

45) Significantly increase access to the Internet by promoting the use of information and communication technologies.
a) Number of promotional campaigns regarding the use of information technologies

b) Number of technology transfer campaigns in the use of information and communications technologies.

❖ 10° SDG REDUCED INEQUALITIES:

46) Achieve maintaining the population's income growth at a rate higher than the national average.
a) Job creation.
b) Households with incomes below 1 SMMLV (Minimum Monthly Legal Wage).
c) Households with incomes above 1 SMMLV.

47) Adopt policies, especially fiscal, wage, and social protection policies, progressively achieving greater equality.
a) Number of associations that allow the payment of social benefits before Biohogar.
b) Number of associations that allow the payment of social benefits after Biohogar.
c) Number of emergency monetary funds for the sub region before Biohogar.
d) Number of emergency monetary funds for the sub region after Biohogar.

❖ 11° SDG SUSTAINABLE CITIES AND COMUNITIES:

48) Ensure access for all individuals to suitable, safe, and affordable housing and basic services.
a) Number of families with access to affordable housing before Biohogar.
b) Number of families with access to affordable housing after Biohogar.
c) Number of families with access to adequate, safe and affordable basic services before Biohogar.
d) Number of families with access to adequate, safe and affordable basic services after Biohogar.

49) Increase inclusive and sustainable urbanization.
a) Number of families with inclusive and sustainable houses before Biohogar.
b) Number of families with inclusive and sustainable houses after Biohogar.

50) Provide support to coffee and cannabis farming families through financial and technical assistance so they can construct sustainable and resilient buildings using biodegradable materials.
a) Number of trainings supported by social investment funds before Biohogar.
b) Number of trainings supported by social investment funds after Biohogar.

51) Implement techniques for sustainable production and consumption modalities, with the participation of all coffee and cannabis farming families.
a) Number of families trained in sustainable production and consumption before Biohogar.
b) Number of families trained in sustainable production and consumption after Biohogar

52) Halve the waste of products derived from harvests, including post-production losses.
a) Percentage of waste utilization after the coffee production process before Biohogar.
b) Percentage of waste utilization after the coffee production process after Biohogar.
c) Percentage of waste utilization after the cannabis production process before Biohogar.
d) Percentage of waste utilization after the cannabis production process after Biohogar.

❖ 12° SDG RESPONSIBLE CONSUMPTION AND PRODUCTION:

53) Ensure that coffee and cannabis farming families have relevant information and knowledge for sustainable development.
a) Number of family heads trained in waste management and disposal before Biohogar.
b) Number of family heads trained in waste management and disposal after Biohogar.

54) Substantially reduce waste generation through prevention, reduction, recycling, and reuse techniques.
a) Number of families trained in sustainable

- 13° SDG CLIMATE ACTION:

55) Enhance awareness regarding climate change adaptation and mitigation.
56) Incorporate measures to reduce the impact of climate change through regional strategies and plans.
57) Promote mechanisms to enhance planning and effective management capacity in relation to climate change, with a particular focus on coffee and cannabis farming communities.

- 14° SDG LIFE BELOW WATER: This SDG does not apply to the Biohogar Spin Off.
- 15° SDG LIFE AND LAND:

58) Integrate ecosystem values and biological diversity by applying development techniques and processes, improving poverty reduction strategies.

- 16° SDG PEACE, JUSTICE, AND STRONG INSTITUTIONS:

59) Substantially reduce illicit financial and arms flows.
60) Establish effective, accountable, and transparent regional institutions.
61) Expand and strengthen the participation of other related institutions.
62) Promote and implement non-discriminatory laws and policies in favor of sustainable development.

- 17° SDG PARTNERSHIPS FOR THE GOALS:

63) Mobilize additional financial resources from multiple sources for the development of sustainable development projects.
64) Promote the development of environmentally sound technologies and their transfer, dissemination, and diffusion through various means of communication.
65) Increase national support for the implementation of programs to promote production and efficiency, with specific sustainable development objectives.
66) Substantially increase the marketing of products/results from Biohogar projects of coffee and cannabis farming families, with the aim of doubling the participation of less interested families.
67) Achieve timely access to different markets.
68) Respect the regulatory framework and leadership of each region to establish and implement poverty reduction and sustainable development policies.
69) Strengthen partnerships among multiple stakeholders that mobilize and promote the exchange of knowledge, technical capacity, technology, and financial resources.
70) Encourage and promote the building of effective partnerships at the public and private levels, leveraging the experience and resource acquisition strategies in partnerships.

