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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19

Ejes de un modelo multidisciplinar de innovación sostenible: Transición de vida después del COVID-19

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Abstract

In the post COVID-19 era, the current sustainability model should be adjusted to the current life transition considering the lessons learned in this atypical era. The current sustainability model, which is composed of three axes: environment, economy, and society, seems insufficient. It should integrate the axes of health, from an environmental health perspective (not only anthropogenic), and legislation within a detailed analysis in the standardization towards a balanced trend in harmony with the environment. In addition, innovation is proposed as a transversal axis. Based on a detailed analysis of more than 400 published works on sustainability, this work proposes a new conceptual model centered on a multidisciplinary perspective, analyzing and integrating each of the proposed axes. This conceptual model represents a strategic correlation between each axis towards a sense of globalized benefit and an environmentally-friendly life transition, hence, respecting the health of the planet.

Keywords: Health; legalization; environment; economy; society; technological innovation.

Resumen

Ante la era post COVID-19, el actual modelo de sustentabilidad debe ajustarse a la transición de vida actual considerando las lecciones aprendidas en esta atípica era. El actual modelo de sustentabilidad, que se compone de tres ejes: medio ambiente, economía y sociedad, parece ser insuficiente. Se deben integrar los ejes de la salud, desde una perspectiva de salud ambiental (no solamente antropogénica), y la legislación dentro de un análisis detallado en la normalización hacia una tendencia balanceada en armonía con el entorno. Además, se propone considerar la innovación como un eje transversal. Con base en un análisis detallado de más de 400 trabajos publicados sobre la sustentabilidad, este trabajo propone un nuevo modelo conceptual centrado en una perspectiva multidisciplinar, analizando e integrando cada uno de los ejes propuestos. Este modelo conceptual representa una correlación estratégica entre cada eje hacia un sentido de beneficio globalizado y la transición del modo de vida en forma respetuosa con el medio ambiente y, por tanto, con la salud del planeta.

Palabras clave: Salud; legalización; medio ambiente; economía; sociedad; innovación tecnológica.

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Introduction

Today, humanity has faced environmental problems such as climate change, deforestation, pollution of natural resources, excessive waste generation, among others. Additionally, we are currently facing the COVID-19 Era. On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic (Ashford *et al.*, 2020; Sohrabi *et al.*, 2020). By November 19, COVID-19 had affected 213 countries, with more than 56 000 000 confirmed cases and more than 1 338 100 reported deaths worldwide (World Health, 2020). Undoubtedly, COVID-19 pandemic has changed many aspects of our lives. However, from a resilience perspective, one opportunity is to build on the collective knowledge that is being produced as we continue to combat the COVID-19 pandemic and respond swiftly to develop new research expertise in tackling grand challenges through sustainability models that envision its implementation and real application in this new life transition.

The sustainability model is essential, even more so in the COVID-19 Era. It should be strengthened and, above all, carried out with achievable goals. Despite the foresight that marked the Brundtland report (Brundtland *et al.*, 1987) and the emphasis of the 17 sustainable development goals (Horne *et al.*, 2020; Tsalis *et al.*, 2020), which span a range of environmental, social and economic areas, even in this COVID-19 Era, economic growth and urbanization continue at a global level. This occurs at the expense of the environment with the costs and benefits of development unevenly distributed (Lim, 2020; Richardson & Erdelen, 2020).

With the pressing challenge of sustainability, there is a growing focus on how to generate sustainability models with a multidisciplinary and applicable profile, integrated with technologies that could provide potential solutions to sustainability challenges. The integration of a sustainable model allows us to focus on organizational systems, because organizations with a networked structure are more responsive, agile, and resilient in the face of adversity (Ferrannini *et al.*, 2020; Obrenovic *et al.*, 2020); consequently, they will more likely achieve sustainability. In parallel, organizations managed with an integrated sustainable model that involves a shorter and more diversified supply chain are more likely to sustain their operations during the pandemic (Ivanov, 2020). It is essential that developing countries find innovative multidisciplinary mechanisms to achieve sustainable development objectives in a cost-effective manner (Ashford *et al.*, 2020; Barreiro-Gen *et al.*, 2020; Jones & Comfort, 2020; Moreno-Serna *et al.*, 2020). This requires identifying standards or policies that can lead to immediate integrated progress towards several goals and aligning economic incentives for sustainable development in the medium and long term.

Given the new times marked by the COVID-19, this study offers a new model of sustainability integrated by five main axes: health, legalization, environment, economy, and society, and it includes technological innovation as a transversal axis. It is worth mentioning that the current model only involves the environment-society-economy axes (figure 1) (Halla & Binder, 2020; World Commission on, 1987).

