

FACULTAD DE INGENIERÍA

Escuela Académico Profesional de Ingeniería Ambiental

Tesis

Organizational Capabilities as a Determining Factor for Sustainability: Case Study of the Socio-Environmental Management of Covid - 19 in Per

Jeraldly Jeshely Lastra Céspedes
Danae Harumi Meza Hinostroza
Jorge Luis Ferrer Uribe

Para optar el Título Profesional de
Ingeniero Ambiental

Huancayo, 2025

Repositorio Institucional Continental
Tesis digital



Esta obra está bajo una Licencia "Creative Commons Atribución 4.0 Internacional" .

INFORME DE CONFORMIDAD DE ORIGINALIDAD DE TRABAJO DE INVESTIGACIÓN

A : Decano de la Facultad de Ingeniería
DE : Jorge Luis Ferrer Uribe
Asesor de trabajo de investigación
ASUNTO : Remito resultado de evaluación de originalidad de trabajo de investigación
FECHA : 4 de agosto de 2025

Con sumo agrado me dirijo a vuestro despacho para informar que, en mi condición de asesor del trabajo de investigación:

Título:

ORGANIZATIONAL CAPABILITIES AS A DETERMINING FACTOR FOR SUSTAINABILITY: CASE STUDY OF THE SOCIO-ENVIRONMENTAL MANAGEMENT OF COVID – 19 IN PERU

URL / DOI:

<https://doi.org/10.1051/e3sconf/202563404003>

Autores:

1. Jeraldy Jeshely Lastra Céspedes – EAP. Ingeniería Ambiental
2. Danae Harumi Meza Hinostroza – EAP. Ingeniería Ambiental
3. Jorge Luis Ferrer Uribe – EAP. Ingeniería Ambiental

Se procedió con la carga del documento a la plataforma "Turnitin" y se realizó la verificación completa de las coincidencias resaltadas por el software dando por resultado 8 % de similitud sin encontrarse hallazgos relacionados a plagio. Se utilizaron los siguientes filtros:

- | | | |
|--|--|-----------------------------|
| • Filtro de exclusión de bibliografía | SI ☒ | NO ☐ |
| • Filtro de exclusión de grupos de palabras menores
Nº de palabras excluidas (en caso de elegir "SI"): 10 | SI ☒ | NO ☐ |
| • Exclusión de fuente por trabajo anterior del mismo estudiante | SI ☒ | NO ☐ |

En consecuencia, se determina que el trabajo de investigación constituye un documento original al presentar similitud de otros autores (citas) por debajo del porcentaje establecido por la Universidad Continental.

Recae toda responsabilidad del contenido del trabajo de investigación sobre el autor y asesor, en concordancia a los principios expresados en el Reglamento del Registro Nacional de Trabajos conducentes a Grados y Títulos – RENATI y en la normativa de la Universidad Continental.

Atentamente,

La firma del asesor obra en el archivo original
(No se muestra en este documento por estar expuesto a publicación)

Organizational Capabilities as a Determining Factor for Sustainability: Case Study of the Socio-Environmental Management of Covid – 19 in Peru

Jeraldy Lastra¹, Danae Meza^{1*}, and Jorge Ferrer¹

¹Professional Academic School of Environmental Engineering Faculty, Universidad Continental, Huancayo, 12001, Peru

Abstract— Socio-environmental management becomes challenging in a period of uncertainty. On March 11, 2020, the Coronavirus was declared a global pandemic, forcing organizations to redesign their management strategies. Therefore, this article analyzed some measures to face the COVID-19 in Peru (the country with the highest mortality rate in the world) based on the design principles (characteristics of norms) and the principles of resilience (characteristics of adaptive strategies). It became evident that the measures taken by the government in charge were not appropriate, as they negatively affected the economy, the health system and accelerated the spread of the virus. This led to the weakening of organizational capabilities (skills and aptitudes to integrate technological knowledge and skills leading to a functional technical solution), moving us further away from the elusive perfect realization of sustainability. If design principles and resilience principles are properly implemented in a socio-ecological system, then organizational capabilities will bring us closer to sustainability, understanding that sustainability only makes sense if humanity continues to exist in an environment where its dignity is respected, that is, its collective participation.

Keywords— Organizational capabilities, socio-environmental management, sustainability, design principles, resilience principles.

1. Introduction

WHO [1] SARS – CoV-2 was first officially reported in Wuhan (China) on December 31, 2019. PAHO [2]. The World Health Organization (WHO) announced on March 11, 2020 that the new coronavirus disease was characterized as a pandemic. As the spread of COVID-19 accelerated throughout the world, public and private organizations had to redesign their strategies to meet human needs in the context of a slowdown in the world economy, and Peru was no exception. Cueto, S et al. [3] In Peru, governmental decisions were characterized by not considering scientific arguments to address the needs of the various socio-ecological systems (SES) that make up the country, which led to the failure of socio-environmental management.

* Corresponding author: 72371706@continental.edu.pe

SINIA [4] Peru is located in South America with a total area of 1'285,215.6 Km2, Table 1 highlights the three traditional geographic regions, with different geographical, socioeconomic and climatic characteristics: coast, highlands and Amazon basin. According to the National Institute of Statistics and Informatics (INEI) [5] In 2022, Peru reached a population of 33 million 700 thousand inhabitants and only the capital Lima (coast) concentrates almost a third of the country's total population.

Table No. 01: Differences between Peru’s regions.