CONNECTION OF SDGS AT AN INDUSTRIAL/PRODUCTIVE LEVEL

At the industrial and/or productive level, we have the following relationship with Sustainable Development Goals (SDGs): SDG 11 Sustainable Cities and Communities involves industrial waste utilization. To create supply chains, we consider SDG 9 Industry, Innovation, and Infrastructure, which leads to monetizing waste, and SDG 1 No Poverty. For product transformation, we rely on SDG 12 Responsible Consumption and Production, SDG 8 Decent Work and Economic Growth, SDG 5 Gender Equality, and SDG 10 Reduced Inequalities. When it comes to governance, we align with SDG 16 Peace, Justice, and Strong Institutions, and SDG 17 Partnerships for the Goals.

To graphically represent the relationship and connection of the SDGs in an industrial/productive context for the Spin-Off, the following graph is presented as Figure - 3:

MAPPING NO. 1: INDUSTRIAL / PRODUCTIVE LEVEL

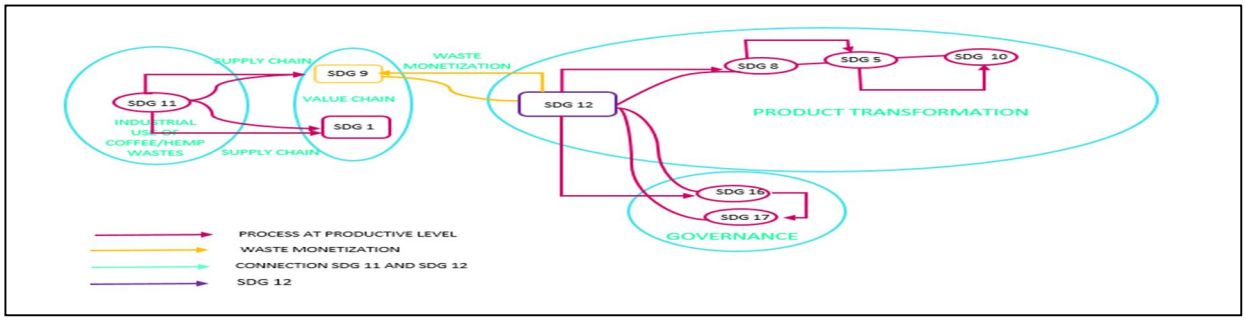


Fig. -3: Own creation

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CONNECTION OF SDGs AT THE SOCIAL LEVEL

To understand the relationship of the KPIs at the social level, it is important to understand the allocation of specific areas:

First area: SUBREGION, where the reduction of multidimensional poverty is generated; ODS 1 No Poverty, ODS 2 Zero Hunger, ODS 3 Good Health and Well-being, ODS 5 Gender Equality, ODS 6 Clean Water and Sanitation, ODS 8 Decent Work and Economic Growth, ODS 10 Reduced Inequalities, ODS 11 Sustainable Cities and Communities, ODS 12 Responsible Consumption and Production, ODS 15 Life on Land; Second area: GOVERNANCE: ODS 13 Climate Action, ODS 16 Peace, Justice, and Strong Institutions, ODS 17 Partnerships for the Goals, ODS 4 Quality Education; Third area: BIOHOGAR R&D: ODS 5 Gender Equality, ODS 8 Decent Work and Economic Growth, ODS 10 Reduced Inequalities, ODS 12 Responsible Consumption and Production.

