

ANEXO 2 - EXPERIENCES AND LEARNINGS OF THE PRINCIPLES OF ECOHEALTH A SCOPING REVIEW

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Experiences and learnings from Ecohealth principles: A scoping review

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Table of Contents

Introduction	2
1. Ecohealth: Context and origins	2
1.1 Research question and search strategy	3
1.2 Document Selection	4
1.3 Methodology to analyze the documents	5
2. Results	6
2.1 Descriptive statistics of key terms and years of publication	6
2.2 The Ecohealth approach as a whole	8
2.3 System thinking	9
2.3.1 <i>Holistic and dynamic approach</i>	10
2.3.2 <i>Socioecological relationships</i>	11
2.3.3 <i>Health, environment and community</i>	12
2.3.4 <i>Facilitators</i>	12
2.3.5 <i>Barriers</i>	13
2.4 Transdisciplinarity	13
2.4.1 <i>Knowledge integration</i>	14
2.4.2 <i>Community knowledge and practices</i>	15
2.4.3 <i>Facilitators</i>	15
2.4.4 <i>Barriers</i>	16
2.5 Participation	16
2.5.1 <i>Community strategic planning</i>	17
2.5.2 <i>Social participation strategies</i>	18
2.5.3 <i>Facilitators</i>	19
2.5.4 <i>Barriers</i>	20
2.6 Sustainability	22
2.6.1 <i>Sustainable social and environmental changes</i>	22
2.6.2 <i>Lasting practices and policies</i>	23
2.6.3 <i>Facilitators</i>	24
2.6.4 <i>Barriers</i>	24
2.7 Gender and social equity	25
2.7.1 <i>Power relationships</i>	26
2.7.2 <i>Facilitators</i>	27
2.7.3 <i>Barriers</i>	28
2.8 Knowledge to action	29
2.8.1 <i>Influence on social policies and practices</i>	29
2.8.2 <i>Methodologies</i>	31
2.8.3 <i>Facilitators</i>	32
2.8.4 <i>Barriers</i>	33
3. Reflections and significant learning	34
3.1 ¿ <i>What is the context in which the Ecohealth approach is applied?</i>	34

<i>3.2 Systems thinking</i>	35
<i>3.3 Transdisciplinarity</i>	35
<i>3.4 Participation</i>	36
<i>3.5 Gender and social equity</i>	36
<i>3.6 Sustainability</i>	37
<i>3.7 Knowledge to action</i>	37
<i>3.8 General assessment of the principles and the approach</i>	38
Bibliography	39
Anexx 1	47
Anexx 2	49
Anexx 3	52

Introduction

The ecosystem approach to human health, or Ecohealth, is an emerging field of research, education and practice whose purpose is to improve the health of people, promote prosperous and resilient communities and favor the achievement of sustainable environments (Charron 2012). The Ecohealth approach seeks to generate knowledge to change problematic conditions based on the analysis of the interdependencies among ecosystems, society and health. The theory and practice in Ecohealth are grounded on six principles: system thinking, participation, transdisciplinarity, gender and social equity, sustainability and knowledge to action.

1. Ecohealth: Context and origins

Brisbois et al. (2017) define Ecohealth as a field of study and practice that emerged at the end of the 20th century focused on the implications of socioecological changes in human health and well-being. In the mid-1990s, the International Development Research Center (IDRC) started to promote projects with the Ecohealth approach, marking a point of inflection to its evolution. At the beginning, these experiences consisted of action-research initiatives in the South to promote human health through environmental management according to three principles: transdisciplinarity, multi-stakeholder participation, and gender and social equity (Lebel, 2003).

Soon after the seminal document of Charron (2012) extended from three to six the pillars of the approach adding: system thinking, sustainability and knowledge to action. Es importante tener en cuenta que la propuesta conceptual de los seis principios no restringe la investigación o práctica, si no que pretende servir de guía para el modo en que se investiga. On the other hand, it has been suggested these principles can be categorized into two groups: three of them which emphasize in a special way the research process and its practice (system thinking, transdisciplinarity and participation); and those that aims to the intrinsic goals of research and action (sustainability, gender and social equity, and knowledge to action) (Charron, 2012).