Regions	GDP (2022)	ALTITUDE (masl)	POPULATION * (%)
Coast	S/. 661,844,636.00	0 – 1000	58
Highlands	S/. 162,934,604.00	1000 - 6768	28.1
Amazon basin	S/. 42,660,987.00	500 - 3000	13.9

*Data from the last national population census in 2017.
Source: Own elaboration based on SINIA – INEI (2022).

BCRP [6] The Gross Domestic Product (GDP) in Peru is derived mainly from the agricultural sector, fishing, metal mining, hydrocarbons and manufacturing.

Table No. 02: Economic indicators.

YEAR	2019	2021
MONETARY POVERTY PERCENTAGE	20.2 %	30 %*
GDP – NATIONAL	2.2%	1.3 %**
UNEMPLOYMENT / RATE	697.400 thousand (3.9%)	1 million 29 thousand (5.7%)
FORMAL EMPLOYMENT	27.3 %	23.2 %
INFORMAL EMPLOYMENT	72.7 %	76.8 %

*Percentage value as of March 2021.
**This percentage value is the difference between the GDP of 2021 and 2020.
Source: Own elaboration based on BCR – INEI (2019).

Regarding Table 2, INEI [7] The highest levels of poverty were recorded in 2021, especially in the rural highlands (44.3%) and in the rural Amazon basin (35.0%). UNICEF [8] In this context, Peruvian society and especially families in poverty were negatively impacted economically and health-wise in the period 2020 - 2021. Gonzales, G. [9] As of August 14, 2022, Peru had the highest mortality rate in the world (6888/million inhabitants).

Ostrom, E. [10] When public policies are imposed in a homogeneous manner without considering the singularities of the different socio-ecological systems (SES) that compose it, for example, the territory of a country, the result is large-scale collapse. In this situation, a large part of the population did not have optimal conditions to satisfy their basic needs, weakening their capacity for self-organization and moving them away from sustainability.

The objective of this article is to highlight the role of organizational capabilities as a determining factor in approaching the sustainability of an SES. For this purpose, some

design principles (characteristics of the norms or rules designed for the optimal use of resources) and some resilience principles (characteristics that adaptive strategies must have to be successful) were used to assist in the analysis of public socio-environmental management (governmental measures).

2. Concepts

Organization: Velasquez [11], based on Luhmann's thoughts, points out that an organization is a system whose exchange of matter, energy and information is subject to roles and interactions, aimed at achieving objectives that impact the surroundings.

Socio-environmental management: Ostrom [10] It depends on the characteristics of the SES, since it requires a constant learning process and without the need to impose a final solution; since it is interdisciplinary – holistic, it emphasizes adaptive management in a socio-ecological context. Bruno and Ferrer [12] In consideration of this type of management, it is highlighted that the relationships between the social and ecosystem dimensions configure specific characteristics in socio-ecological systems, therefore in these systems the human dimension is constantly redefining ecosystems, and ecosystems in turn influencing human decisions.

Organizational Capabilities (OC): Heylighen [13] Self-organization refers to the formation and maintenance of structures that arise from local interactions, the product of numerous complex and non-linear interactions between different elements. A variable that would explain self-organization is the degree of strength of the family units. Ríos and Ferrer [14] This variable could be added to already defined to explain self-organization, most of which are linked to the decisions and actions of the users. Mendez et al. [15] The OC are made up of a set of competencies and skills that an organization has to integrate technological knowledge and skills that lead to a functional technical solution. Likewise, Davila [16], based on the theory of Helfat and Peteraff, proposes another definition that highlights that OC are socially constructed entities, which symbolize a collective way of addressing problems, evolve over time through a learning process (therefore, they have an inherent dynamic component), and represent a distinctive and superior way of combining and allocating resources.

Sustainable Development: According to the Brundtland Report (BR) [17], sustainable development refers to the capacity of the human system to satisfy the needs of current generations without compromising the resources and opportunities for the growth and development of future generations.

Sustainability: UN [17] We start from the BR's concept of sustainable development, which states that sustainability consists of satisfying needs involving the environmental, economic and social aspects without affecting future well-being.

Design Principles (DP): Ostrom [18] understood as “an element or condition that helps to account for the success of institutions in maintaining common access resources and gaining user compliance with rules of use across generations.”

Resilience Principles (RP): Biggs et al [19] There are seven principles (proposed by Stockholm University) and they are a guide on how to take advantage of opportunities to work within SES, ensuring their adaptation and permanence. In this way, the systems would be able to provide services and/or products necessary to maintain the population's well-being in a changing world.

Restriction of social mobility: Defensoria del Pueblo [20] In an emergency situation, certain fundamental rights may be restricted: rights to personal liberty and security, inviolability of the home, meetings and transit in the territory.

3. Methodology

A descriptive method was used, the information collected was based on reports from official agencies and supreme decrees that alluded to government measures to manage COVID-19.

Eisenhardt and Graebner [21] Experiments and/or cases are studied for two reasons: a) the revelation of an unexpected phenomenon and Yin [22] b) because they provide a broad and unusual access to information. The case of study: socio-environmental management of COVID 19 fits into both reasons, so it became necessary to analyze some governmental measures, qualifying their impact on the DP and RP.

Maritan [23] Investing in new organizational capabilities is different from investing in existing capabilities, it questions that it is not enough to make new capital investments. In this sense, this article addresses the analysis of an unusual public management (COVID-19 pandemic) that is rapidly transitioning to a scenario where new organizational capabilities are required and necessarily dependent on the fulfillment of the DP and RP.