To graphically represent the relationship and connection of the SDGs in a social context for the Spin-Off, the following figure, Fig. -4, is presented:

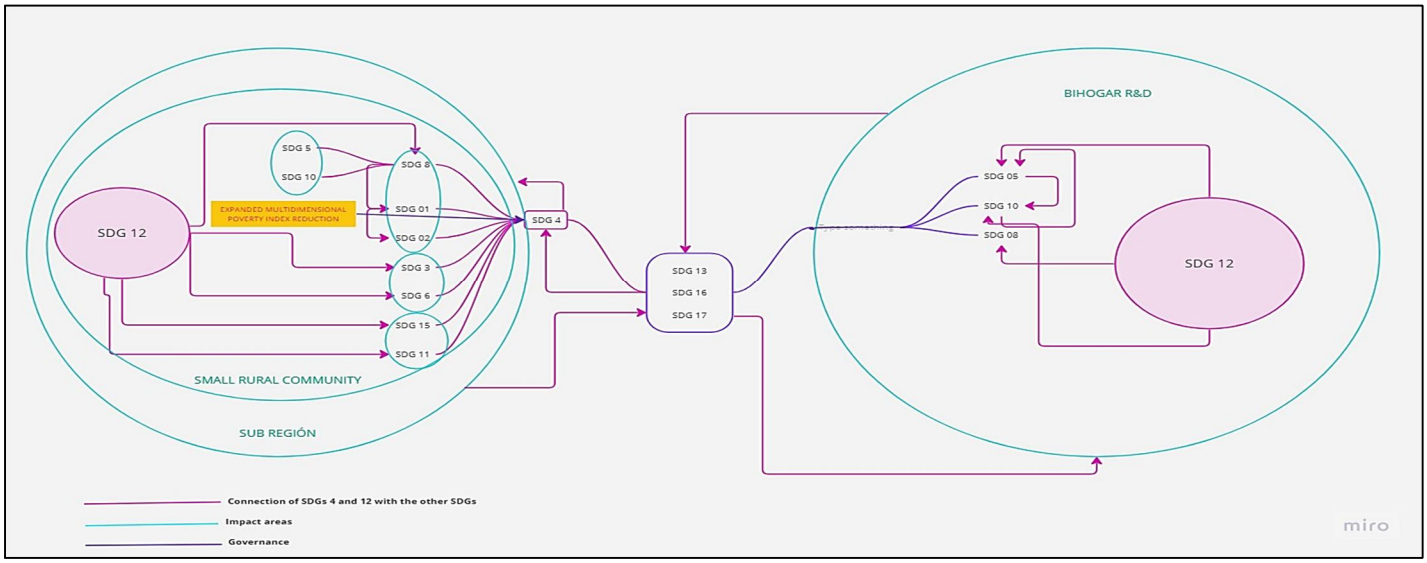


Fig. -4: Own creation; Miro App

The objective of the mappings is to see how Biohogar R&D is integrated into a region in order to determine the model of social immersion and acceptance by waste-producing communities. In the following graphic, Fig. -5, the unified relationships regarding the industrial/productive and social contexts that impact Biohogar R&D are demonstrated.