In this way, Ecohealth is configured as a research-action framework to generate new transdisciplinary knowledge and practices related to the interdependencies among the environment, society and health. Its goal leads to the adoption of policies and interventions to promote health and prevent diseases from a sustainable perspective.

The purpose of this document

This document was developed as an input to bridge the gap between Ecohealth communities of practice and the specific field of Food Systems (FS). In particular, the purpose is to contribute from the lessons learned in Ecohealth to research and action in healthy food systems for the prevention of chronic non-communicable diseases (NCD). The evaluation of these lessons learned in the practice of Ecohealth during a period of 20 years (1997-2017) was carried out through a *scoping review*, emphasizing on the implementation of each of the principles mentioned above. Specifically, was done a rigorous work of searching and consulting written documents (including indexed journals and gray literature) to analyze the scope in the development of the Ecohealth principles, its barriers and facilitators.

The selected documents were characterized quantitatively in terms of some general variables and then processed through qualitative methodologies of content analysis to write a narrative synthesis in which each principle was addressed, presenting its developments, barriers and facilitators. In addition, some proposals from the revised documents are presented to strengthen the Ecohealth approach and the conclusions of this scoping review are in the final section.

Methodology of the scoping review

The Joanna Briggs Institute's handbook of scoping reviews (2015) explains that, unlike other types of reviews that usually respond to specific questions, these are developed to identify key concepts which support a research area, to clarify conceptual definitions or to delineate the limits of a topic, its strengths and weaknesses. The scoping reviews can also determine the dimensions of the available investigations and also present the way in which the research has been developed.

In this review, according to the suggestions of this manual, five methodological steps were conducted: 1) identification of research questions and assign the operational definitions; 2) search of documents to answer the questions; 3) selection of relevant studies; 4) data extraction; and 5) the analysis of the results.

1.1 Research question and search strategy

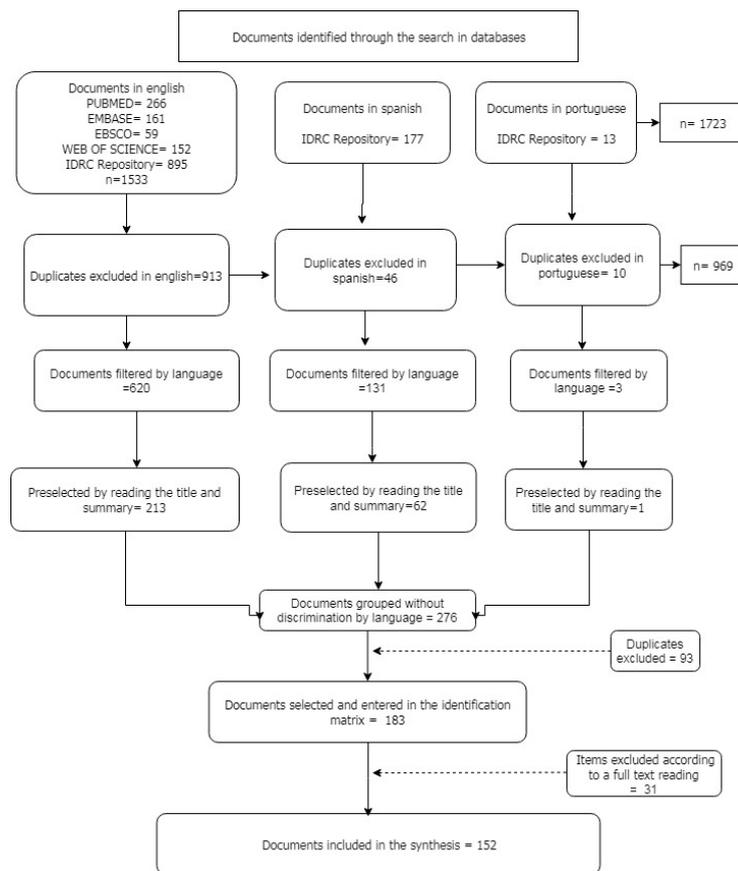
The guiding question of this scoping review was: *How have the Ecohealth principles contributed to a successful Ecohealth practice?* This main question was subdivided into specific questions for each principle to detail the context of the experiences, their barriers and facilitators (See Annex 1). Specifically, according to the theoretical definitions of Charron (2012) and Lebel (2003) an operationalization of the search strategy was proposed in relation

to the general Ecohealth approach and each of its principles. Search strategy was implemented from these inputs and queried in the databases: PUBMED, Web of Science, Embase, EBSCO and the IDRC Repository. The filters to include a document were: published texts between 1997 and 2017, in English, Spanish and Portuguese, and also gray literature (*See Anexx 2*).

