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CLIMATE CHANGE AND PUBLIC HEALTH

Latin American Survey about Management

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Acknowledgments

The Program for Energy Security and Climate Change in Latin America, of the Konrad Adenauer Foundation, carried out the project entitled “Analysis of the determinants concerning the policy and management of sustainability, climate change and public health in Latin America.” This study is part of the project and the objective of knowing the relationship’s main determinants, the management approach, and the opportunity areas. We received support from various institutions and expert organizations in health and the environment to carry out this study. This statement thanks them for their commitment and support.

Addressing the challenges presented requires a collaborative effort between governments and multiple stakeholders in the region. For this reason, this study has been conducted to analyze the determinants in the relationship of climate change management policy and public health in Latin America, to promote comprehensive actions in the region, and analyze proposals that contribute to the creation of transformations leading to a resilient, sustainable, and socially responsible economy.

Abstract

Mortality due to extreme weather is of great concern to cities since studies show a direct relationship between high temperatures and excess mortality. Air quality and the various environmental problems (climate change and loss of species and ecosystems) show tangible evidence of imminent dangerous scenarios. The scale of threats to the biosphere and to all forms of life, including humans, are so grand that it is difficult to comprehend them in many cases. COVID-19 showed us that we are not prepared to face global problems, including those associated with climate, which we have already begun to suffer and will continue to face. This study shows an analysis, under the "One Health" approach, and presents the results of a survey carried out on the subject by specialists from ten Latin American countries with the largest population: Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, and Peru, to contribute to the identification of comprehensive actions in the region that drive the creation of transformations leading to a resilient, sustainable, and socially responsible economy. This report also aims to obtain an overview of the perception that exists in Latin America on the subject. This study seeks to find a niche of opportunity among Latin American countries to design a political agenda aligned with the magnitude of both environmental problems and the needed solutions.

Content

1. Introduction

According to the United Nations (UN, 2018), an estimated 68 % of the world's population will live in urban areas by 2050, so sustainable development will increasingly depend on the proper management of urban growth. It is estimated that this urbanization takes place in developing and underdeveloped countries.

Climate change is a growing problem due to the uncontrolled consumption of natural resources. Higher temperatures are recorded each year, natural disasters have increased, sea levels increase, and seasons do not tend to be regular anymore. Climate change has a significant impact on water, air, and food; these three elements constitute the critical components.

In numerous regions, future temperatures are likely to increase the risk of forest fires by leading to increased droughts. Climate change can increase allergies due to pollen production and other nature allergens. Climate change alters the seasonality of the aeroallergens, for example, increased pollen production with warmer temperatures and higher environmental carbon dioxide.

Water-borne diseases are expected to worsen because of more intense rainfall due to climate change. Vector-borne infectious diseases are equally climate-sensitive through several mechanisms: first, through geographical changes, second through a change in development rates, survival and reproduction of vectors and pathogens, and third through increased insect bites and prevalence of infection. These affect humans directly due to exposure to diseases such as dengue, which is likely to worsen in a warmer world.

Climate change is projected to reduce global food production by up to 2 % per decade. More than 800 million people are currently chronically hungry, and climate change is expected to reduce wheat yields, maize, sorghum, and millet. An estimate suggests that by 2050 approximately 25 million more children could be malnourished because of climate change.

Depression, anxiety, and related disorders cause significant morbidity. In addition to vulnerability to the adverse effects of heat, climate change can threaten mental health in other ways.

All these changes pose a threat to the health of the population, posing challenges to health services and national and international governments. Therefore, it is necessary to broaden the conversation about public management of health and the environment. A significant aspect that has developed within public health management is called environmental health. It refers to "the theory and practice of assessing, correcting, and controlling those environmental factors that may potentially harm the health of current and future generations (Actions and Programmes. Environmental Health, 2017).

Environmental issues must be simultaneously integrated as they would be recognized as

a process of collective learning for a society where the capacity to reduce problems can be enhanced. Many sectors can be decisively and positively influenced, bringing benefits to many people.

This study shows an analysis under the “One Health” approach and is integrated by the following chapters: 1. Introduction, 2. Relationship between health and the environment, 3. Bad environmental management and its consequences for health, 4. Importance of environmental performance in public health policy, 5. Survey on the environment and public health, 6. General conclusions.

2. Relationship between health and environment

Organizations such as the World Health Organization (WHO), the Pan American Health Organization (PAHO), and other collaborating centers have devoted much of their efforts and funds to building alliances and strategies with civil society and regional and international agencies to address and prevent such diseases and other problems that threaten the public health of the world population. According to WHO (2003), climate change is the biggest threat to global public health in the 21st century due to the dramatic changes that have taken place and the resultant consequences. Some of the figures in his article Preventing Disease Through Healthy Environments published in 2012 indicate that "around 12.6 million deaths worldwide annually (23 % of all deaths) are attributable to the environment" (Riojas, Rodríguez., 2019).

The same document displays a comprehensive list of up to 100 diseases and injuries that can be attributed to environmental conditions such as respiratory infections, diarrhoeal diseases, intestinal nematode infections, Malaria, Trachoma, Schistosomiasis, Chagas disease, Lymphatic Filariasis onchocerciasis, cancers, mental, behavioral and neurological disorders, Asthma, musculoskeletal diseases congenital abnormalities, unintentional poisoning, falls, fires, heat and drowning by hot substances. (Neira, M. 2016).

The WHO's Department of Public Health, Environment and Social Determinants of Health (2021) seeks to work to help create a healthy and healthier environment for all, where through preventive practices, partnerships and programs can be created to improve policies in all sectors so that environmental threats and threats to public health can be tackled at source. The UN Sustainable Development Goals (SDGs) aimed at a healthy environment seek to improve public health's negative impact.

In short, it can be deduced from this that there is indeed a relationship between health and the environment. A healthy environment leads to a better state of health for its population, and, in that sense, diseases can be prevented through the environment's care.

Climate change affects health directly

Thus, some aspects of climate change directly impact public health and are more complex to trace their incidence but have an indirect relationship. Among the diseases directly related to the environment, it is known that each pathogen and allergen are found in the air, which is higher in high temperatures. Therefore, changes in the environment resulting from climate change contribute to this phenomenon and lead to cardiovascular and respiratory diseases. Another example is heat waves that contribute to dehydration, and if people do not have the resources to hydrate or take refuge, the heat waves can lead to mortality. Indirectly, it is found that the increasing alteration of aquifers resulting in a lack of clean water contributes

to water scarcity and drought, lack of food, and problems of lack of hygiene or pests of disease-carrying insects.

Today, there are records that natural disasters caused by climate change (such as hurricanes, storms, droughts, and intense heat waves) are the types of threats that directly attack public health. While other diseases such as respiratory diseases, food insecurity, malnutrition are indirect problems of climate change. Climate changes are likely to prolong the transmission stations of significant diseases and alterations in their geographical distribution, and all populations will be affected by climate changes (WHO, 2018).