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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

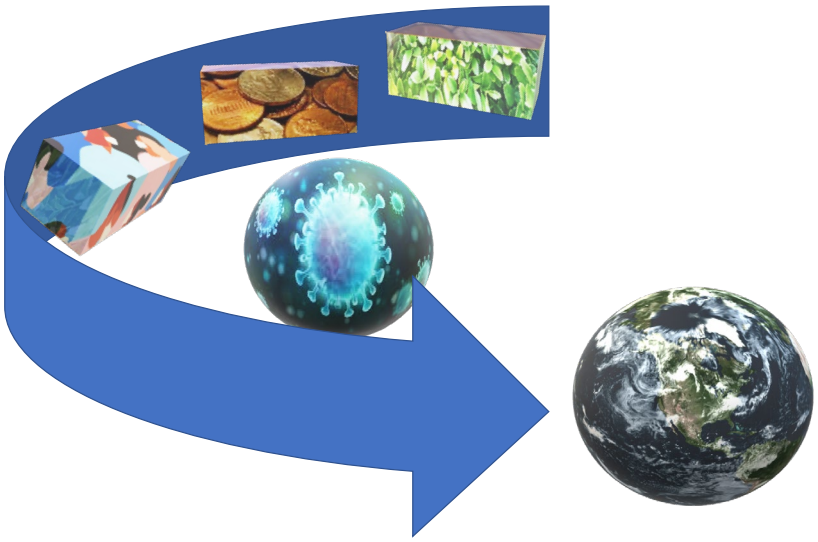

Figure 1. Graphical representation of the traditional model of sustainability, where only the environment, economy and society interact in front of COVID-19
Source: Authors' own elaboration using Paint 3D Software 5.1809.1017.0.

Methods

First stage

The bibliographic search was carried out through the digital platform revistas.ugto.mx, which provides access to more than 50 editorial platforms such as Elsevier, Emerald, PubMed, Springer, Web Science, Wiley, among others. The database consulted covered from 1987 to 2020. The keywords used for the search were sustainability, environment, society, economy, innovation, environmental health, legislation, sustainable models, and COVID-19. The database was integrated into the bibliographic database by EndNote (EndNote online version, Web of Science). Approximately, 480 publications were reviewed and analyzed.

Second Stage

With the obtained database comprising 480 publications through EndNote online, a bibliometric map was constructed using the VOS viewer software (version 1.6.7). The network produced shows the keyword elements and their correlation. The incidence of similar publications with models or concepts of sustainability in correlation with the COVID-19 Era was analyzed in detail through the bibliometric map.

Third Stage

Based on the results obtained during the conceptual analysis of several concepts and models of sustainability and their correlation with the COVID-19 Era, the structuring of the proposal of a conceptual model of sustainability from a multidisciplinary perspective was carried out. For the analysis of the proposal, the topics related to each proposed axis were selected, described, and integrated: society, environment, economy, environmental health, and legalization, as well as innovation as a transversal axis.

ISSN online 2007-9621
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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

Results and Discussion

First stage: Precedents of the concept of sustainability

In the face of the atypical times that humanity has lived during the COVID-19 Era, the concept of sustainability has grown towards multidisciplinary integration. The use of different terms leads to challenges in finding literature on sustainability. These definitional challenges have likely arisen because multiple disciplines address similar problems. Some researchers define sustainability as an environmental concept, while others define it based on definitions borrowed from the Brundtland Commission (table 1) (Brundtland et al., 1987; Karadag et al., 2014; World Commission on, 1987). Although research on sustainability published in the literature has expanded significantly, in recent years, the term *sustainability* has all but lost its meaning. Understanding sustainability is one of the significant implementations of science challenges. It seems to have become the buzzword of our time. However, most implementation studies do not present a definition for sustainability, even when assessing it (Ben-Eli, 2018; Moore *et al.*, 2017). Given the experience that humanity has gained due to the COVID-19 pandemic, the concept of sustainability in its entirety must be understood and structured (Barreiro-Gen *et al.*, 2020; De Las Heras *et al.*, 2020; Hakovirta & Denuwara, 2020; Korhonen & Granberg, 2020; Obrenovic *et al.*, 2020). Several works have reported the concept of sustainability from the perspective of various years (table 1) (Aarons *et al.*, 2011; Brundtland *et al.*, 1987; de Burgh-Woodman & King, 2013; Elkington, 1994; Geissdoerfer *et al.*, 2017; Greenhalgh *et al.*, 2004; Gruen *et al.*, 2008; Hakovirta & Denuwara, 2020; Hult, 2011; Ivanov, 2020; Newman *et al.*, 2012; Olsen, 2014; Pan & Zhang, 2020; Roostaie *et al.*, 2019; Stirman *et al.*, 2012; Varadarajan, 2015; Volschenk *et al.*, 2016).

Table 1. The concept of sustainability from a multi-year perspective.

Year	Definitions	References
1987	Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.	(Brundtland *et al.*, 1987)
1994	Sustainability is the interlinking pillars of the triple bottom line: economics, environment, and society (also known as people, planet, and profits).	(Elkington, 1994)
2004	Sustainability of organizational innovations can be thought of as the point at which new ways of working become the norm, and the underlying systems and ways of working are transformed in support.	(Greenhalgh *et al.*, 2004)
2008	"The simplest definition of sustainability is the 'capability of being maintained at a certain rate or level'".	(Gruen *et al.*, 2008)
2011	We use the term sustainment to denote the continued use of an innovation in practice.	(Aarons *et al.*, 2011)
2011	Market-focused sustainability can be a strategic resource that leads to competitive advantage for the organization and, ultimately, to superior performance.	(Hult, 2011)
2012	1. Whether, and to what extent, the core elements (the elements most closely associated with desired health benefits) are maintained. 2. The extent to which desired health benefits are maintained and improved upon over time after initial funding or supports have been withdrawn. 3. The extent, nature, and impact of modifications to the core and adaptable/peripheral elements of the program or innovation. 4. Continued capacity to function at the required level to maintain the desired benefits.	(Stirman *et al.*, 2012)