1.2 Document Selection

At the beginning of the search, 1533 documents were found in English, 177 in Spanish and 13 in Portuguese. In the second phase, a filter was applied per language and after that duplicated documents were identified among the databases to be eliminated. In the third phase, repeated texts were filtered by language, a distinction that was maintained because it was found that not all documents had metadata for any of the languages of interest for this revision. During the fourth phase, the title and the summary of the texts were read to pre-select those that correspond to the objectives of the review. As a result, the pre-selected documents were 276, distributed as follows: 213 in English, 62 in Spanish and 1 in Portuguese. The fifth phase consisted of eliminating duplicates among languages, which reduced the available documents to 183. After the full text reading of each document, another 31 documents were removed because they did not fulfill with the purposes of the revision, therefore, 152 texts were finally available for analysis.

Graph 1. Flowchart of the search strategy and document selection



1.3 Methodology to analyze the documents

The methodology used was *content analysis* which, according to Krippendorff (1990), it is a reproducible methodological process to systematize the content of a document. Rules of content analysis must be explicit and replicable in all documents or analysis units. This analysis framework allows to capture the symbolic meanings as data and, second, to analyze not explicit phenomena once data is consulted. In other words, content analysis is sensitive to the context and is capable of processing symbolic shapes and establishing systematic processes through content sampling and statistical analysis. Additionally, in the content analysis, a worksheet is created to systematize and have a coding guide useful during the statistical analysis and the sampling of topics, based on the registration of data extracted from the documents.

Each document was read rigorously to be processed in the AtlasTi software. This procedure included the selection of extracts from the texts that were coded according to the operational definitions designed during the search strategy (See Annex 2). Finally, the statistical analysis and the narrative synthesis were elaborated based on the consolidated data.

2. Results

2.1 Descriptive statistics of key terms and years of publication

In order to identify the prominence of some keywords in the revised Ecohealth texts, the documents were processed to visualize the frequency of use of these terms. The keywords were counted and a word cloud was designed in which the size of the letter is proportional to the frequency. The procedure was applied for English data because this language was the most recurrent. The keywords “Ecohealth” and “Health” were excluded from the cloud due to they are words of permanent use.

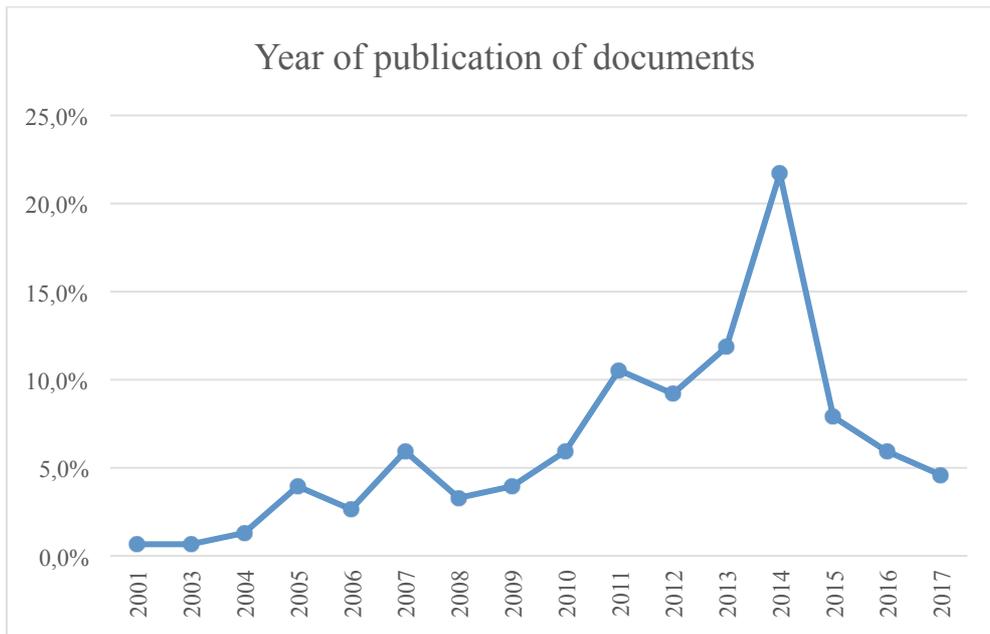
The most frequent keyword was *research*, a term to emphasize that projects are based on the Ecohealth framework. The keywords *environment* and *management* are less frequent than research and in a third place are *community*, *social* and *ecosystem*. The most mentioned words of the cloud suggest that there is an interest on investigating the interrelationships between community, environment and health. Regarding the Ecohealth principles, two of them are highlighted: *participation/participatory* and *sustainability/sustainable*.