Among all the diseases that have been mentioned, WHO has identified that some of them have a high burden of prevention due to environmental risks, for example, respiratory diseases could be prevented by 35 %, diarrheal diseases by 57 %, malaria in 42 %, and neonatal conditions in 11 %. (Neira & Prüss-Ustün, 2016). In Mexico, the Program of Action: Environmental Health (PRASA) of the Ministry of Health 2001-2006 estimated that about 35 million inhabitants in Mexico live exposed to poor air quality. There are between 2,000 and 4,000 deaths per year due to particles' inhalation from the urban atmosphere. In rural areas of the country, firewood in kitchens exposes women and children to average concentrations of breathable particles up to five times higher than those recommended for the city. Another problem affecting farmers is pesticide poisoning, of which there are 6,000 cases per year in the country." (The Program of Action: Environmental Health (PRASA) of the Ministry of Health, n.d.).

It can then be said that climate change affects public health, and its impact and scope on public health are extensive. It can be further studied since it is beyond this article's objectives to mention the link and the incidence of all these diseases that have been somehow attempted to outline.

3. Environmental mismanagement and its health consequences

Environmental management covers all actions for the conservation, recovery, and mitigation of environmental problems and actions that may result from them, such as waste management, the management of productive activities with a high percentage of pollutant emissions, such as agriculture, mining, or industry; among other elements to consider that have been mentioned throughout this document. In short, that is why poor management of the environment with all the elements that constitute it has the consequence of increasing the probability of contracting diseases or some injury to the general population snowball endlessly. It can lead to an increase in the need for treatment, leading to a shortage of medicines and medical services saturation.

In the long term, poor environmental management would have adverse effects on health and the economy, and future generations' development. Creating a public health policy by governments could be of great support, and it should contain environmental issues and criteria. Often, education about caring for the environment is not as effective as in different societies. Advice or indication is not taken as accurate until there is the law's impact or some authority. Doing so would present an increase in followers and a wider diffusion by creating awareness of environmental care and the health repercussions that could arise if not following the indications by abusing natural resources.

Governments should formulate public policy on public health issues integrating environmental issues and criteria

The political approach to the environment has changed very rapidly. It has also presented new and growing challenges since the end of the last century. New concerns have emerged from the depletion of natural resources such as water, and new conceptions developed, such as ecology and sustainability.

Economic and population growth contributes most to the increase in global GHG emissions; experts estimate that emissions should be significantly reduced to avoid heating the earth to more than two degrees. Failing to do so may cause changes in the terrestrial system: temperature changes, torrential rains, sea-level rise, and ocean acidification. As we have seen, the importance of a healthy environment for equally healthy public health is excellent. It has been seen that many diseases are directly or indirectly related to the consequences of environmental problems or adverse natural events. For this reason, the efforts made in a joint public policy should be recovered, and the concepts and actions that link health and the environment should be reinforced.

Governments need comprehensive approaches to protect public health: mitigation or significant emissions reduction, which correspond to prevention and adaptation to anticipate

and reduce threats. There are many actions to mitigate the effects of climate change. Many of them would improve health immediately, such as managing the environment by implementing sustainable energy technologies, changing transport patterns, and improving the design of structures to produce accurate and feasible benefits. Policies that serve the planet and health must also be developed.

4. Importance of environmental performance in public health policy

The environmental performance indicators contribute to evaluating and monitoring the efforts that governments are carrying out in this area and the occurrence of natural phenomena that may cause a risk or are already influencing some environmental problem that affects public health. The performance indicators provide updated information on the environment and its relationship with a specific sector, considering population variables, policies, practices, and procedures. It will depend on the information available and the criteria with which it has been collected.

One of the most important aspects of taking care of indicators is methodological rigor since errors in processes can present significant risks. Some authors also warn about the indiscriminate use of indicators, which can occur because there is a risk of making decisions based on very limited or unrepresentative information. Further, there is the possibility of not correctly evaluating environmental criteria (Perevochtchikova, M. 2013).

Then the scope of the indicators will depend on the methodology of their implementation. In general, the indicators allow an easily accessible view of what is happening in the different territory regions, be it at the macro or micro level. This makes it possible to precisely identify where the most critical or vulnerable areas are concentrated for each type of event, whether individual health or environmental, or if greater precision is required, where they are jointly concentrated. It allows better management of problems, the design, and implementation of actions and contributes to decision making.

For this reason, the design of public policy must consider environmental performance indicators. The relevance of having public access indicators later facilitates governments to inform and prepare the population for future eventualities to minimize the damage and adverse effects generated. However, the indicators are also significant for all sectors: investors, companies, NGOs, and civil society since the transparency of information allows us to interpret a phenomenon or process more simply and concretely where all interested parties can collaborate.

Private initiative in the relationship between public health and climate change

It is well known that capitalism and unsustainable and consumerist practices play an important role in environmental problems today, especially those related to greenhouse gas emissions. An essential part of society is aware of environmental problems. As customers and consumers, they expect and demand that companies mitigate the adverse effects on the environment generated by their activities. So, the role of entrepreneurs is to create strategies and promote sustainable practices.

The private sector (entrepreneurs and investors) has a strong influence on these issues. They can play the role of interceding in the government to formulate public policies that directly or indirectly affect them. On the other hand, this sector greatly influences compliance with environmental regulations and laws in countries. It is their responsibility to comply with them correctly and manage their business without affecting the environment.

It should be mentioned that it is a sector with great relevance because it controls most natural resources. There have been severe cases of abuse of these resources within the sector to increase productivity and profits within the sector. For this reason, the government must fulfill the function of regulating and monitoring the activities of companies, as mentioned in 1999 by the then Secretary of Ecology Sergio Reyes Lujan, "if we were to monitor 125 companies, we would solve more than 75 % of the problem" (Micheli, 2002).

Although there are also other causes, which are expected to become the majority, it can positively influence the matter. Their contributions can range from offering training programs and environmental updating to educate new generations, reducing their environmental impact by supporting the communities where they are established, creating jobs, and the community's improvement through recreation, education, and health services.

Investors represent a key point in the race for the care of the environment since without their money, many companies would not continue ahead. Their influence can support the generation of new environmental public policies, basing their conditions of participation in how sustainable companies are to environmental problems and the support they present in their community. In this transparency, there would be more opportunities for decision-making regarding whether to continue investing in a company that is not concerned about the environment.

It should be considered that caring for the environment requires such arduous work that there are private companies that have turned it into a profitable business not only for their activities but also for the environment, as is the case with ecological products or recycling waste; regarding which government financing or private investors are of utmost importance.

The academy in the relationship pollution-climate change-public health

Universities and research centers should be the epicenter of change. The groups of individuals arise who demand large corporations and the government to have better practices and find solutions or alternatives to the various sectors aligned with the 2030 Agenda.

This aid can be part of the internal approaches of universities. However, both the public and private sectors can also develop alliances to develop new tools, strategies, and other services that these centers can provide to guarantee the job's trajectory. Thus, fulfilling two important aspects simultaneously for developing the subject – obtain practical solutions in the short term and educate future generations in the long term.