MAPPING #3: UNIFICATION OF INDUSTRIAL/PRODUCTIVE AND SOCIAL MAPPING

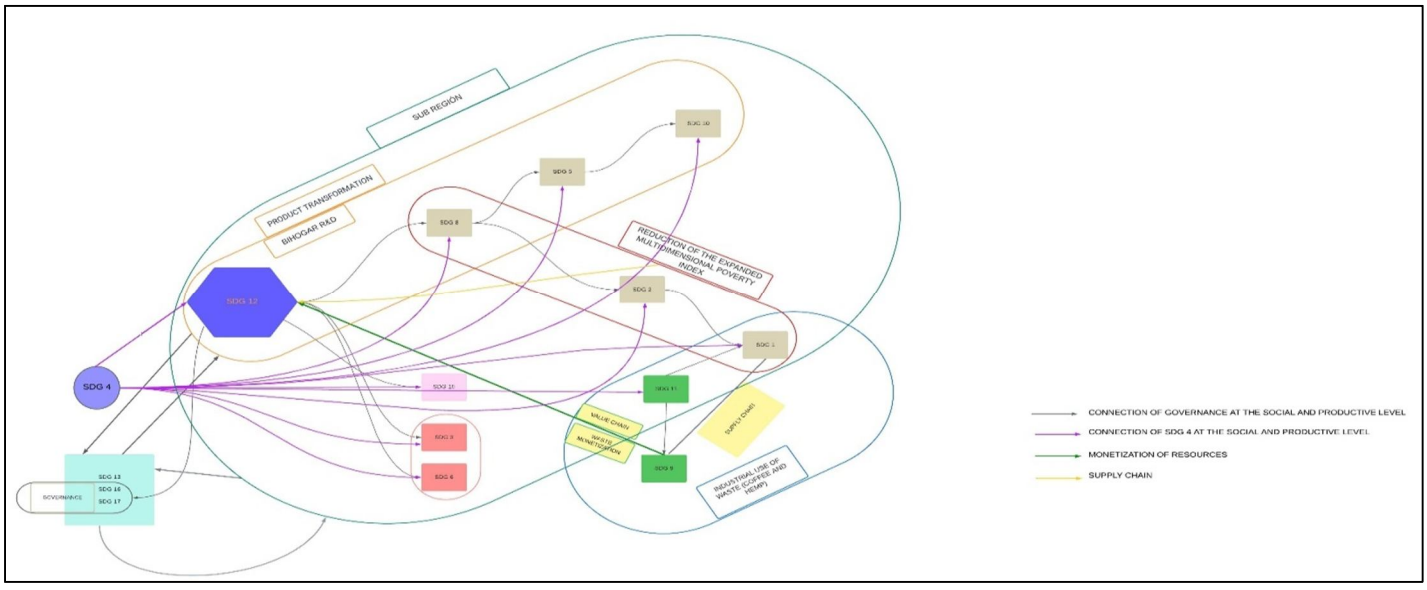


Fig. -5: Own creation; Lucid. App

STRATEGIC PLANNING: What is a strategic plan? A strategic plan is a tool used to define where your organization wants to go and what actions will be taken to achieve those objectives. Typically, a strategic plan will include statements of your company's vision and mission (27), your long-term goals (as well as your short-term annual objectives), and an action plan outlining the steps you will take to move in the right direction (28). In Biohogar R&D, a 10-year projection is carried out within the period (2024/2034), resulting in the following projections in the two main levels focused on by Biohogar R&D, the industrial/productive level, and the social level.

The industrial-level projection is represented in the following graph, fig. -6:

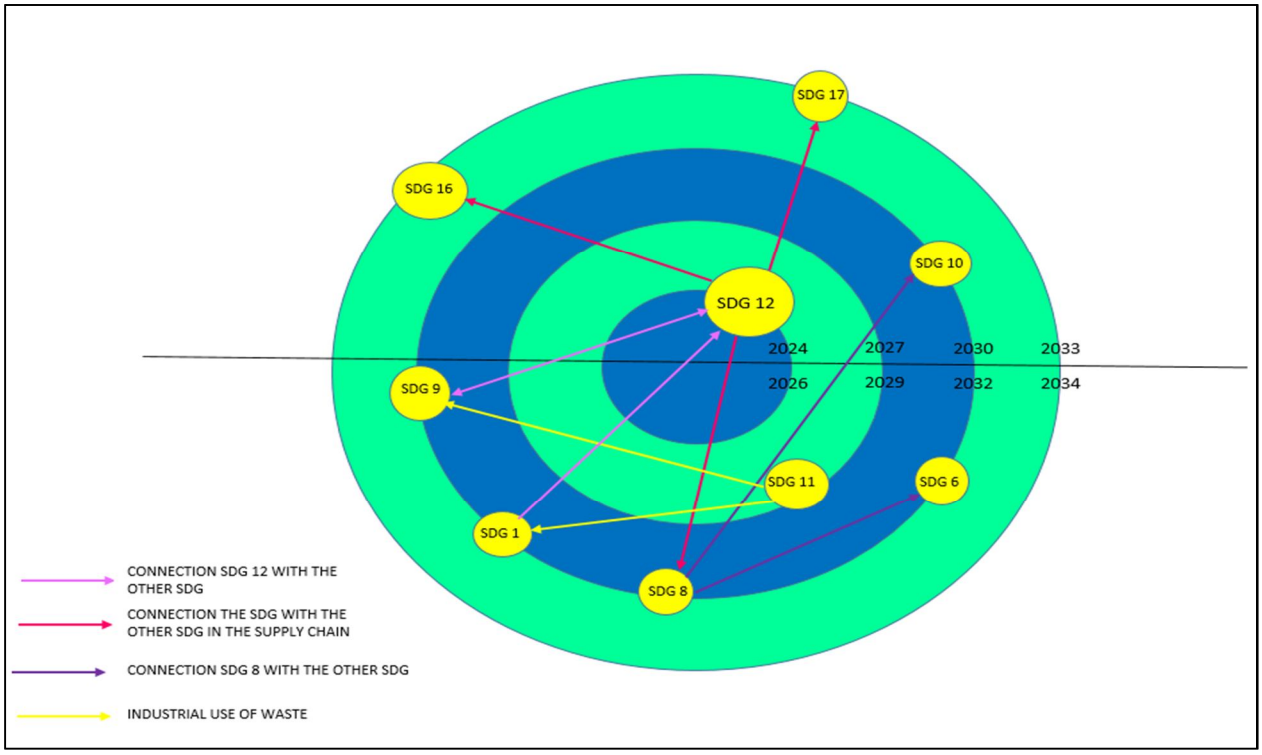


Fig. -6: Own creation; Lucid. App

The projection at the social level is represented in the following graphic fig. -7:

MAPPING N°5: MAPPING N°2, PROJECTED SOCIAL LEVEL IN 10 YEARS

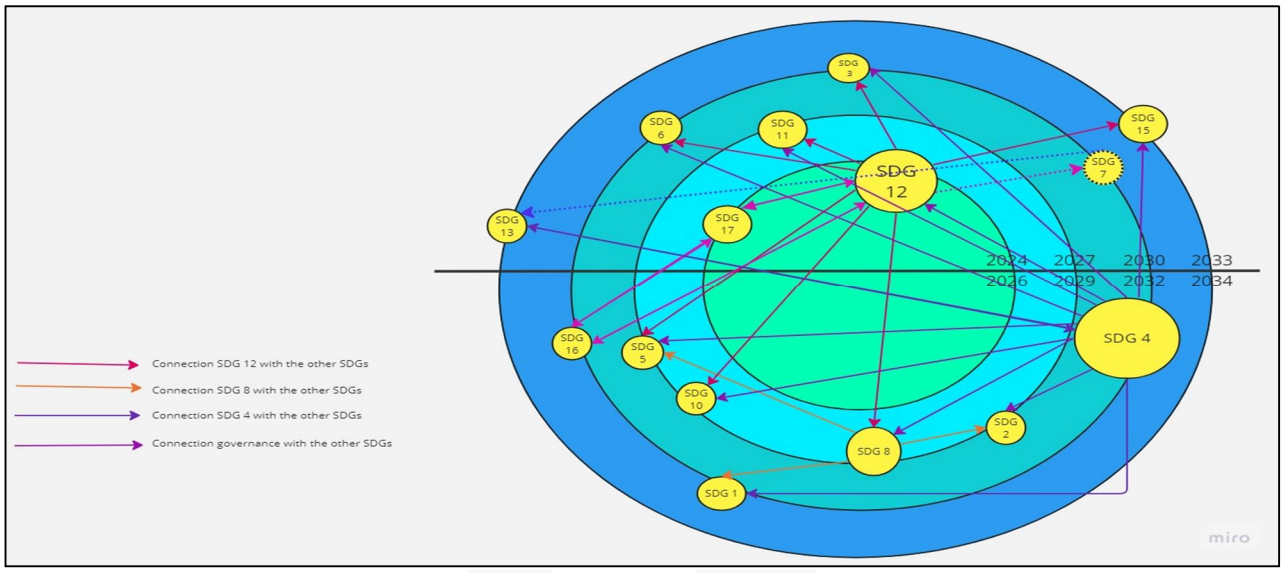


Fig. -7: Own creation Miro. App

In the following mapping fig. -8, it is observed how compliance with the SDGs projected in 10 years can be achieved. The most relevant SDG is number 4, quality education due to the nature of the Spin-Off based on technology in biotechnology.