Graph 2. Keywords cloud



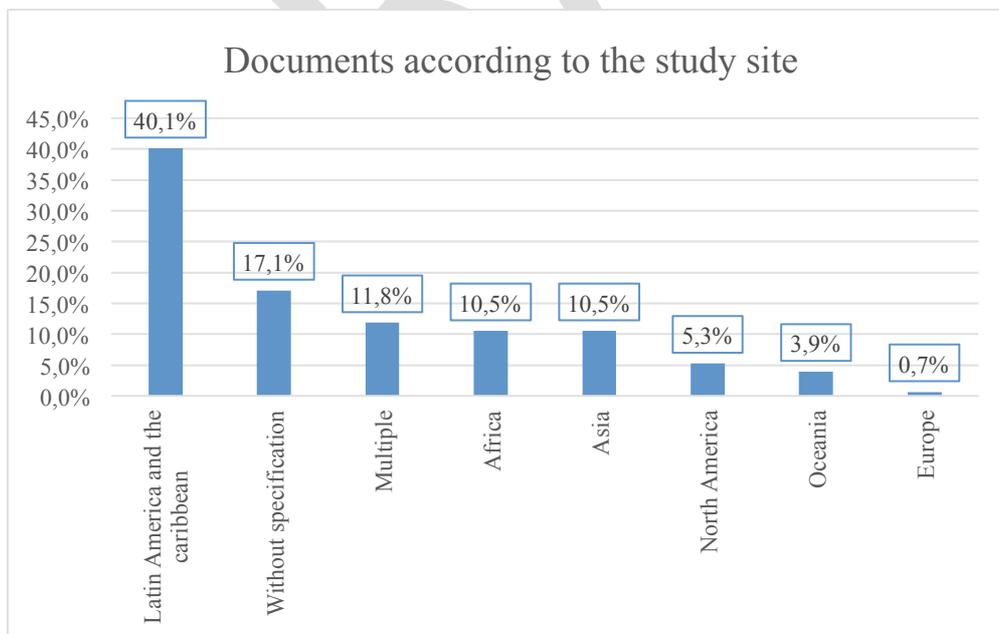
During the publication year of the documents, an upward trend was observed from 2010, with a peak in 2014 and a declination in the number of publications after that date.

Graph 3. Publication year of the documents



The revised documents were developed in a 40% in Latin America and the Caribbean and in a lesser frequency in Africa and Asia (10.5% each). Some were conducted in multiple continents and 17.1% of the publications did not register a specific place of study, since this is the case of theoretical and analytical writings and not of proposals with a practical content in a specific territorial context.