Civil organization in the relationship between pollution-climate change-public health

Civil organizations' function is to help address the population's needs or problems that the government has not addressed. It encompasses environmental and public health issues, so promoting non-profit campaigns to change people's bad habits and gathering or disseminating information to help solve these problems could be their contribution.

In our country and throughout the world, civil society organizations seek to fight to reverse the effects of climate change on the planet. These organizations' day-to-day activities are in favor of improving environmental management and protecting ecosystems. Also, they pressurize governments to improve environmental legislation, monitor that laws are complied with in a correct and timely manner, and, many times, denounce in case of damage to the environment.
NGOs focused on the subject have done significant work on both issues, including disseminating information to raise awareness of environmental care and health. They also have a strong presence in improving the community on public health issues.

The function of society is to cooperate by complying with the laws and get involved through citizen participation to seek the common good. Society must play an active role in environmental and public health matters by being more aware of the actions that may harm the environment daily. Also, society needs to be more critical of companies that we believe are violating environmental laws and are not doing anything to reduce their impact on the environment. Each of us must change our habits and ways of life so that there is a change; we are the last generation that can do something to reverse global warming. We must take that responsibility with the seriousness it deserves and, above all, act with consequence.

Society, in general, has the power to seek alternatives that do not harm the planet, use resources responsibly, contribute to scientific research cases, and seek to support health services to improve their training and attention to society. The reduction of greenhouse gas emissions through improvements in our means of transport and the diet that everyone maintains can improve health (Barbero, 2012).

Education is a pivotal element to improve our environment; by forging new ideas in favor of caring for the environment, impacts can be minimized. Their rapid progress can be delayed, and education with a sustainable approach can generate innovative projects that support the improvement of the environment, which would generate positive changes in terms of public health.

Individual responsibility in the climate change-public health relationship

It is also considered that an individual's responsibility is to get involved in those practices

that seek to solve these problems and have the initiative to promote this type of practice, always seeking the common good. As an individual, our function is to take care of ourselves and the environment. Each action counts, so being informed is our primary function to take actions with the least possible environmental impact.

Collaboration between the government and interest groups for proper environmental and public health management

Collaboration between the government and other actors can be achieved from a win-win vision, generating opportunities, competitive advantages, and improving reputation. A collaboration between the government and the other actors for correct environmental management could be presented through alliances. These alliances can be driven to coordinate awareness actions in the population about climate change and its impact on health, invest in scientific studies about methods to reduce the impact of the environment, improve the population's quality of life, and support health promotion through environmental care.

Through cooperation and the creation of intersectoral alliances, it is believed that good environmental management could be generated that improves public health and, holistically, consider the needs and interests of all the actors involved to find a solution and common objective.

It is essential to mention that although companies, investors, universities, government, and NGOs can contribute significant resources individually, the actual change is achieved when they all come together. Only in this way can a change be achieved since each area will contribute to a specific section of the population by creating awareness at all levels, increasing the scope and impact. Only by working together can a change in environmental care be generated to improve people's quality of life and maintain a balance with our natural environment.

Intersectoral alliances are of great help since they allow the implementation of holistic actions that address problems from many areas that the government alone could not. This type of alliance has outstanding results since all sectors of the population row the same boat, and the objectives have a positive impact on the population, on the environment, and in this case, they could have on public health, always acting for the common good.

5. Latin American survey on the environment and public health management

As has been argued throughout this study, the impact of climate change, loss of biodiversity, deforestation, poor water management, and intensive agricultural practices are determinants considered potential risks to public health due to the breakdown of the environment's balance and the possible spread of pathogens and diseases. Therefore, public policy formulation must adopt an integrative orientation and consider the "One Health" approach, providing opportunities to design and manage public policies integrating sustainability criteria with public health policy. Likewise, early interventions should be planned and implemented to mitigate possible impacts of environmental, plant, or animal origin.

It is necessary to identify interconnected explanations between sustainability and human health to achieve a better and in-depth understanding of climate change's health implications, promote evidence-based policies, analyze the main determinants in relational behavior, and promote raising awareness of the issue.

Furthermore, addressing the challenges presented requires a collaborative effort between governments and multiple stakeholders in the region. However, the relationship between health and the environment remains little studied in academia, and discussions are often framed in technical terms. For this reason, a survey was conducted with a group of experts located in Latin American countries regarding their perceptions of the relationship between environmental and public health events in the region. It investigates how they consider the public policy work carried out on the matter, as well as proposals to improve the latter to contribute to the identification of comprehensive actions in the region that contribute to the creation of transformations that lead to a resilient, sustainable, and socially responsible economy; as well as obtain an overview of the perception that exists in Latin America on the subject.

Experts on the subject and coordinators of the Regional Program for Energy Security and Climate Change in Latin America of the Konrad-Adenauer-Stiftung (EKLA-KAS) developed the survey between October and November 2020. The survey included notes received by the first webinar organized as part of this project. Also, specialists in environmental and public health issues were consulted to ensure that the questionnaire was relevant and logically sound.

For the survey, a sample of experts was selected from various labor sectors related to environmental and public health issues. A database was compiled with 1,800 potential high-profile experts from the ten most populous Latin American countries: Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, and Peru.

The sample for each country was integrated and proportionally distributed as follows:

- 12.5% federal/national government officials, managers of environmental issues.
- 12.5% federal/national government officials, managers of public health issues.
- 6.25% federal/national legislators (deputies or senators) linked to environmental issues.
- 6.25% federal/national legislators (deputies or senators) linked to public health issues.
- 12.5% of academics related to environmental areas from the leading public and private universities.
- 12.5% of academics related to public health areas from the leading public and private universities.
- 12.5% of people in a business related to environmental issues.
- 12.5% of people in a business related to the public health sector.
- 12.5% of leaders of non-governmental organizations (NGOs) related to environmental or public health issues.

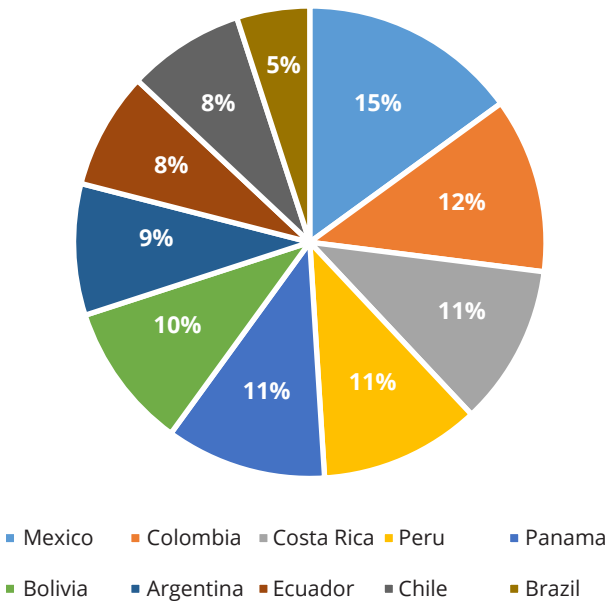
The research focused on experts assumes that their specialized knowledge can be beneficial for academic purposes and influence political lobbying. Besides, experts sometimes have significant differences in opinion among themselves on the various problems, so this plurality of perspectives provides essential knowledge from a democratic perspective and how leaders on the subject approach collective action problems.