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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

2012	Sustainability is achieved when all people on Earth can live well without compromising the quality of life for future generations	(Newman *et al.*, 2012)
2013	Sustainable consumption is the idea of ethical consumption, anti-corporatism, and green responsibility.	(de Burgh-Woodman & King, 2013)
2014	Commitment to the well-being of the economy, society, and environment; looking at CSR-related initiatives that highlight commitment to the environment and the related effects.	(Olsen)
2015	Sustainable innovation is a firm's implementation of a new product, process, or practice, or modification of an existing product, process, or practice that significantly reduces the impact of the firm's activities on the natural environment.	(Varadarajan, 2015)
2016	Sustainability is where companies collaborate with their competitors to reduce harmful environmental impact or to create environmental value.	(Volschenk *et al.*, 2016)
2017	Sustainability is the balanced integration of economic performance, social inclusiveness, and environmental resilience to the benefit of current and future generations.	(Geissdoerfer *et al.*, 2017)
2018	Sustainable marketing is the strategic creation, communication, delivery, and exchange of offerings that produce value through consumption behaviors, business practices, and the marketplace, while lowering harm to the environment and ethically and equitably increasing the quality of life (QOL) and well-being of consumers and global stakeholders, presently and for future generations.	(Lunde, 2018)
2019	Sustainability is the perspective of level three assessment frameworks, provide comprehensive coverage of environmental, economic, social and use a mix of objective and subjective data.	(Roostaie *et al.*, 2019)
2020	Digital sustainability is the convergence of digital and sustainability imperatives that involves a transdisciplinary approach of deploying digital technologies in tackling sustainability issues.	(Pan & Zhang, 2020)
2020	Sustainability is the capacity linked to survivability and offers a viable supply chain framework within ecosystems.	(Ivanov, 2020)
2021	Sustainability, as the dynamic balance between humanity and its respectful interaction with all beings on the planet and its surroundings, focused on five main axes: environment, society, economy, environmental health, legislation, and innovation as a transversal axis.	This study

Source: Authors' own elaboration.

For example, Moore *et al.* (2017) conducted a search for knowledge syntheses of sustainability in healthcare interventions using the validated search filter for reviews in PubMed Clinical Queries. The authors based on over 200 studies to identify 24 existing definitions of sustainability. Within their results they identified five key sustainability constructs (Moore et al., 2017):

1) A defined period of time

2) A strategic implementation programs

3) An individual behavior change

4) A programme for human adaptation to contingencies

ISSN online 2007-9621

5) Benefits for individuals or systems

Towards a commercialization approach, Lunde (2018) analyzed the concept of sustainability and commercialization. This systematic review examined 228 articles published in the top 25 marketing journals over the past 20 years (1997–2016). The review analyzes the most used theories and models to form five sustainability principles that ground sustainability in marketing research: the green framework of sustainable marketing.

In the present work, a new, holistic definition of sustainability in marketing is proposed: Sustainable marketing is the strategic creation, communication, delivery, and exchange of offerings that produce value through consumption behaviors, business practices, and the marketplace, while lowering harm to the environment and ethically and equitably increasing the quality of life and well-being of consumers and global stakeholders, presently and for future generations.

Some works have mentioned that sustainability encompasses the context of the whole planet, the integrity and health of its biosphere, and the future wellbeing of humanity. The goal of establishing the concept of sustainability as the organizing principle on the planet should be to foster a well-functioning alignment between individuals, the society, the economy, and the regenerative capacity of our planet's life-supporting ecosystems (Barbier & Burgess, 2020; Ben-Eli, 2018; Cheval *et al.*, 2020; Pan & Zhang, 2020; Panda *et al.*, 2020; Pramanik *et al.*, 2020).

Within the socioeconomic perspectives, before the COVID-19 pandemic, Ferrannini *et al.* (2020) have analyzed a new integrated analytical framework on industrial policy to steer a sustainable structural change of the economies and societies towards sustainable human development, by identifying preliminary implications on industrial policy governance and implementation, investing in the accurate and transparent design of industrial policy in the post-COVID19 Era. This paper argues that industrial policy should serve as a technical and political intervention to redesign future societies, favoring and governing a structural transformation focused on industry, economy, and society. Therefore, it implies a new understanding of the multiple inter-linkages and feedbacks among industrial policy economics, political economy, and management, shaping its governance mechanisms and implementation processes.

In the same context, other works identified three policies applied before the Era of COVID-19: 1) Financing investments in clean energy and the dissemination of renewable energy in rural areas; 2) Reassigning irrigation subsidies to improve water supply, treatment, and sanitation infrastructure; and 3) A tax on fossil fuels for natural climate solutions. In this manner, developing countries can foster greater progress towards achieving the Sustainable Development Goals through cost-effective and innovative policy mechanisms that do not rely on external funding to be implemented (Barbier & Burgess, 2020).