A. Ostrom [18] Design Principles (DP): Seven design principles were used

DP-1: Clearly defined boundaries:

Individuals, households or other authorized persons have the right to withdraw or extract a common resource, provided that this resource is clearly defined. This principle also requires establishing rules that define with clarity who has the right to use a resource and what the limits of that resource are.

DP-2: Congruence:

- A. The distribution of benefits from appropriation rules is proportional to the costs imposed by provisioning rules.
- B. The rules of appropriation that restrict time, place, technology, and amount of resources are related to local conditions.

DP-3: Collective choice arrangements: Most people affected by the operating rules can participate in their modification.

DP-4: Monitoring (Supervision): Those who actively monitor resource conditions and user behavior are responsible to users and/or are the users themselves.

DP-5: Gradual sanctions: Users who violate the operating rules are subject to graduated sanctions (depending on the seriousness and context of the violation) by other users, by officials who answer to them, or by both.

DP-6: Conflict resolution mechanism: Users have quick access to low-cost local forums to resolve conflicts.

DP-7: Minimum recognition of the right to organize: The rights of users to design their own institutions are not challenged by external or government authorities.

B. The Resilience Principles (RP): Biggs et al. [24] The 7 resilience principles.

RP-1: Maintain diversity and redundancy: This is related to functional diversity and should be implemented in governance systems, integrating diverse perspectives for problem solving, in order to promote the creation of knowledge and innovation.

Managing Connectivity (RP-2) Broadening Participation (PR-6)

RP-2: Managing connectivity: Refers to the way and intensity with which resources, species or actors are distributed, migrate or interact in different areas, habitats or social domains within a socio-ecological system.

RP-6: Broadening participation: Involving a variety of stakeholders can enhance legitimacy and enrich the diversity of knowledge. Also, participation is not a one-size-fits-all solution; it is essential to do so in a responsible manner and avoid self-interest.

PR-3: Managing slow variables and feedbacks: This involves identifying the variables and slow feedbacks that maintain the social-ecological regimes that

produce ecosystem services. It is also necessary to strengthen the feedbacks that maintain desirable regimes, monitor important slow variables, and establish governance structures that can respond to the information.

Fostering complex adaptive systemic thinking (RP4). Stimulating learning (RP5)

RP-4: Promote complex adaptive systemic thinking: It means moving away from reductionist thinking and accepting that in a socio-ecological system several connections occur at the same time at different levels.

RP-5: Foster learning (stimulate learning): There are guidelines to promote learning to achieve resilient outcomes, including: supporting long-term monitoring of social and ecological components, providing opportunities for interaction to enable prolonged engagement among participants, establishing an appropriate social context for knowledge exchange, ensuring that there are sufficient resources to enable learning processes to take place, and creating communities of practice.

RP-7: Promote polycentric governance: SES governance is based on norms that regulate the interaction of organizations across hierarchies and structures. This governance strengthens the resilience of ecosystem services in six ways: it facilitates learning and experimentation opportunities, promotes broader participation, improves connectivity, fosters modularity, enhances diversity of responses, and establishes redundancies that help minimize and correct errors in governance. However, traditional and local knowledge is more likely to be taken into account, thus improving the exchange of knowledge and learning across different cultures and spatiotemporal scales.

4. Results

4.1 Governmental Measures Linked To The Restriction Of Social Mobility During The Management Of Covid - 19:

- **Mandatory social isolation**

El Peruano [25] According to article 01 of Supreme Decree No. 044-2020-PCM published on March 15, 2020, a state of national emergency was declared for a period of fifteen calendar days, and mandatory social isolation (quarantine) was ordered, due to the outbreak of COVID-19. Quarantines were constantly rescheduled every 15 days (a total of 3 and a half months of social isolation) which meant that the population was in constant uncertainty about the period of validity of the regulations. El Peruano [26] Through Supreme Decree No. 130-2022-PCM, the end of the health emergency (June 30, 2020) is declared throughout the national territory.

- **Peak and gender**

El Peruano [27] According to article 3 of Supreme Decree No. 057-2020-PCM, El Estado Peruano fragmented the movement of inhabitants according to their sex. Where men could circulate on Mondays, Wednesdays and Fridays, women could circulate on Tuesdays, Thursdays and Saturdays, however, on Sundays no one could leave home.

- **Curfew**

El Peruano [28] In accordance with Section 3.1 of Article 3 of Supreme Decree No. 051-2020- PCM, published on March 27, 2020, the mandatory social immobilization of the population at their home is, from 10:00 p.m. to 5:00 a.m. the following days.

El Peruano [29] On the other hand, Supreme Decree No. 010-2022-PCM suspends the curfew nationwide from January 31, 2022.

- **Traffic reduction**

El Peruano [25] According to article 9 of DS N°044-2020-PCM, on transportation in national territory, in 9.1. provides the reduction of 50% in land and fluvial means and article 9.2 provides the suspension of interprovincial service was ordered, by air, fluvial

and land means, coming into effect on March 16, 2020. As from March 18, 2020, the use of private vehicles was prohibited, except those necessary for the provision of essential services and emergency vehicles, with law enforcement authorized to retain the driver's license and property card, while the state of emergency lasted.

Table 3 highlights the relationship between public management of COVID-19 (government measures whose common objective was the restriction of social mobility) and each PD. The government measures analyzed were: prolonged quarantines (three and a half months), peak and gender, curfew and reduction of the transit of people in the national territory.