The survey was carried out in a period between November 11 and December 11, 2020. A total of 323 surveys were answered online, and 196 telephone interviews were collected, giving 519 participants consulted.

5.1. Survey results

The survey instrument consisted of 11 questions. The first three questions were about general data: seven multiple-choice questions and one open-ended question. According to its geographical location, the experts' group was distributed (See graph 1).

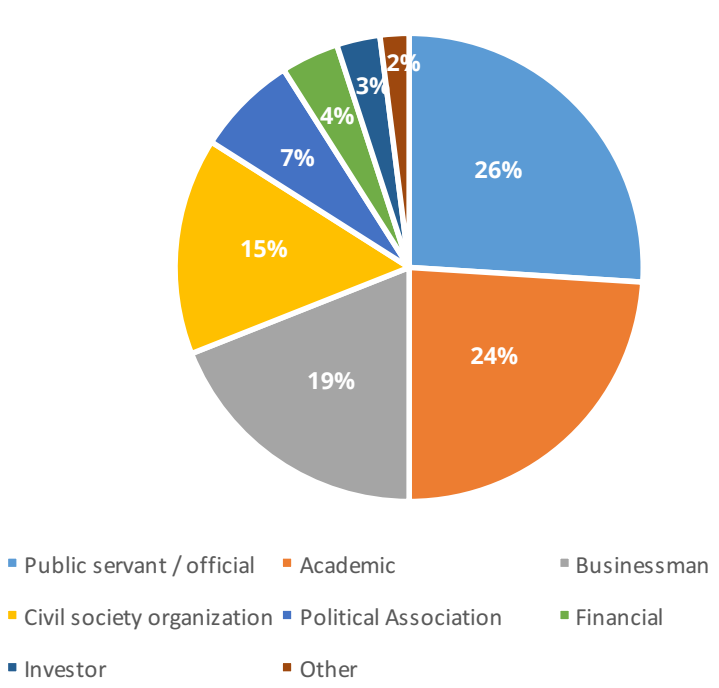
GRAPH 1. Country of origin of the people surveyed



Source: Own elaboration.

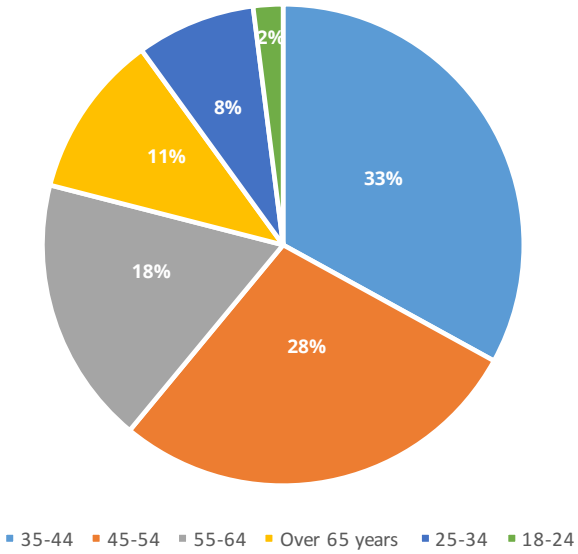
Among the sector of experts who were consulted, public officials specializing in environmental or public health matters predominated with 26%, followed by members of the academy with 24% of the participants (see graph 2). There was much variation regarding the respondents' age, but 33% were mainly concentrated between 35 and 44 years, followed by 45 and 54 years with 28% (see graph 3).

GRAPH 2. Professional profile of the people surveyed



Source: Own elaboration.

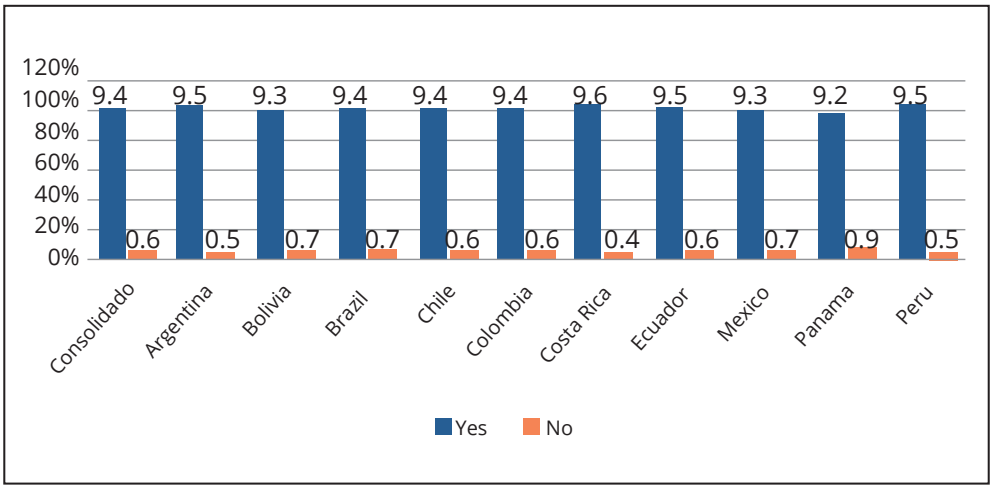
GRAPH 3. Age of the people surveyed



Source: Own elaboration.

Regarding the multiple-choice questions, the first question was: Do you consider a direct relationship between caring for the environment and public health? (See graph 4), to which most of the experts answered affirmatively with a range between 90.5% and 95.6%. Interestingly, the distribution of responses to this question among each of the countries is quite similar. However, the percentage that indicated "No" should not be underestimated since it is considered that the selected leaders are experts in one of the two topics or both. Therefore, it would be good to investigate later what is missing to evidence that relationship. Respondents in Panama were the ones who mostly answered "No" given their perception of a relationship between the environment and public health, with 8.5% denial. Conversely, the experts from Costa Rica were the ones who answered "Yes" to this relationship, with 95.6%.