Towards an information systems approach, (Pan & Zhang, 2020) propose opportunities to conduct responsibly from the six themes: 1) Expanding digital surveillance, 2) Tackling the infodemic, 3) Orchestrating data ecosystems, 4) Adapting information behaviors, 5) Developing the digital workplace, and 6) Maintaining social distancing, in which Pan and Zhang identified technology, information and data issues that could help solve challenges in these areas.

In a resilience approach, Zabaniotou's (2020) paper examined conceptual frameworks and mapping methodologies to structure the discourse focused on the role of leadership and empowerment, based on a transdisciplinary integrator and solidarity facilitator of adaptation, mitigation and decision making in the moment of uncertainty and anxiety created by the COVID-19 pandemic. This study argues that society should go beyond the control of the risk approach in planning and implementing strategies to cope with

hazards. It mentions that a systemic approach to resilience and ecological sustainability is needed to improve humanity. It also points out that a well-informed and self-motivated population is often more resilient and more effective than a forcibly democratized and ignorant population. To achieve this level of compliance and cooperation, people need to trust health care systems, authorities, and leaders.

Second Stage: COVID-19 and sustainability conceptual models

In correlation with the COVID-19 Era, and based on the analysis of more than 400 manuscripts (figure 2), in this work sustainability is defined as the dynamic equilibrium between humanity and its respectful interaction with all beings on the planet and its environment in which human population develops economically and with a commitment to universal values, generating and ensuring the welfare of environmental health for future generations of all living beings on the planet, without producing irreversible adverse effects and involving responsible analysis to avoid actions that expose the risk of biotic and abiotic security of our planet. To generate the new proposal of the Sustainable Innovation Conceptual Model for the COVID-19 Pandemic, we based on the analysis of the new concept generated.

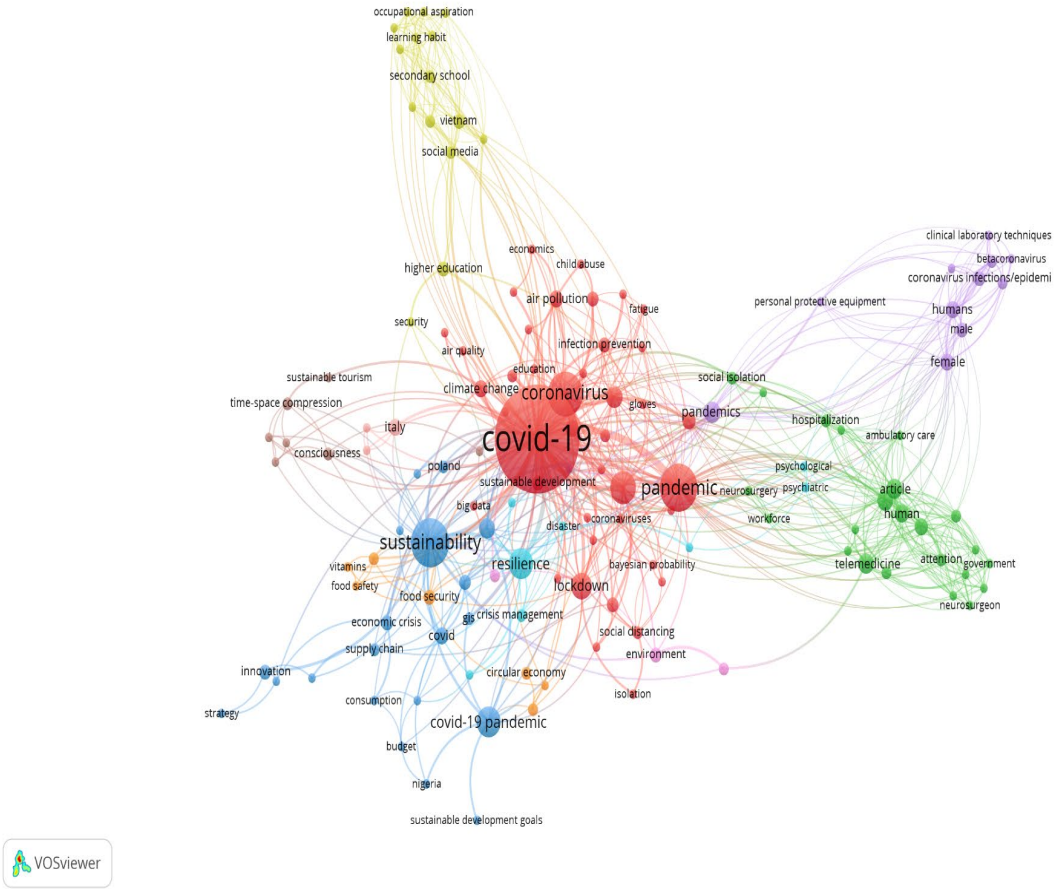

Figure 2. Relationship of publications between the COVID-19 theme and sustainability.
Source: Authors' own elaboration using software VOS viewer version 1.6.15.