Table No. 03: Analysis of socio-environmental management (government measures) through design principles (DP).

DP.	Government measures linked to the restriction of social mobility
DP 1	Parlamento Andino [30] During Covid-19, the Central Government of Peru adopted radical measures using law enforcement to ensure the mandatory isolation of the entire population. They were enacted quickly and violated human liberties. The population was unable to fully receive or process the measures because they were implemented 16 hours after their promulgation, restricting the use of transportation and interprovincial travel and therefore violating PD-1.
DP 2	Users must perceive a positive economic return when governed by new regulations, however, facing COVID-19, the analysis considered it necessary to also take into account energetic and emotional profitability. INEI [31] In 2019, 72.7% of the economically active population in Peru was informal, which indicates that these people depended on the income generated daily. The measures taken by the government kept people at home, reducing work possibilities. This contributed to reduced food acquisition, negatively affecting nutritional and immunological quality and raising the level of emotional stress in families. The benefits derived from the regulations should consider the energetic, economic and emotional spheres of individuals. Ultimately, none of these spheres were achieved under the imposed measures. IPE [32] Users should perceive that the rules were established based on the geographic and cultural context. The measures were applied homogeneously throughout the country, ignoring the fact that Peru is heterogeneous economically, climatically, geographically and culturally. The measures should have been given based on the different characteristics of Peru's socio-ecological systems. This principle has been weakened in terms of a and b.
DP 3	Ostrom, et al. [33] The measures applied lacked a sufficiently interdisciplinary approach to equitably address the three dimensions of sustainability: social, economic and environmental. Instead, there was an overemphasis on the social dimension in the health variable and a complete neglect of the economic and environmental dimensions. As a consequence, society's capacity to modify the adopted measures in a timely manner was weakened, generating chaos in the country. As a result, this principle was weakened.
DP 4	El Peruano [25] According to DS 044 – 2020 - PCM, all public, private and mixed health entities in the national territory, as well as other officials and workers in their service, were placed under the direction of the Ministry of Health for the protection of people, property and places, and being able to impose on them. Therefore, public management arrogated a monopoly (decisions) on health, limiting the participation of other sectors of society in the modifications and monitoring of management. This principle was weakened.
DP 5	El Peruano [34] The sanctions were mainly directed towards citizens who were not able to internalize the measures, nor were unable to adapt to them. PPEDC [35] However, during the state of emergency, there were representatives of public administration who were involved in corruption cases and have not been punished.
DP 6	El Peruano [36] The measures taken to restrict social mobility led to an increase in conflicts. "Peak and gender" increased tensions within families, as not all had the same number of members of both sexes for an equitable distribution of daily activities. El Peruano [28] There was also the curfew, which affected more than 70% of the economically active population, who were informal and were forced to stop working, thus leading to the weakening of subsistence (health and food). In view of these measures, it is clear that any restriction of human freedoms contributes to increasing conflicts.
DP 7	The measures taken in response to this pandemic ended up weakening the organizational capacities of Peruvian society.

Source: Own elaboration.

Table 4 highlights the relationship between public management of COVID-19 (governmental measures whose common objective was the restriction of social mobility) and each resilience principle. The governmental measures were: prolonged quarantines (3 and a half months), peak and gender, curfew and reduction of the transit in the national territory.

Table No. 04: Analysis of socio-environmental management (government measures) through the resilience principles (RP).

RP	Government measures linked to the restriction of social mobility
RP1	BCRP [37] Peru was one of the countries whose GDP was negative in 2020: -11%. Due to the restriction of social mobility, the population had reduced opportunities to work, limiting the sources of economic income per family, as well as the weakening of OC among families. As a consequence, the emotional stability and health of the population were at risk.
RP2 and RP6	A. Seclen [38] The measures taken by the government weakened social relations, that is, the network of social connections that could have been a support for resilience. Considering that public health services were collapsed, the result was a considerable increase of infected people and deaths. B. Cueto, et al. [3] The decisions taken by the government did not have an interdisciplinary perspective to address the environmental, economic and social dimensions of the pandemic. On the other hand, the government hindered the intervention of private initiatives to address the real needs of the majority of Peruvian population living in the informal sector and in different SES.
RP 3	CGR [39] Public health care was deficient because the deficits in infrastructure, equipment and health staff were not addressed. Cueto et al. [3] In addition, no viable strategies (from an interdisciplinary and scientific perspective) were proposed for public entities or for the population itself.
RP 4 and RP 5	The government's management lacked an interdisciplinary approach, Ostrom [10] to address the different variables that constitute the environmental, economic and social dimensions of sustainability. This was reflected through homogeneous measures for a heterogeneous socio-geographical reality. Regarding the learning principle, at no time was recourse made to experiences of management of respiratory epidemics that occurred in countries where these events are chronic or based on the global experience with the Spanish flu of 1919. Jaramillo and Lopez [40] If this were the case, more coherent and realistic measures would have been chosen in relation to the behavior of a respiratory virus and the conditions of the country.
RP 7	Precisely from the government's measures the interaction of organizations linked in hierarchies and structures was negatively affected. The monopoly of decision-making was concentrated in the central government.

Source: Own elaboration.