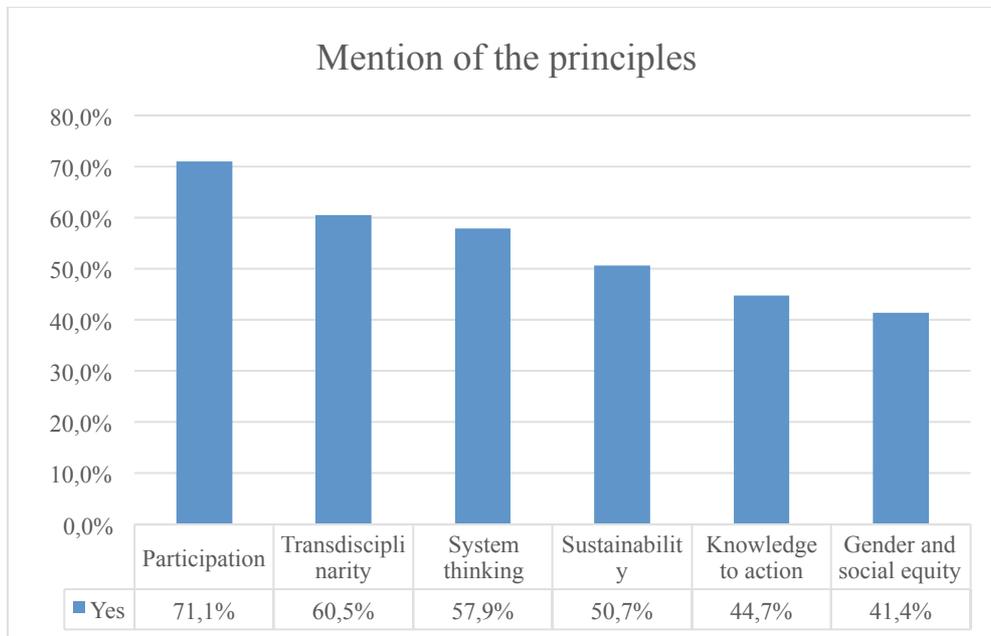
Graph 4. Documents according to the study site



The most mentioned principle in the revision was participation in 71.1% of the documents, followed by transdisciplinarity with 60.5% and system thinking with 57.9%. This is partly

explained because two of the three most frequent principles (participation and transdisciplinarity) were proposed during the first years of Ecohealth as a field of action research, while the remaining three are part of the conceptual expansion of the approach by Charron (2012).

Graph 5. Mention of the Ecohealth principles in the documents



2.2 The Ecohealth approach as a whole

The Ecohealth approach starts from conceiving health as the result of complex interactions that occur in socio-ecosystems. In particular *“a fundamental premise of Ecohealth is that human health is influenced by four subsystems that interact with each other: ecological, sociological, political and economic, and it is the integration of these epistemologies that is needed to guarantee an impact and relevance of the health research”* (Lebel, 2003 quoted by Grace et al., 2011, p. 58). Along these lines, it is necessary to recognize the Ecohealth principles as conceptualizations with theoretical purposes, with different emphasizes among them, but the practice presupposes the existence of coincidences and synergies among them.

This integrative vision of subsystems and principles is a source of complexities, challenges and strengths in the development of the approach. Specifically, according to the review proposed by Leung, Morrison and Middleton (2016, p. 772) in the Ecohealth approach *“there is a need for better documentation of the experiences of various associations that involve public health actors from academia, the State, civil society and the private sector, and how they have helped to promote programs and effective and integrating policies”*. In this sense, the analyzed texts suggest that effective communication among stakeholders is one of the challenges for the development of the projects with the Ecohealth approach because they address complex problems, involve diverse interests, technicalities may emerge and in certain cases, the perspectives may diverge between sectors, which means reaching agreements is not

an easy task (Bunch, 2016). Accordingly, Anticona et al. (2013) show that, if there is no effort to present the results in a pedagogical, attractive and inclusive way, opportunities to generate interest and develop the initiatives of the approach can be lost. In particular, in an experience with indigenous communities exposed to heavy metals in the Peruvian Amazon, researchers faced the problem of not finding potential solutions due to the lack of pharmaceutical treatments to reduce the effects of contamination. Consequently, the only viable option was to reduce the exposure, but the absence of information about the sources of the contaminant, imply serious dilemmas related to how to inform the population and make decisions.