MAPPING N°6: UNIFIED INDUSTRIAL AND SOCIAL LEVEL, PROJECTED FOR 10 YEARS

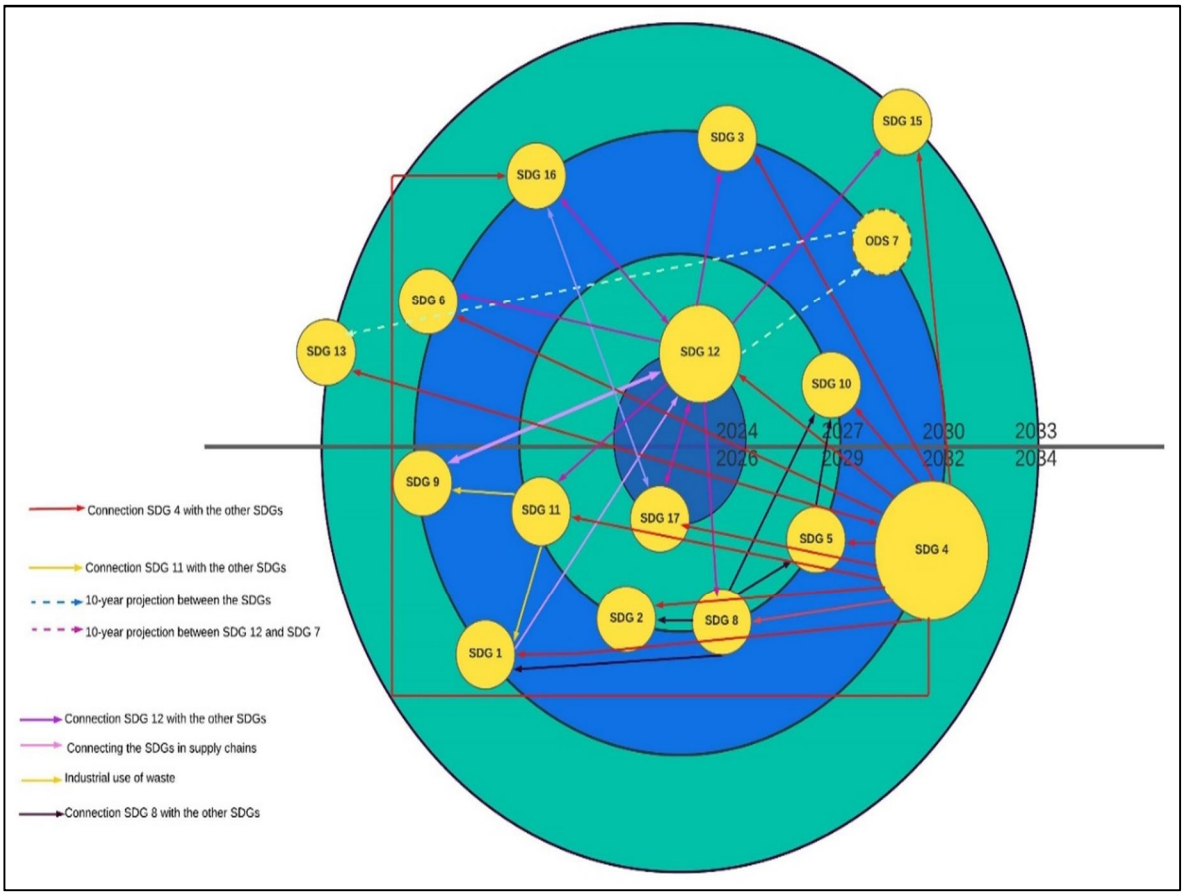


Fig. -8: Own creation; Lucid. App

IV. CONCLUSIONS

A strategic analysis was carried out to measure the impact of the Sustainable Development Goals on the "Biohogar R&D" Spin-Off, based on the future of the inter-institutional strategic alliance within the regions where the project will be developed. This mapping allowed us to project a vision of strategic planning integrated with the SDGs in a regional context; It was carried out by grouping the interactions between the SDGs, taking as reference a timeline with a 10-year projection for the levels (industrial/productive level and social level), which link to the Spin-Off. Likewise, the analysis and unification of the connection of the Sustainable Development Goals at the two levels involved was designed, demonstrating the impact of each of them on the specific areas and processes to be worked on. It was possible to see which SDGs are the most relevant and which could be addressed immediately, in the medium and long term.

Management and performance indicators were defined, laying the foundations that will allow the "decision maker" to take action measures aimed at measuring, evaluating and adjusting activities both in the present and in the future, when required, said decisions should be correct. to focus on opportunities for improvement and achieve the goals established in the selection of criteria. The parameters used were based on a before and after the arrival of the company to the sub regions, a sample number of heads of family was set at 10 initially and 40 projected in a short time.