4.2 Other Governmental Measures During The Management Of Covid - 19:

- Handwashing

El Peruano [41] In order to comply with this measure, the government issued Supreme Decree No. 016-2022-PCM, which declared a situation of national emergency due to the circumstances affecting people's lives and health as a result of COVID-19 and established new measures for the reestablishment of social coexistence, including handwashing.

Peru is one of the 20 countries with the most water resources, however, water is distributed unevenly across the territory and is not necessarily found in the areas of greatest demand. The Peruvian coast is home to more than 70% of the population, but only has 1.8% of the total water produced. OXFAM [42] Between 7 and 8 million Peruvians do not have access to drinking water. This government measure was incongruous for a large part of the Peruvian population, which lacks access to water resources. During quarantines, water tankers were unable to deliver water to populations that lacked drinking water service, further weakening the sanitary situation.

- Diagnostic tests

El Peruano [43] In order to comply with this measure, the government launched emergency decree No. 028-2020, which issued extraordinary economic and financial measures for the acquisition of diagnostic tests for Covid-19.

OMS [44] "Molecular tests", such as polymerase chain reaction (PCR) tests, can identify the genetic material of a virus, such as SARS-CoV-2, to determine whether a person is currently infected with it. Serological tests are able to identify the presence of antibodies against a specific virus and estimate the amount of antibodies generated after infection, which helps determine whether a person had a previous SARS-CoV-2 infection. However, WHO [44] They should not be used to diagnose an acute SARS-CoV-2 infection, since antibodies usually appear several weeks after infection. In addition, the government prioritized the

purchase of serological tests, that is, those that are less effective in diagnosing an infected individual. See Table No. 5.

Table No. 05: Purchase of molecular tests.

2020		
	Molecular tests	Serological tests
Quantity (units)	468 229	5 233 346
Percentage	8.21 %	91.79%

Source: Peru Compras [45] Own elaboration from the Public Procurement Centre.

5. Discussion

Measures such as handwashing incentives hid a worrying lack of access to drinking water. INEI [46] In 2020, there were approximately 2 million residents in Metropolitan Lima who lacked piped drinking water service. Haque [47] This deficit in the water supply increased the number of infections, affecting the OC of the family units themselves.

Likewise, the measure based on the preferential purchase of serological diagnostic tests brought many “false negatives” which caused the number of infected and deceased people to increase, once again putting the OC of family units at risk.

The government measures linked to the restriction of social mobility that were applied during COVID-19 in Peru were analyzed through the DP and RP. Such measures were applied in violation of the aforementioned principles and without taking into account that our country is culturally and geographically diverse. This disconnection severely affected the OC of the population, especially in its nuclear organization: the family. The measures applied in a homogeneous manner (linked to the restriction of social mobility) to a heterogeneous territory resulted in economic decline, weakening of the immune system, increased stress and, as a consequence, the fragility of the OC.

The economic decline: IPSOS [48] During the quarantine, 89% of Peruvians reduced their income, 69% had difficulty restocking products, and 52% experienced emotional problems: stress, depression, and confrontations.

Perez [49] Each day during the quarantine, Peru lost 343 million dollars (June 2020 1-dollar value = 3.5 PEN). To get a better idea of the level of economic deterioration generated by the quarantines, the total number of days in quarantine was three and a half months (115 days), which was equivalent to 54.7% of the country's total international reserves registered until June 2020.¹

This economic scenario raised the level of poverty by 10% in just one year. As the economic support of families was affected, it directly impacted the satisfaction of basic first-level needs (physiological needs: among them the availability of food), according to Maslow's pyramid of human needs. As a result, the economic deterioration weakened the OC of the population.

Weakening of the immune system: Rook [50], Professor of Medical Microbiology at University College London (UCL), supports the old friend's hypothesis, which postulates that failure of immunoregulation is due to inadequate exposures to microorganisms that drive the development of the immune system. Lenti and Quezada [51] Furthermore, poor immunoregulation contributes to the increase in chronic inflammatory disorders (allergies, autoimmune diseases and inflammatory diseases). Measures based on the restriction of social mobility weakened the immune responses of individuals, adding one more factor against OC.

Increased stress: A study (whose sample surveyed during the month of August 2020 was 1,207 people over 18 years of age of both sexes, 94% of whom were Peruvian nationals) evaluated the emotional perception of COVID-19 and the impact of mandatory social isolation. Regarding emotional perception: 54% were afraid, 27% confused, 18% sad, and in

¹ Up to June 2020, international reserves according to the BCRP were 72 billion dollars [55].

the face of mandatory social isolation, 37% were afraid, 21% sad, 4% angry, and the remaining 38% did not know any emotions.

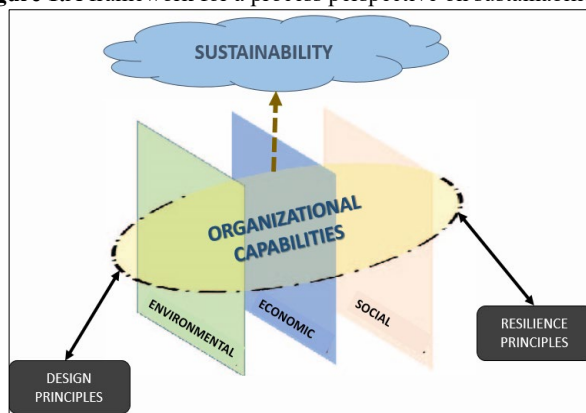
Alvarez et al. [52] During the quarantine in times of COVID-19, two silent pandemics such as obesity and malnutrition also occurred, conditions that represented a risk to the health of those who could potentially become infected. Rook [53] Epidemiological studies suggest that a reduction in mortality rates, cardiovascular diseases and psychiatric problems are attributed to psychological mechanisms, driven by exercise, social interactions and sunlight. Therefore, the prolonged restriction of social mobility increased the stress of the population, making it difficult to use the skills and abilities appropriate for the exercise of OC.