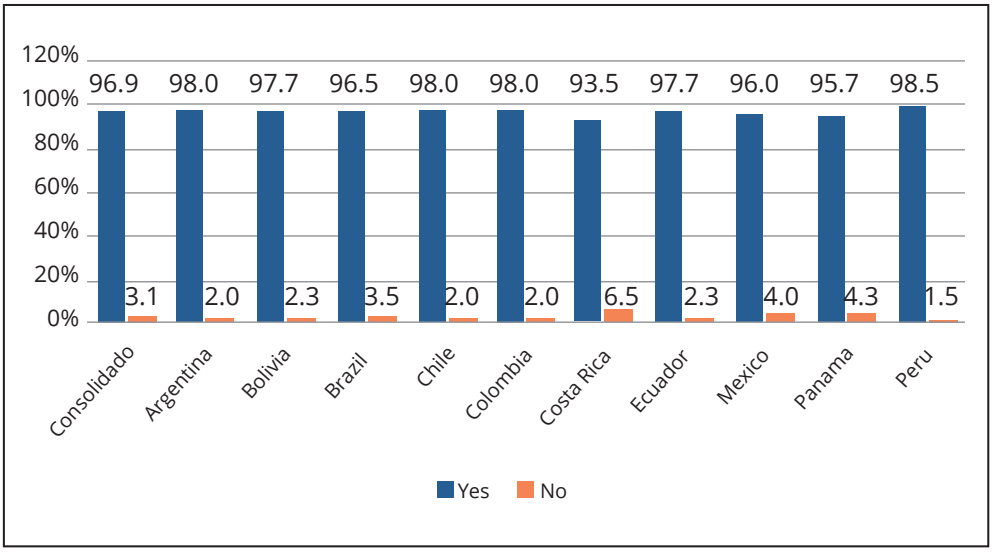
GRAPH 4. Do you consider that there is a direct relationship between caring for the environment and public health?



Source: Own elaboration.

The following question was asked to inquire more about recognizing the relationship between the environment and public health: Do you consider that environmental problems represent a serious threat to public health? The affirmative response range was even higher than in the previous question, ranging between 93.4% and 98.4% (See graph 5).

GRAPH 5. Do you consider that environmental problems represent a serious threat to public health?

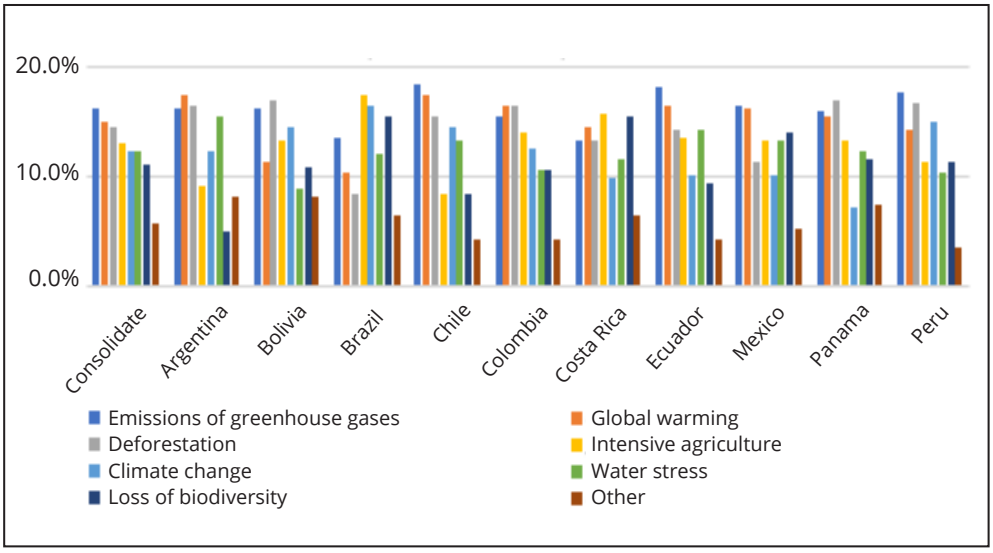


Source: Own elaboration.

Contrary to what happened in the previous question, the experts from Costa Rica indicated the highest percentage of denial compared to the other countries, followed by Panama. On this occasion, Peru had the highest percentage of affirmation with 98.4%, followed by Chile with 98% and Argentina with 97.99%. It should be noted that, in general, the plurality of the region considers environmental problems a threat to public health.

The respondents were then asked to rank eight environmental problems according to their relevance, asking: What environmental problems do you think could have the most significant impact on public health? (See graph 6). Four countries (Chile, Ecuador, Mexico, and Peru) consider greenhouse gas emissions to be the main problem; consequently, the average of the selections per country (consolidated) presents this problem as a priority.

GRÁFICO 6. What environmental problems do you think could have the greatest impact on public health?



Source: Own elaboration.

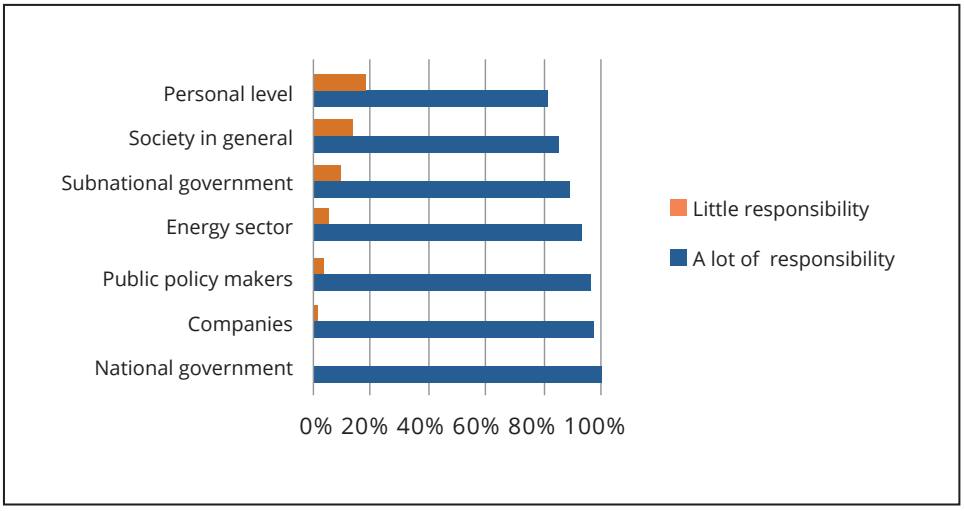
In order of importance, on a regional average, in the second place, global warming is presented, individually only Argentina considered it as the main problem and Colombia placed it among its main problems along with deforestation. On the regional average, the third place in importance is occupied by deforestation. It should be noted that all, except Argentina, considered other unspecified problems to be minor. It would be interesting to investigate this other factor affecting public health, observed by experts in Argentina.

On the other hand, it is not surprising that Brazil's main problem is intensive agriculture since, as mentioned earlier in this document, this is one of the main productive activities in the country, and that is why natural areas have been invaded, notably those belonging to the territory of the Amazon. The same situation faced by Costa Rica, followed by the loss of biodiversity, which has been analyzed, is closely related since the search for land for agriculture leads to the destruction of areas rich in biodiversity to obtain arable land.

On the other hand, Mexico points to greenhouse gas emissions as the main problem, which can be understood by recognizing that it is one of the three countries with the most polluted air in Latin America[1] and has one of the ten most polluted cities globally[2]. In general, the region is worth noting the importance of variations in prioritizing problems between countries. It is recognized that their experts have knowledge and value what is happening in their territories.