ISSN online 2007-9621

Dynamic equilibrium. From various perspectives, dynamic equilibrium is an operational condition within a system (Ben-Eli, 2018; Binder et al., 2020; La Torre et al.; van Barneveld et al., 2020; Wolff, 2020; Zabaniotou, 2020). Under this context, by building the model that encompasses sustainability, we took the broader aspect of general system theory: cybernetics.

Cybernetics theories focus on questions about how systems regulate themselves, how they adapt and evolve, how they self-organize and, more specifically, what the structures and mechanisms are that mediate their operation, performance, and conduct. Therefore, the sustainability model can be considered as a state of the system, mediated by specific internal structures. These structures can help to analyze and utilize mechanisms needed to produce effective change with the desired results. Hence, the sustainability model should be structured from the balance associated with the whole planet, the health of its biosphere, and the future wellbeing of humanity, towards an integration that involves a process of continuous creation; producing, as the process unfolds, a state of dynamic equilibrium between all parties. In this COVID-19 Era, we are experiencing imbalance because of the lack of our respectful coexistence with the environment, derived from the excessive increase in the needs of human population and the intensification of anthropogenic activity.

Economic development and universal values. The economic sphere is fundamental in the sustainability model, since it provides a framework to define, create and manage wealth. However, it is important to always carry out an analysis of the components that encompass costs in relation to the impacts of resource depletion and the pollution it generates. Inadequate measures, and the regulations and subsidies that often accompany them, drive markets and continue to fuel adverse effects on people and ecosystems. Adopting an appropriate economic system must be aligned with the planet's ecological processes and reflect true and comprehensive biosphere pricing to guide the economy. The relationship of the economic aspect sets up new companies with a multidisciplinary vision, where econonomy develops and trains the community of the company but assuming social responsibility based on universal values, in such a way that it gives rise to a strategic-synergistic benefit that will project its economic future.

Environmental health. In these times of COVID-19, humanity has learned to value, even more, the importance of having health. However, it is not enough to focus on human egocentrism. From a systematic perspective, the health of our planet, along with all living beings, is of fundamental attention and great importance. Therefore, the current model of sustainability should include as the main axis *health*, in its entirety. Ensuring that this process is accessible and transparent to all living beings on the planet is crucial in terms of sustainability. Several works have implied from various perspectives the rise of environmental health. Behnke *et al.* (2020) conducted a systematic scoping review of environmental conditions, exposures, and outcomes in protracted displacement settings, obstacles to improvement in environmental health services. The data were extracted on environmental health topics, including water, sanitation, hygiene, overcrowding, waste management, energy supply, vector control, menstrual hygiene, air quality, and food safety. With global population growth and the impacts of climate change, human mobility is likely to become more frequent, and the likelihood of crises becoming protracted will remain high. Adequate environmental health services are critical for human health, dignity, and human rights, but we find that environmental health conditions in protracted displacement are often poor. Therefore, these conditions can provide the spread of communicable disease, foster environmental hazards, and lead to harmful health and livelihood outcomes.

Innovation. COVID-19 is accelerating innovation design. Accordingly, in this era of transition, the development and application of technological innovation is a fundamental cross-cutting issue within the sustainability model. From a multidisciplinary perspective, and given this COVID-19 Era, innovation and

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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

the application of emerging technologies is fundamental for the transition to sustainable living that is already required. Every proposal or project should integrate innovation and the characteristics of sustainability. Some work has focused on developing a framework for constructive sustainability assessment that enables the application of sustainability assessments in emerging technologies as part of a broader approach (Matthews *et al.*, 2019). Linking the concept of responsible research and innovation is the aspiration for innovations and technological change to be directed towards tackling societal grand challenges, including the pressing need for a transition to a more sustainable society (Von Schomberg, 2013).

The importance of innovation lies on emerging technologies to yield broadly distributed public goods as well as to tackle grand challenges within technological R+D+i project to foster responsible innovation; therefore, it should be analyzed the level of self-awareness within the institutions, governance structures and actors involved in scientific developments, including being open-minded to one's own assumptions and framings (Stilgoe et al., 2013). In this same context, anticipation is a process of capacity building through the generation of lived experiences that leads, as best as possible, to the transition of the way of living with a sustainable future vision.

Following this same context, human society has had to resort to the use of technologies to satisfy its needs or to carry out economic development within its own welfare. But when did technological development and implementation start? how did it turn towards a social responsibility approach? In this COVID-19 Era, what is the trend? The formal elaboration of technology assessment arose in the second half of the 20th century, aiming to reduce the costs of trial-and-error learning by anticipating potential social and technical problems associated with emerging technologies (Rip & Misa, 1996). It was not until the 80s and 90s that constructive technology assessment emerged with the aim to inform decision-making surrounding technologies by anticipating impacts while taking a constructive approach, facilitating societal alignment of emerging technologies. Another characteristic is that it focuses on analyzing the differences between technological agents and society, providing interactive workshops and other events that can provide spaces for anticipation and reflexivity (Rip, 2018). The aim in this case is that these events can help reduce the uncertainties around the technology impacts and generate clear responses to society. Finally, innovation should be linked to thinking and development of anticipation, since it is a process of capacity building through the generation of sustainable technological visions with real applications.