Principles, organizational capabilities and sustainability: The DP focus on a normative approach to resource use, while RP relate to the strategies we should adopt in the face of constant disturbances and changes. Ostrom [18] Compliance with most of the DP contributes to having long-lasting self-managing organizations and Folke [54] Compliance with what were considered “general policy recommendations” (later RP) contributes to achieving resilience within the SES framework. Considering the definition of socio-environmental management, the implementation of the DP and the RP contributes to embodying: constant learning, the interdisciplinary-holistic approach, the emphasis on adaptive management and the assessment of the reciprocal influence between the human and ecosystem dimensions. In other words, such implementation leads to optimal management of the SES, through the strengthening of the OC. However, from the analysis of tables 3 and 4 it is evident that all government measures negatively affected the implementation of the DP and the RP.

Based on the definitions of organization and OC, we emphasize that the implementation of DP and RP implies the gathering of individuals with competencies and aptitudes that allow the integration of knowledge and skills to obtain some level of solution. The quality of the social interactions of individuals is dependent on: the economic condition, the emotional and physical situation, as well as the learning processes that improve the combination and allocation of resources. Likewise, individuals are the result of social experiences that began in the first form of social organization: the family. We consider that each DP and RP are the result of base principles or zero principles that rightly originate in the family. The zero principle of resilience: highlights in its conceptual essence the need for the population to overcome its fears, paranoia and prejudices, generating optimal conditions of emotional health to establish quality interpersonal relationships, which is decisive to sustain all other principles of resilience. The zero design principle: refers to strengthening family nuclei since they are the first social contact of the individual and where human needs are satisfied, but in addition to being a social support, they must become the first place of training to learn to value the characteristics of the norms that will guide the use of resources. Although both zero principles must be developed from the family, other formative environments (schools, churches, communities and universities) should actively internalize them.

The definitions of sustainability and sustainable development refer to the satisfaction of human needs, however, how these needs are met is key. The definition that best captures the process of achieving such satisfaction is sustainability. Etymology Dictionary [56] The word sustainability etymologically comes from the Latin verb “sustentare” (to grasp from below), so sustainability is the human capacity to sustain something over time, so that something lasts at a certain level over time. Therefore, sustainability could be better used in a process perspective, given that it involves decisions and actions that contribute or not to strengthening competencies and aptitudes, that is, organizational capabilities. Whereas the term sustainable development would be framed as the expected result: the satisfaction of human needs.

Figure 1. A framework for a process perspective on sustainability



Source: Own elaboration

The conceptual integration shown in the **Figure 1** highlights the bidirectional relationship of decisions and actions framed in the DP and RP with respect to the OC, and both redefining each other. Based on the case analyzed, it is highlighted that government measures prevented the DP and RP from being implemented in an ideal manner, and then the OC were weakened. Another condition suggested by the graph is that the OC should be developed taking into account, if possible, all the second-order variables for the analysis of the SES² distributed in the dimensions: environmental, social and economic. Based on the case analyzed, it is highlighted that the government measures did not address the wide distribution of variables between the dimensions indicated. Finally, the graph highlights a discontinuous arrow between the OC and the elusive perfect realization of sustainability.

6. Conclusions

The experience of managing the COVID-19 pandemic in Peru should be considered a great opportunity to educate the population and those who make decisions at some level of government. Management should be approached from a scientific, interdisciplinary, adaptive, constantly learning and specific perspective according to the socio-ecological context. Ñaupari and Ferrer [57] Public management should, essentially, provide the conditions to strengthen the organizational capacity of the population and not rely solely on models foreign to the national context.

Due to the inherent complexity of SES (derived from their dynamic nature), sustainability must be approached from a procedural perspective, as a roadmap that must guide human decisions and actions that will be framed within the DP and RP. The reciprocal redefinition between these principles and the OC will be affected by the values that are hegemonic in an organizational culture. If these principles are adequately implemented in the management of SES, then sufficiently robust organizational capacities will be configured to bring us closer to sustainability.

In the case study presented, government measures were not aligned with optimal socio-environmental management, negatively compromised the implementation of DP and RP, leading to economic weakening, poor health, an increase in infected people and the highest mortality rate in the world. All of this led to the continuous weakening of organizational capabilities.

Ferrer [58] To the extent that political spaces are not consolidated with the participation of the population, the latter will continue to be marginalized.

²Second-tier variables in the analysis framework of an SES [10].

Sustainability only makes sense if humanity exists in a surrounding in which its dignity, that is, its collective participation, is respected. Dignity depends on the strength with which its organizational capabilities are expressed: the determining factor that will approximate us to sustainability.