Then, it was asked to assess whom do you consider that the responsibility of caring for the environment falls on as an axiom of public health? The experts could select all the options they considered from among seven groups: national government, companies, public policy makers, energy sector, sub-national government, society in general, and personal level. They are establishing the level of responsibility of each group in a range between "a lot of responsibility" and "little responsibility" (see graph 7). Most of them were attributed a lot of responsibility to all groups. It stands out that 100% of the respondents considered that national governments have a lot of responsibility, followed by companies and, thirdly, public policymakers.

GRAPH 7. Who do you consider to be responsible for caring for the environment as an axiom of public health?



Source: Own elaboration.

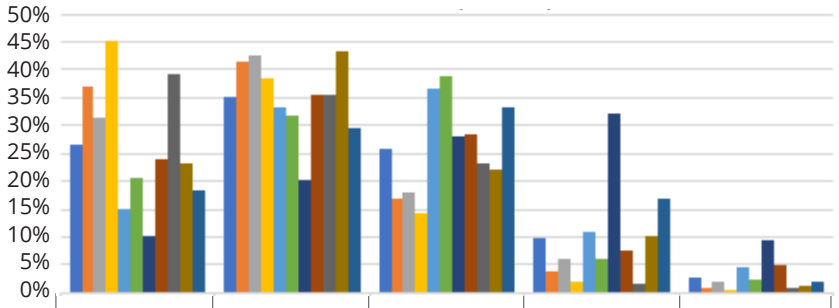
1 For more information, please visit: *https://es.weforum.org/agenda/2019/07/donde-en-america-latina-esta- el-aire-mas-contaminado/*

2 For more information, please visit: *https://es.statista.com/estadisticas/1067363/ranking-de-las-ciudades- mas-contaminadas-de-latinoamerica-y-el-caribe/*

It is interesting to observe how the subnational government occupies the fifth position in perception of responsibility compared to the national government that occupies the first position. One would have to ask, how is this link of responsibilities between governments being managed, and why the differentiation between national and subnational? The group to which the experts attribute the least responsibility is at the personal level and the second group with the least responsibility is a society in general, which is important to highlight because it contradicts many ideas present in the mass media, such as "change is in one same" or "we are all responsible."

The next question focused on the perception of the work carried out by the government in these matters, asking: "How satisfied are you with the measures of your government to favor the care of the environment and public health?" giving five valuation options that go from extremely satisfied to not satisfied at all (see graph 8).

GRAPH 8. How satisfied are you with the measures of your government to favor the care of the environment and public health?



	Not satisfied at all	Little satisfied	Satisfied	Very satisfied	Extremely satisfied
Consolidado	26%	35%	26%	10%	3%
Argentina	37%	41%	17%	4%	1%
Bolivia	31%	42%	18%	6%	2%
Brazil	45%	38%	14%	2%	0%
Chile	15%	33%	36%	11%	5%
Colombia	21%	32%	39%	6%	3%
Costa Rica	10%	20%	28%	32%	9%
Ecuador	24%	35%	28%	8%	5%
Mexico	39%	35%	23%	1%	1%
Panama	23%	43%	22%	10%	1%
Peru	18%	30%	33%	17%	2%

Source: Own elaboration.

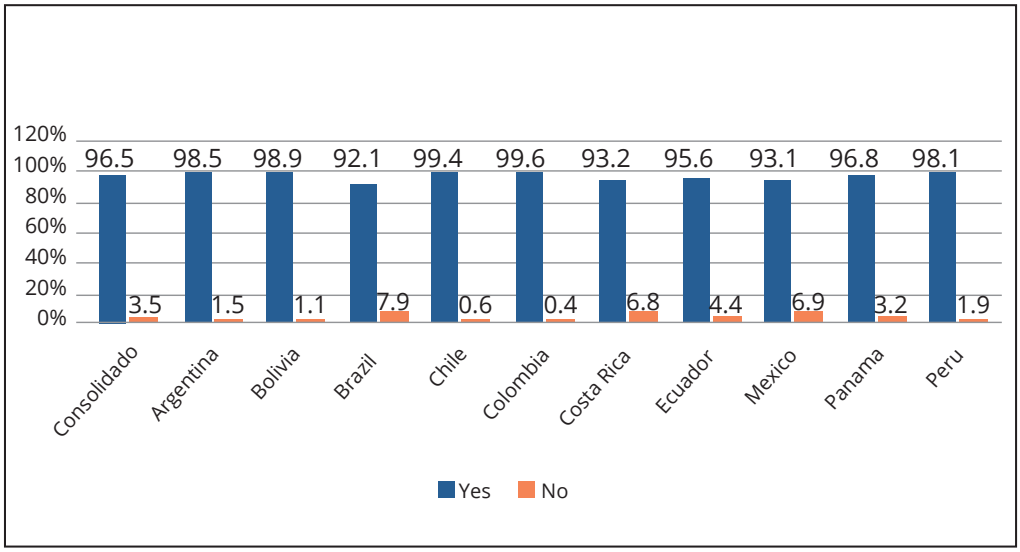
Costa Rica was the country that indicated that it had the highest percentage of satisfaction with the work of its government, with 9% highly satisfied and 32% very satisfied, followed by Peru with 2% highly satisfied and 17% very satisfied. There is a balance between satisfied and not very satisfied in Chile and Colombia, since the reporting percentage is similar with 36% and 33% respectively in Chile, and 39% and 32% respectively in Colombia.

On the other hand, Brazil and Mexico are the countries that showed the lowest satisfaction with 45% and 39% respectively of not satisfied at all, and 38% and 35% respectively of not very satisfied. In Brazil's case, it could be attributed to the fact that the president has made several statements denying the negative impact of climate change and has made decisions that affect the territory of the Brazilian Amazon, also known as the lungs of the world. On the other hand, it could be attributed to the recent cancellation of large renewable energy projects by the federal government in Mexico.

In general, the average of the surveyed countries (consolidated) is not very satisfied with the governments' measures with 35%, and there is a tie between not satisfied and satisfied with 26%. If the results are observed individually, the balance has a greater weight towards negative indications, although specific percentages per country, as mentioned above, indicate satisfaction.

The next question was: Should your country's government prioritize the protection and care of the environment when planning the recovery from the COVID-19 pandemic? With the answer options "yes", "no", and "I don't know" (see graph 9). The experts surveyed answered "yes," reaffirming the importance of joint management between the environment and public health. Brazil was the country that answered "I don't know" most frequently, followed by Mexico and Costa Rica, which could be related to the low satisfaction with the measures taken by their governments expressed in the previous question.