Third Stage: Towards a constructive sustainability conceptual model

Figure 2 represents the proposed new model. Based on a multi-disciplinary approach, this model integrates five axes that structure sustainability, and as a transversal axis it considers innovation within the framework of Research + Development + Innovation (R+D+I). It is important to point out that this is the first time a document integrates innovation as a transversal axis within a sustainability model.

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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

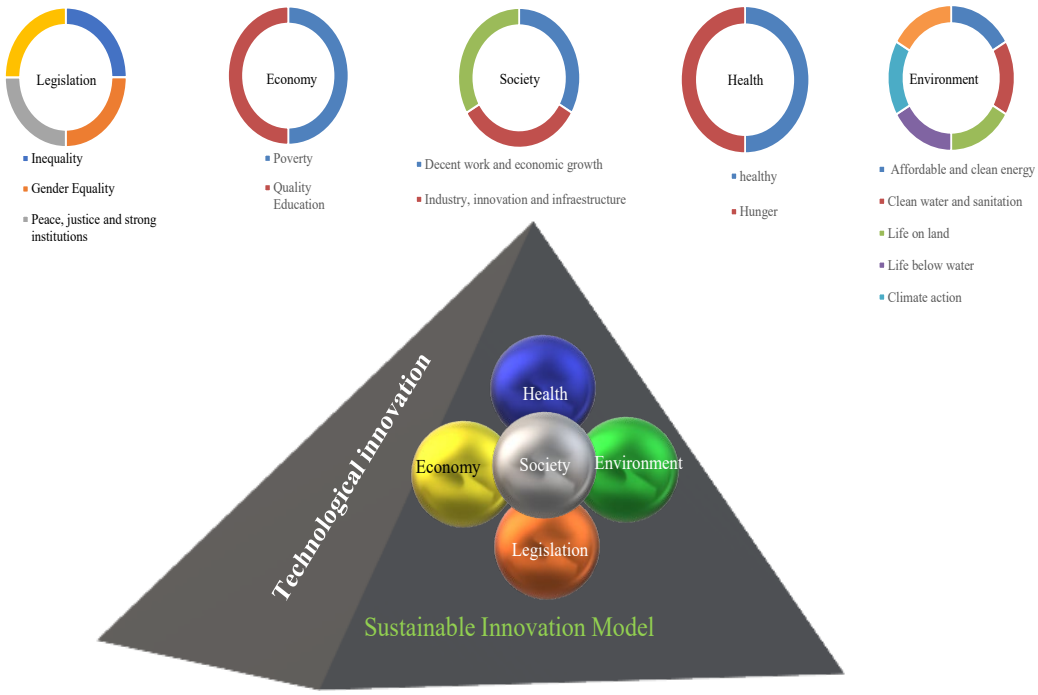

Figure 3. The conceptual model of sustainability in a Post COVID-19 Era, based on a multidisciplinary approach.
Note: At present, the concept of the sustainable model must incorporate the axes of (environmental) health and legislation added to the previous model of society-environment-economy, having innovation as a transversal axis. This represents the transition to a new way of life that humanity faces in its wide environment.
Source: Authors' own elaboration using Paint 3D Software 5.1809.1017.0.

The challenges that society faces in this COVID-19 Era mark a transition in the way of living. The sustainability challenges faced by society fundamentally span social, environmental, political, or legal fields; especially in the field of health. From a multidisciplinary perspective, human wellbeing is a question that requires a societal response. Therefore, the sustainability model requires the integration of social science and natural science theories and practices, engaging activities alongside analytical assessments; that is, human society must analyze its way of life. All Anthropogenic activities must be directed towards achieving a sustainable profile. Resilience has led to the real analysis of the very existence of human society about its environment. Humanity must be respectful with every being on the planet and understand the great impact it generates in overexploiting natural resources for their excessive demands. Society must learn and understand the emerging technologies of innovation and through digital platforms or tools direct the search for solutions that each person could contribute with and develop. In this way, the economy itself will be favored, which could well be analyzed towards an environment of hegemony based on our norms or laws applied fairly and impartially. In parallel, we cannot leave our universal values behind. Solidarity and teamwork can be values of opportunity in the COVID-19 Era, which through international communication via the Internet offers a range of contribution through workshops, forums, seminars, among others, that can unite and feedback. Following this same context, society itself, when being respectful with the environment (entirely), generates environmental health and consequently human health.

In the face of this lifestyle transition, environmental health plays an important role. Within the sustainability model, health must be related to all living beings, advance knowledge towards innovation applications and promote human health benefits in an environmentally sustainable way. Therefore,

integrating environmental health must be related to all axes comprised in the model. In the field of legislation, sustainable laws must include real and achievable standards for society in terms of environmental health. In several countries, there are no regulations that require respect for nature. And the implication of environmental health is unknown. It should be valued and understood that human health is totally linked to environmental health. For example, it is well known that natural resources polluted with high levels of contaminants will cause severe toxicity problems, which will impact human health in the short or medium term. Legislation must emphasize through regulations the preventive measures under the analysis that environmental health entails.