REFERENCES

- [1] WHO. World Health Organization. [Online] (2019). https://www.who.int/es/health-topics/coronavirus#tab=tab_3
- [2] PAHO. WHO. [Online] March 11, (2020). <https://www.paho.org/es/noticias/11-3-2020-oms-caracteriza-covid-19-como-pandemia>
- [3] S. Cueto, et al. *Analysis of the Socio-Environmental Management of Covid 19 in Peru.* E3S. (2021)
- [4] SINIA. Sistema Nacional de Información Ambiental. *A climate Chance Conference.* 2014-2019.
- [5] INEI. Instituto Nacional de Estadística e Informática. [En línea] (2022). <https://www.inei.gob.pe/media/MenuRecursivo/noticias/nota-de-prensa-no-115-2022-inei.pdf>
- [6] BCRP. Banco Central de Reserva del Perú. *ECONOMIC ACTIVITY: APRIL 2023.* Lima: sn, (2023).
- [7] INEI. Instituto Nacional de Estadística e Informática. [online] (2021). <https://m.inei.gob.pe/prensa/noticias/pobreza-afecto-al-259-de-la-poblacion-del-pais-en-el-ano-2021-13572/>
- [8] UNICEF. [En línea] (2021). <https://www.unicef.org/peru/informes/covid19-impacto-de-la-caida-de-los-ingresos-de-los-hogares-en-indicadores-de-ninez-y-adolescencia>
- [9] G. Gonzales . *Is Peru the country with the highest mortality rate in the world?: A situational analysis.* Bogota : s.n. (2022).
- [10] E. Ostrom. *A diagnostic approach for going beyond panaceas.*, PNA. (2007)
- [11] Velasquez *The organization, the system and its dynamics: a version from niklas luhmann.*. 61, BBASM, **0120-8160** (2007)
- [12] E. Bruno. and J Ferrer. *Management Community of Communal Lands in the Andean Rural Community of San Roque de Huarmitá, Concepción, Junín, Peru.* EES (2021).
- [13] F. Heylighen. *Self-organization in Communicating Groups: the emergence of coordination, shared references and collective intelligence.*. Heidelberg: sn. **1860-0832**.(2013)
- [14] J. Ferrer and Y. Ríos *Analysis of the variables that contribute to self-organization for the management of family lands in.* Huancayo: IOP Conference Series, (2023).
- [15] Á. Méndez, C. Petit, E. Emilia. *Organizational capacity in the implementation of computerized systems. Cases: Propilven and LUZ FM* **102.9**. VJM **v.15 n.52** Maracaibo Dec. (2010) .
- [16] J. Dávila. *Organizational capabilities: dynamic by nature**. (2013).
- [17] UN. United Nations. *Report of the World Commission on Environment and Development: Our Common Future.* (1987).
- [18] E. Ostrom. *Governing the Commons: The Evolution of Institutions for Collective Action.* (1990).
- [19] R. Biggs, M. Schlüter and M. Schoon. *Principles for Building Resilience Sustaining Ecosystem Services in Social-Ecological Systems.* (2015).
- [20] Defensoría del Pueblo. Defensoría del Pueblo precisa funciones de FF. AA. y PNP en contextos de estado de emergencia. [online]. December 15, (2022). <https://www.defensoria.gob.pe/defensoria-del-pueblo-precisa-funciones-de-ff-aa-y-pnp-en-contextos-de-estado-de-emergencia/>
- [21] K. Eisenhardt, M. Graebner. *Theory building from cases: opportunities and challenges.* (2007).
- [22] Yin, R. Case study research design and methods. (2022) <https://panel.inkuba.com/sites/2/archivos/YIN%20ROBERT%20.pdf>
- [23] C. Maritan. *Capital investment as investing in organizational capabilities: an empirically grounded process model.* 3, New York: TAMJ, **Vol. 44**. (2001)
- [24] R. Biggs, et al. *Principles for building resilience.* CUP.(2015)
- [25] El Peruano. Decreto Supremo No. 044-2020-PCM . 2020.[Online] https://cdn.www.gob.pe/uploads/document/file/566448/DS044-PCM_1864948-2.pdf?v=1584330685