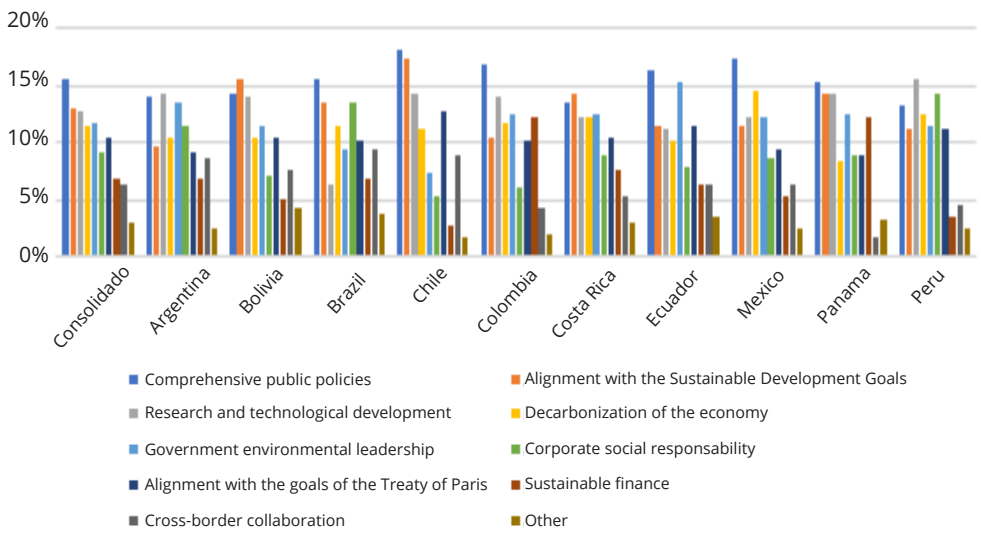
GRAPH 9. Should your government prioritize protecting and caring for the environment when planning to recover from the COVID-19 pandemic?



Source: Own elaboration.

In the last multiple-choice question, the respondents were asked to select three initiatives that they consider as the main factors for climate action (see graph 10). On average, countries mainly selected comprehensive public policy options, alignment with the SDGs, and research and technological development. Bolivia, Chile, and Panama follow this trend.

GRAPH 10. Select three initiatives that you consider to be the main drivers for climate action



	Consolidate	Argentina	Bolvia	Brasil	Chile	Colombia	Costa Rica	Ecuador	Mexico	Panama	Peru
Comprehensive public policies	15%	14%	14%	15%	18%	17%	13%	16%	17%	15%	13%
Alignment with the Sustainable Development Goals	13%	10%	15%	13%	17%	10%	14%	11%	11%	14%	11%
Research and technological development	13%	14%	14%	6%	14%	14%	12%	11%	12%	14%	15%
Decarbonization of the economy	11%	11%	10%	11%	11%	12%	12%	10%	15%	8%	12%
Government environmental leadership	12%	13%	11%	10%	7%	12%	13%	15%	12%	12%	11%
Corporate social responsability	9%	11%	7%	13%	5%	6%	9%	8%	9%	9%	14%
Alignment with the goals of the Treaty of Paris	10%	9%	10%	10%	13%	10%	10%	11%	9%	9%	11%
Sustainable finance	7%	7%	5%	7%	3%	12%	8%	6%	5%	12%	4%
Cross-border collaboration	6%	9%	8%	9%	9%	4%	5%	6%	6%	2%	5%
Other	3%	2%	4%	4%	2%	2%	3%	4%	2%	3%	2%

Source: Own elaboration.

Individually, Argentina, Colombia, Costa Rica, and Ecuador presented a variation to the general average, selecting the three main governmental environmental leadership. Brazil and Peru vary among their top pick corporate social responsibility. Mexico varies with the economy's decarbonization, a coherent measure concerning the previous answer where the surveyed experts identified greenhouse gas emissions as the country's main problem.

Finally, an open question was asked to explain with their words what public policies could improve the relationship between the environment and public health. To facilitate reading the proposals, they were divided into general categories and emptied in their entirety. Because the question was open, some categories have more proposals than others. Here are some of the proposals:

Governance

- Integrate environmental goals in all the fundamental development axes: energy production, agriculture, tourism.
- Policy to reduce the intensive use of pesticides.
- Policy to achieve synergies between the Rio agreements or at the AMUMAS level.
- Policy to generate synergies and integrate sustainable and environmentally friendly production approaches and reduce perverse incentives on the part of the productive sectors.
- Effective conservation of biodiversity, fair access to drinking water for human consumption, and agriculture as a priority for food sovereignty.
- Promote a diet that cares for the environment.
- Greater awareness of society in general, giving it the importance that the subject deserves.
- A more significant effort by governments to put public policies into practice.
- Sanctions for those who do not comply with the rules and provide the population with tools to comply with the rules (such as efficient recycling campaigns).
- Sustainable tourism, environmental policies, environmental management laws, and solid waste.
- Truly comprehensive policies that promote the reduction of emissions.
- A solution for environmental problems faced by the country through incentives and sanctions.
- Policies based on disaster risk reduction (Sendai Framework for Action).
- Adaptation and mitigation against climate change (Paris Agreement).

Education

- Incorporate this subject as a compulsory subject in health sciences, environment, engineering, and social and legal areas as an integrated system to achieve personal and professional change.
- Make the population aware of the importance of the environment in public health.

- Educate to teach how to live with other life forms.
- One of the significant barriers is the lack of communication and understanding that small actions contribute to the environment's deterioration. With this, they can have consequences that directly affect public health. A clear example is COVID-19, whose origin is presumed to be the indiscriminate consumption of wild species, which carry viruses of their species, which end up in humans, causing pandemics.
- If you have environmental education, public finance and waste management, and general awareness, you could carry out a comprehensive improvement of the environment.
- Campaign with aggressive impact to raise awareness of the changes that humans make to the planet. Provide education from a young age to future generations on recycling, saving water, and limiting population growth.
- Teach and generate love for the planet through art, free colloquia for the population where they are informed of the state, we find ourselves. To round up to have more information and campaigns to raise awareness among the population.

Mobility

- Mandatory air quality monitoring programs and their mitigation actions in cities with more than 500 thousand inhabitants.
- Policies for the evaluation, installation, and monitoring of decent, safe, punctual, and non-polluting public transport.
- Promotion of new forms of transportation, bicycles, trusts, or support for the acquisition of electric or hybrid cars.
- The gradual disappearance of private cars powered by fossil fuels.
- Investment in research and development focused on public transport, that is, that all transports are hybrids.
- Incentives to encourage the use of bicycles.
- Discourage car use, change energy generation for clean alternatives, investment in clean technologies.
- Formalization of means of transport, promoting the use of bicycles, and building bicycle lanes.
- Promote renewable energy sources and the consequent use of electromobility and green hydrogen.
- Vehicle management, fleet renewal, technology, and clean fuels.

Industrialization

- Effective programs for monitoring, sanctioning, and promoting industrial practices adhering to environmental guidelines.
- Policy for the integration of productive activities and climate change.
- Demand clarification of waste from factories since they pollute the land and seas.
- Generate a culture of general garbage recycling.