A dashboard was designed for the KPIs associated with the SDGs, the quantitative parameters they have in the Spin-Off were associated. This prior diagnosis allowed us to obtain a real image of what happens inside and outside Biohogar R&D from a general point of view, the alignment between objectives and indicators carries representative and sufficient information to carry out the appropriate measurement of each of the 17 sustainable development goals.

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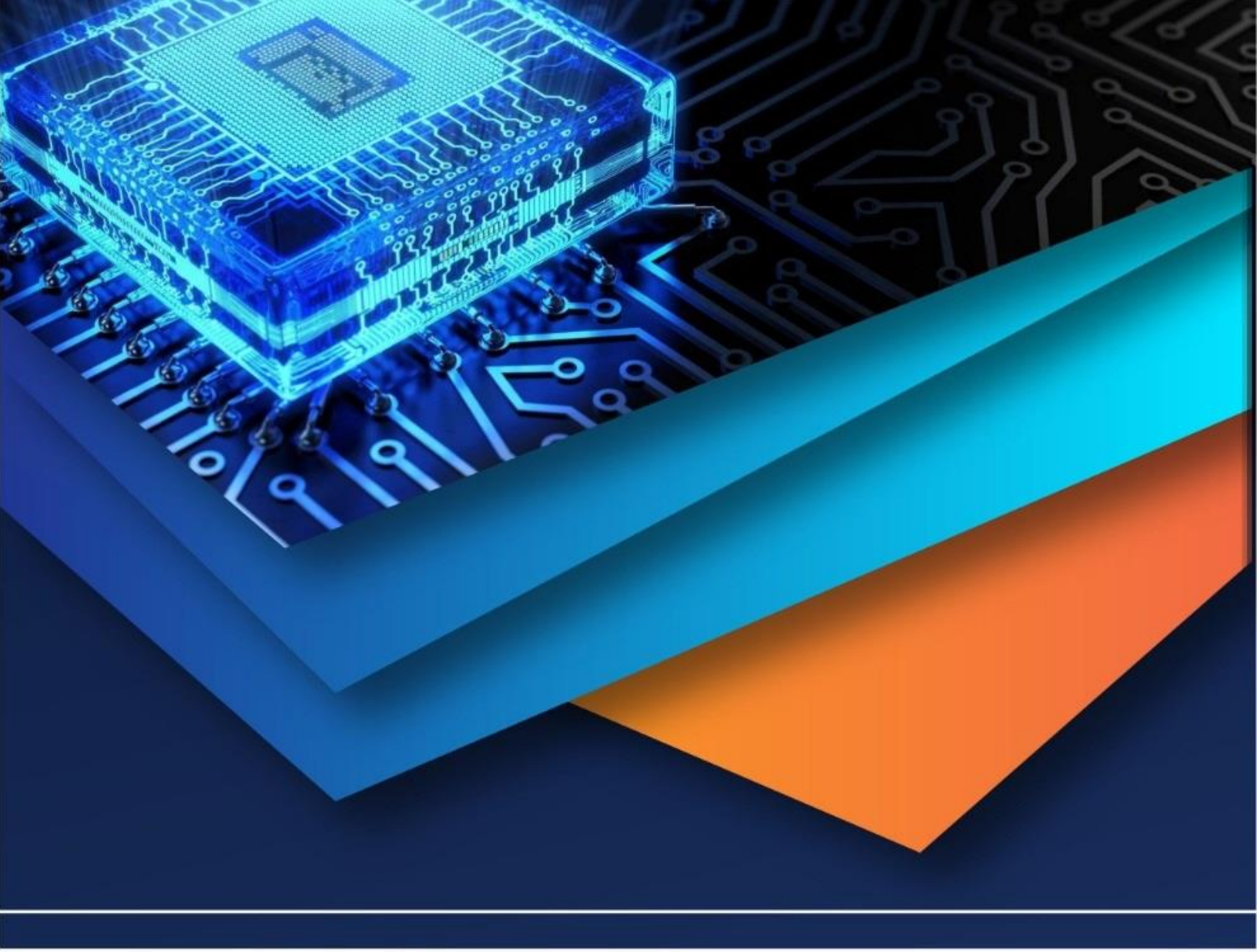
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