- [26] El Peruano. Decreto Supremo. No. 130-2022.. 2020.[Online]
<https://busquedas.elperuano.pe/dispositivo/NL/2119571-1?fbclid=IwAR2AI3KA-v-S67ovyTCeN2HU1OI9uz22kEioyn9HdDbAKX3w9sMa2s7tv8to>
- [27] El Peruano. Decreto Supremo. No. 057-2020-PCM. 2020. [Online]
https://cdn.www.gob.pe/uploads/document/file/574872/DS_057-2020-PCM.pdf?v=1585868310
- [28] El Peruano. Decreto Supremo. No. 051-2020 - PCM. 2020. [Online]
https://cdn.www.gob.pe/uploads/document/file/572157/DECRETO_SUPREMO_N%C2%BA_051-2020-PCM.pdf?v=1585418864
- [29] El Peruano. Decreto Supremo. No. 010-2022-PCM. 2020. [Online]
<https://cdn.www.gob.pe/uploads/document/file/2793236/Decreto%20Supremo%20N%C2%B0010-2022-PCM.pdf?v=1643467755>
- [30] Parlamento Andino. *Main measures adopted by the Peruvian government in response to the emergency*. Lima: sn, 2022. [Online]
<https://www.parlamentoandino.org/images/actualidad/informes-covid/Peru/Principales-medidas-adaptadas-por-el-gobierno-peruano.pdf>
- [31] INEI. Instituto Nacional de Estadística e Informática. *Production and informal employment in peru*. (2020). [Online]
https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1764/libro.pdf
- [32] IPE. Instituto Peruano de Economía. *More than 10 million Peruvians live off their daily income*. April 26, 2020. [Online] <https://www.ipe.org.pe/portaI/mas-de-10-millones-de-peruanos-viven-de-sus-ingresos-del-dia/>
- [33] E. Ostrom, C. Tiebout, and R. Warren *The Organization of Government in Metropolitan Areas: A Theoretical Inquiry*, p. 12. (1961)
- [34] El Peruano. Decreto Legislativo N° 1458. (2020). [Online]
<https://www.gob.pe/institucion/presidencia/normas-legales/473579-1458>
- [35] PPEDC. Procuraduría Pública Especializada en Delitos de Corrupción. *REPORT ON CORRUPTION DURING THE STATE OF EMERGENCY DUE TO COVID-19 IN PERU*. Lima: sn, (2021). [Online] https://procuraduriaanticorruptcion.minjus.gob.pe/wp-content/uploads/2022/01/INFORME-CORRUPCION-DURANTE-EL-ESTADO-DE-EMERGENCIA_v2022-VB.pdf
- [36] El Peruano. Decreto supremo No. 057-2020- PCM. (2020). [Online]
<https://www.gob.pe/institucion/pcm/normas-legales/466151-057-2020-pcm>
- [37] BCRP. Banco Central de Reserva de Perú. *ANNUAL REPORT 2021*. Lima: sn, (2021).
- [38] S. Seclén *Impact of the Covid-19 pandemic on the management and control of chronic non-communicable diseases*. 3, LRMH, , Vol. 32. 1729-214X. (2021)
- [39] CGR. Contraloría General de la República. Gob.pe. [Online] May 21, (2020). [Cited on: <https://www.gob.pe/institucion/contraloria/noticias/301228-n-267-2020-cg-gcoc-advierten-deficiencias-en-atencion-de-pacientes-con-covid-19-en-hospitales-regional-y-lorena>]
- [40] M. Jaramillo and K. Lopez. *Policies to combat the COVID-19 pandemic*. Lima: Analysis Group for Development (GRADE), (2021).
- [41] El Peruano. Decreto Supremo No. 016-2022-PCM. (2022). [Online]
<https://www.gob.pe/institucion/pcm/normas-legales/2772386-016-2022-pcm>
- [42] OXFAM. *Between 7 and 8 million Peruvians do not have access to drinking water*. [Online]
<https://peru.oxfam.org/qu%C3%A9-hacemos-ayuda-humanitaria/entre-7-y-8-millones-de-peruanos-no-tienen-acceso-agua-potable>
- [43] El Peruano. Decreto de Emergencia No. 028-2020. [Online]
<https://www.mef.gob.pe/es/por-instrumento/decreto-de-urgencia/22088-decreto-de-urgencia-n-028-2020/file>
- [44] WHO. World Health Organization. COVID-19: serology, antibodies and immunity. [Online] 31 December 2020. <https://www.who.int/en/news-room/questions-and-answers/item/coronavirus-disease-covid-19-serology>.
- [45] Peru Compras. COVID-19 TRANSPARENCY. [Online] 2020 - 2022.
<https://www.perucompras.gob.pe/contrataciones/contrataciones-emergencia-covid19.php>
- [46] INEI, Instituto Nacional de Estadística e Informática. *Peru: Access to water and basic sanitation*. Lima: sn, (2019). [Online]

- https://www.inei.gob.pe/media/MenuRecursivo/boletines/boletin_agua_junio2020.pdf
- [47] M. Haque *Handwashing in averting infectious diseases: Relevance to COVID-19*. Kuala Lumpur: JPT, **Vol. 27**. (2020).
- [48] IPSOS. *Opinion Data - April Peru 2020*. Lima: sn, (2020). [Online] https://www.ipsos.com/sites/default/files/ct/news/documents/2020-04/opinion_data_-_22_de_abril_del_2020.pdf
- [49] C. Perez *Impact of Covid-19 on the Peruvian Economy 2020*. sl : GEBRC, (2020).
- [50] G. Rook. *The old friends hypothesis: evolution, immunoregulation and essential microbial inputs*. London: Front. Allergy. **4:1220481** (2023).
- [51] M. Lenti and J. Quezada. *Emotional perception of COVID-19 and mandatory social isolation*. Lima: sn, , **Vol. 30. 2708-5007**. (2022)
- [52] J. Álvarez, S. Lallena. And M. Bernal. *Nutrition and the COVID-19 pandemic*. 23, Madrid: Medicine - Accredited Continuing Medical Education Program, **Vol. 13. 0304-5412**. (2020)
- [53] G. Rook. *Regulation of the immune system by biodiversity from the natural environment: An ecosystem service essential to health*. Sl. PNASUSA. **110. 10.1073**. (2013)
- [54] C. Folke, et al. *Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations*. AMBIO,. **Vol.31 N 5**.(2002)
- [55] BCRP. Banco Central de Reserva de Perú. *Summary of the Financial Position as of June 30, 2020*. Lima: sn, 2020.
- [56] OED. Online Etymology Dictionary. [Online] <https://www.etymonline.com/search?q=sustainability>.
- [57] J. Naupari and J. Ferrer *The Effect of Public Management on Social Resilience in Peru in the Face of the COVID-19 Pandemic and Climate Change*. Huancayo: **Vol. 20. 2325-1166** (2024)
- [58] J. Ferrer. *State action and the exploitation of a common access resource, the chestnut (Bertholletia excelsa): a case study in the Amazonian community of Tres Islas, in the Madre de Dios Region, Peru*. Piracicaba: USP (2012).