Waste management

- Promote mechanisms for the installation of Waste-to-Energy treatment plants for urban solid waste in metropolitan areas.
- More significant support for conservation and restoration schemes in areas with high environmental value.
- Drinking water and basic sanitation.

Health

- Make explicit the link between environmental conditions and health. Integrate protection and attention to environmental risks into health schemes.
- Control of zoonotic diseases.
- Consider the impacts of the environment on people's health, both short-term and long-term, with a multisectoral and multi-professional vision.

Biodiversity

- The conservation and recovery of ecosystems.
- Any public policy related to the use and management of territories, waters, and resources, avoiding considering only short-term impacts, as sector policies have been operating.
- Encourage the recovery of forest cover and establish goals for the conversion of agricultural activities to sustainable systems.

Economy

- Promote sustainable finance by establishing a sustainable reference taxonomy for the country.
- Nature-based solutions with a focus on landscape. Carbon pricing and circular economy.

Energy

- Energy efficiency policy.
- The migration to renewable and non-polluting energies.

5.2.Survey conclusion

The survey of experts from ten Latin American countries reaffirms that there is recognition, from the various positions they hold, of the relationship between the environment and public health and the importance of their joint management. However, there is still a percentage,

albeit a minimal one, that has not affirmed this relationship. Being part of the expert leaders with influence on the subject or perhaps decision-maker may represent an obstacle at work. Therefore, not it must be lost sight of. This kind of effort must continue to be made to inform decision-making that benefits all. The survey also makes it possible to see an essential gap between recognizing the relationship between the environment and public health given by the experts consulted and the measures effectively implemented by governments to be redoubled so that this knowledge and recognition run. In general, it is observed that there is a positive trend for the joint assessment of the environment and public health, which is expected to be positive in the long term for all the region's inhabitants.

6. Final conclusions

Recognizing the intrinsic connection between health and the environment is one of the critical aspects that the COVID-19 pandemic has brought to our days. Therefore, under the "One Health" approach, this study examined the relationship between the determinants associated with environmental and public health problems as common causes and consequences and how these are collectively understood for their management in the countries from Latin America. Environmental health is a significant element in public health since it allows to identification, characterize, monitor, regulate, and evaluate the physical, chemical, biological, and psychosocial threats present in the environment for human health.

The "One Health" approach aims for various sectors to collaborate and produce better public health outcomes. This study's findings aim to be beneficial to diverse stakeholders, such as government officials, legislators, academics, and actors from all sectors, to foster multisectoral responses to risks and threats to public health and incorporate collaborative approaches local, national, international, and global level.

Humanity has become a dominant force in shaping the earth, so natural resources are essential for subsistence. Environmental management could be defined as the administration and management of all human activities that influence the environment through a set of guidelines, techniques, and mechanisms that ensure a rational and sustained environmental policy. In other words, it consists of executing the environmental system based on the processes that form it and knowing what activities affect it. Environmental management must prevent and mitigate natural assets' degradation and value them since they are finite.

There are various environmental management components, such as environmental policies, where technical standards are established, and environmental legislation that establishes human behavior standards. There are also environmental institutions, which execute environmental policies and monitor compliance with them and administrative instruments, such as permits, to carry out specific actions with a negative impact on the environment.

Environmental management is a preventive tool to mitigate or stop global warming. Global warming and climate change are interrelated, although both are two different kinds of phenomena. Governments should cooperate in formulating environmental health policies that regulate environmental practices to enhance sustainable development and promote good health. In Latin America, the main problem has been the ineffective activation of current environmental health management laws. Biodiversity loss resulting from population pressure in urban areas represents a threat to sustainable growth and development.

In addition to the lack of political will in the formulation and implementation of environmental health management policies, there is also a general lack of public participation in determining laws to help solve the region's environmental challenges. There is a need for public education and participation in environmental conservation issues.

7. Recommendations

Air quality also has direct impacts on urban health. These are more complex than the impacts of high temperatures because air pollutants affect different cardiovascular, respiratory, and various types of allergies. Government, society, private initiative, and scientists must force this to move in the right direction because the survival of the planet and us depends on it. There may be a niche of opportunity if all countries design a political agenda that understands the magnitude of environmental problems and the needed solutions. Now is the best time to participate actively and creatively, to start moving towards a more socially just and equitable and environmentally sustainable system. Thus, in Latin America, we will make significant progress towards inclusive and sustainable public policy, regardless of ideologies.

The survey recognizes the importance of the relationship between human diseases and climate change due to increased temperature and pollution. Although local actions could help, at the regional level, joint collaborative efforts could be made to mitigate climate change effects through policies designed to increase adaptive capacity, create a prevention model, and commit to the reduction of greenhouse gas emissions.

In the coming years, the public policy process is essential to meet the SDGs. It will have to be a process that incorporates sustainable development from economic, social, and environmental criteria. Governments must undertake policies that improve urban and rural people's quality of life while strengthening their links. It is about the benefits of urbanization being inclusive of health care and promoting a safe environment.

Towards a correct management of environmental risks

Excessive heat and air pollution increase mortality and morbidity levels in cities worldwide; the necessary measures and actions must be taken because future scenarios predict that temperatures will continue to rise and that the effects of global warming on health may be worse.

The management of health risks can vary depending on many factors related to physiological sensitivity to high temperatures and air pollution, socio-economic variables that modify the levels of exposure to threats, and spatial locations that are dangerous living spaces.

Mitigation strategies are efforts to curb climate change, and adaptations aim to increase the capacity of human beings to adjust and reduce their vulnerability to the effects of climate change. Cities can contribute to these actions through public policies that seek to reduce energy consumption, ensure green energy, make transport and industries more efficient, among many other things. Each country will establish and manage these policies depending on its socio-economic and socio-ecological context.

Water-borne diseases can be reduced with better management infrastructure to handle torrential rains, and through urban design, better monitoring can also help reduce many climate-related infectious disease risks.

Regarding the possible reduction in world food production due to climate change, preventive measures should be taken to range from crops resistant to drought or salt to improved technologies such as drip irrigation and inexpensive greenhouses. Other possible adaptation strategies include changing planting dates and increasing crop diversity.

Reducing the consumption of fossil fuels has a significant positive impact on health, especially in developing countries. Reducing and controlling emissions will also reduce anthropogenic heat released into the atmosphere, thereby slowing down global warming. For cities, switching from fossil fuels to renewable energy will promote a healthier lifestyle and better air and life quality for urban areas.

In the region, joint efforts could be made in action plans such as using targets to reduce vulnerability to climate change, under an integrated approach to achieve the objectives, emphasizing the shared responsibility between governments, society, and companies. The development of Latin American countries' action plan to reduce vulnerability will be a significant step towards sustainable development.

Cities must have a good risk management strategy to mitigate and adapt to climate change and its effects: GHG emissions must be reduced, and cities "cooled" through multiple actions that can be carried out. Many cities have adopted surveillance, warning, and alert systems to trigger emergency responses on poor air quality days. However, there is not much information on whether these strategies have had positive health benefits.

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