In this globalized and resilient world, in the face of the COVID-19 Era, integrating environmental health into the model of sustainability leads and links humans to the economy. A healthy population and environment generate more productivity. The economy is, perhaps, one of the axes where more attention is required. We have fallen into a capitalist hegemony focused on excessive consumerism that breaks the balance of environmental health itself. The sustainable economy is directed toward activities that contribute to a reasonable, healthy, and socially-beneficial consumption of natural resources. Thus, consuming local products and producing, to the best of our ability, our own products lead to a better balance of the economy for most of the population, not only for a few.

Within the development of technological innovation, the generation of emerging technologies can be focused from origin to domestic application. The sustainable use of the organic fraction from urban solid waste can be used as raw material to obtain compost, generate urban gardens, and even generate domestic biofuels. This provides a wide range of opportunities among "n" activities that can be created and innovated. This model, represented by five integrated axes linked to the transversal axis of technological innovation, offers a guideline to sustainability.

However, it is worth mentioning that this model highlights of the importance of universal values. To carry out this universal concept, human society must always bear in mind each one of the universal values outlined, and it must characterize the human essence. To carry out sustainable activities, respect for all living beings and our entire environment must always prevail to strengthen environmental health. Honesty and justice lead to good actions and law enforcement. Solidarity, responsibility, and teamwork will lead to an economic balance. In this era of COVID-19, generating and promoting a balanced and sustainable society can lead to a life transition of the desired peace.

Strategic correlation between each axis and the conceptual model

Innovation is the transverse axis of great importance in the strategic correlation of each axis. Focusing on this new transition of life, the integration of the five proposed axes (environment, economy, society, health, and legislation) must entail, in a certain obligatory way, searching, creating, and innovating; with the purpose of developing and applying new trends in our way of life; in such a way that future problems can be foreseen, and at the same time current problems can be addressed.

The justification is that the planet must be healthy in order to develop wellbeing focused on anthropogenic activities in respectful harmony with the environment and other living beings, in addition to promoting socio-economic wellbeing regulated by environmental standards that lead to real sustainability. Therefore, the following strategies are proposed in correlation with Environmental Health and Innovation (figure 4).

ISSN online 2007-9621
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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

Current analysis of society: Anthropogenic way of life

This new atypical, globalized experience has allowed us to reflect on our old way of living. Exaggerated consumerism has led to dependence on the production system, over-serving one's own needs and, thus, unbalancing environmental health. This new transition invites to reduce consumption and consume more consciously. There will only be sustainability when everyone is sustainable, when society changes the paradigm of unbridled consumption for a sustainable society. The goal should be a paradigm shift. Innovation plays an extremely important role. The sustainable use of household waste generated daily is an example of making a change and contributing to environmental health. The traditional transformation of the organic fraction of municipal solid waste (MSW) into compost is well known, and so is generating organic home gardens or even producing our own biofuels. Innovation in the reuse or recycling of MSW, with proper separation, characterization, and management can be redirected to a field of utility that goes from the domestic to the industrial sectors, with the production of high value-added products. The sum of several activities of this nature generates the real transformation of a sustainable life and, with it, wellbeing of health in all its gamma. In the same context, the management and responsible use of water is another of today's hot topics. While in the COVID-19 Era home confinement has contributed to the improvement of air quality, excessive water use continues to increase considerably.

The zero day is more accentuated in every point of the planet. It is our responsibility to change the bad habit of excessive use of water sources. The challenge is titanic. However, the monitoring and creation of innovative technologies help to make better use of this vital fluid, for example, the incorporation of domestic appliances or equipment in the industrial sector involving green technology systems in water saving. Therefore, it is necessary to promote innovative programs such as water cultivation (rainwater harvesting), domestic hydroponic gardens, use and efficiency in wastewater treatment for transformation into energy, among others. In addition, there are several productive sector activities, such as mining, that use large amounts of water. Therefore, they must implement sustainable innovation technologies to reduce water use efficiency by at least 50%. Several sectors have applied good water management and use. However, this is not enough if the environmental education of society is deficient. Humanity is facing new eras, so it is essential to work on environmental education from early stages. Beyond breaking the anthropogenic health, lack of respect for the environment with all the natural resources necessary for life can undoubtedly jeopardize the environmental health of the entire planet and, thus, cause its extinction.

Evaluation of education at all levels

Speaking strictly in a pedagogical sense, at all educational levels in this new COVID-19 Era, the trend towards education and outdoor activities, indispensable in educational training, has had to be modified, rethought and innovated to transmit knowledge, especially in field work activities. The alternative of innovation has been sought towards virtual field work with the support of digital platforms or tools. For many, it is a new learning discovery. However, on a real practical level, things in this virtual learning world do not meet all goals or expectations. Skills, knowledge, and experience must be real life learning. Therefore, new measures must be rethought collectively, considering the new guidelines previously and carefully elaborated for the new way of life.

Integration of innovation in the creation of sustainable cities

Sustainable cities are an indispensable requirement nowadays. In fact, that is part of the 11 primary objectives contained in the 2030 Agenda. Several countries have managed to take this challenging goal and continue with the maintenance and growing follow-up throughout its concept. One of the main objectives of sustainable cities is to generate and promote environmental health. Good resource management, MSW management, and good practices that contribute to socio-economic development, along with specific laws regulating anthropogenic and environmental wellbeing, are key strategies to understand the changes

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Axes of a multidisciplinary model for sustainable innovation: Life transition after COVID-19 | 1-17

towards a new post-COVID Era, a new way of life. Sustainable cities cannot be solved by individual organizations alone. Governance and standards must look at actual management to address such complex problems, including policy change and the adoption of innovations, which will require purposeful and integrated collaboration by society. This will be reflected in programs and projects that involve the integration of the five axes of the proposed conceptual model, as well as innovation applied to natural resources to promote environmental health. Published work has compared water-related innovations in large cities in Australia, the Netherlands, and the United States, where government agencies, water utilities, professional organizations, and industry innovators are vital players, along with supportive community education (van de Meene *et al.*, 2020). In the initiation phase of innovation, sustainable innovation advocates used informal networks to leverage support. As pilot projects emerged, more formal support processes and financial incentives were crucial. In the case of large projects and integration of pilot projects, the role of formal coordination and integration mechanisms was vital for a consistent and successful implementation. This research demonstrated the need to continually evaluate the innovation process to ensure that key ingredients are applied in a timely manner to strengthen the process and enable effective and purposeful collaboration.

Another paper mentions that, in order to develop smart and sustainable communities, cities must understand the potential of information technology to create and use knowledge to promote urban innovation, value creation, and learning opportunities (Romanelli, 2020). Future research perspectives imply the need to investigate how cities use technology in sustainable urban strategy and planning, based on both a smart and community-oriented vision as a future pathway for urban, inclusive, socially-responsible and human-driven growth.

Sustainable cities, as smart communities, must support the creation of knowledge and people (creativity, diversity, and education), develop smart governance and design smart policies to drive lasting urban development, reinvent the future and readapt new ways of living, with environmental health as a priority goal. Therefore, cooperation between people, businesses and organizations living in the city helps to rethink the design of the city as a sustainable community. The design should be based on fostering the transition from a smart city to a smart urban community, promoting sources of knowledge to continuously develop learning and innovation processes, so that society and humanity are as well prepared as possible for any contingency or atypical situation, such as the COVID-19 Era.

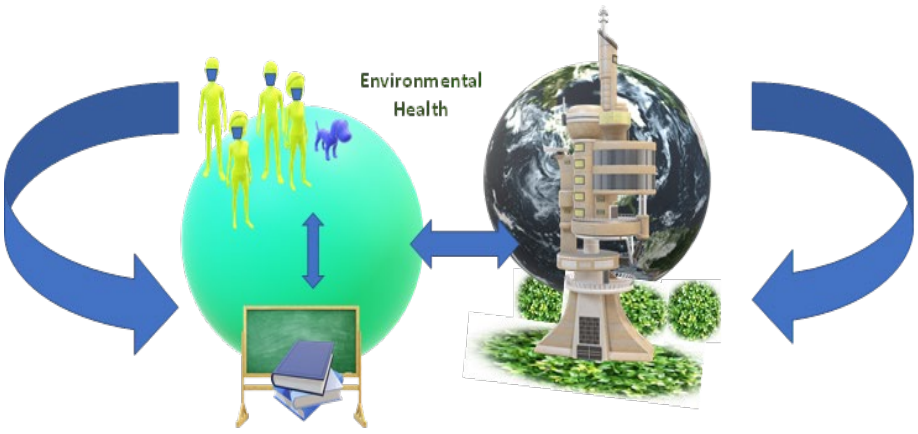

Figure 4. The transition of the way of life, environmental education, and the generation of sustainable cities, starting from environmental health as a central axis in correlation with the other four axes and innovation always presented as a transversal axis, provide a guideline to the strategic correlation between each axis and the sustainable conceptual model.
Source: Authors' own elaboration using Paint 3D Software 5.1809.1017.0.

Conclusion

The concept of sustainability, post COVID-19, should integrate two essential axes: Environmental Health and Legislation, and include innovation as a transversal axis.

In a post-COVID-19 era, in both developed and developing countries, a turning point has been reached in connecting sustainability, policy, environmental health, and innovation with the goal of safeguarding the well-being of all living beings. In the future, applied research is needed to implement the sustainability model linked to all its axes to explore the connection between achievable objectives, strategic goals, and effective tools. This would lead to a detailed, comparative, and approved analysis of a social policy for sustainable human development in a long-term perspective. In addition to analyzing multilevel governance mechanisms and policy coherence, it is advisable to delve deeper into policy-making mechanisms and institutional settings that favor the identification of a normative vision of society and a collective interest, as well as conflict management, transparency, and accountability. In the same way, it is important to assess the effect of the different tools of the sustainable model with respect to broader goals and challenges of society and its environment. The future is not yet written; however, this atypical era invites us to analyze our way of life, which must always be shaped by the model of sustainability. Therefore, human society must look for innovation strategies in its daily activities, in its way of life. We must reflect on how we can leave a sustainable planet for following generations. The strategy of correlating the axes that involve the conceptual model of sustainability proposed gives a guideline for a balanced and more conscious way of life, thus, changing the current paradigm.

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Conflicts of Interest

The authors declare no conflict of interest.

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