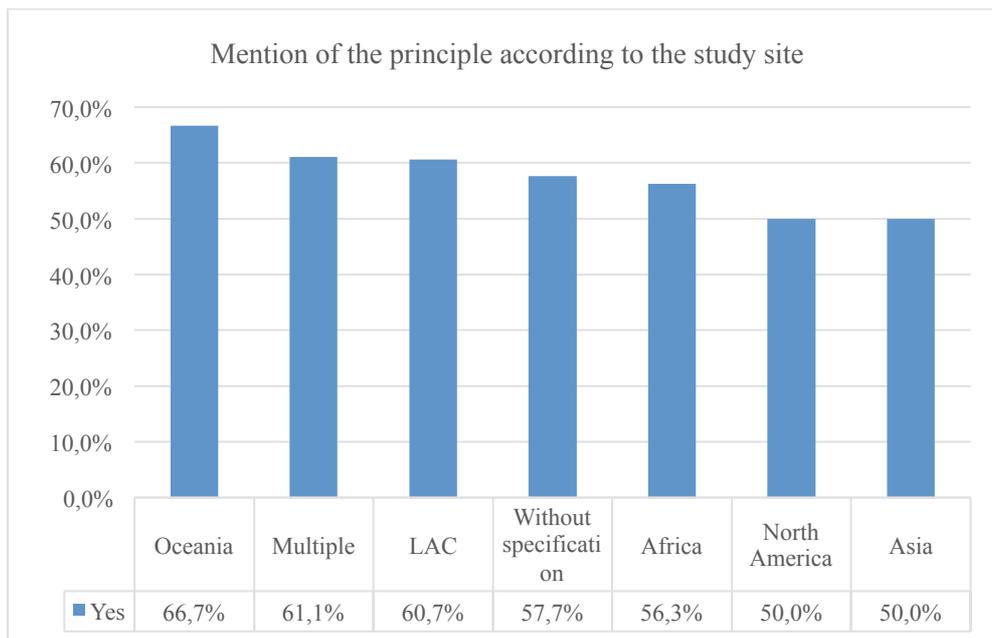
The scoping review also shows that overall experiences of Ecohealth, define the approach based on the postulates of Lebel (2003) and Charron (2012), recognizing the six principles, but not always developing all of them. Although the principles are cited repeatedly, usually to support proposals or decisions, in few cases are discussed in a conceptual manner. In a practical sense, the experiences display the flexibility of the researchers to work with the principles and not to conceive them as instructions of a manual to be applied. In this way, the text of Monroy et al. (2014) present how was possible to reduce the reinfestation of the vector significantly in a scaling-up project that began in Guatemala and was replicate in El Salvador and Honduras related to the prevention of the Chagas disease. Although the socioecological conditions, population and particular problems of each territory were recognized, it was necessary an adaptation time to evaluate the features of each area and adjust the interventions.

2.3 System thinking

System thinking can be theory, method or discipline. It allows to investigate in a holistic and dynamic way the relationships that exist among people, environment, culture, social, economic and political conditions of the community, institutional development, public policies, health system and governance. Each of the described relationships are dynamic, in this sense, the system thinking proposes a broad and integrative view, therefore, it offers a greater flexibility and creativity during the formulating and developing actions (Charron, 2012)

The principle of system thinking is mentioned only in 50% of the experiences of North America and Asia, but it is more frequent in other regions.

Graph 6. Mention of system thinking in the documents



According to the content analysis of this principle, three of its attributes are described below: holistic and dynamic approach, socioecological relationships and the interrelationships among environment, health and community; in addition, its facilitators and its barriers.

2.3.1 Holistic and dynamic approach

The documents agreed that health, well-being and relationships among humans, animals and the environment are the result of complex and dynamic interactions between factors that affect each other (Iris, 2014; Lisitza & Wolbring, 2016). The holistic and dynamic approach is understood by Mertens and Weihs (2013) as a “*complex matrix*” that determines and integrates health, in addition, is conditioned by the social and economic activities of people. Consequently, this holistic approach considers the influence of human activities on the ecosystem and the capacity to mitigate the adverse impacts of its actions.

As defined by Iris (2014, p.37), system thinking, health and well-being link a complex and dynamic interaction of several factors: “*demographic changes, poverty, urbanization, deforestation, changes in agricultural production models and in the relationship between people and animals, the management of natural resources, gender differences and cultural patterns*”.

Thus the main idea of this attribute is to relate the individual and collective features, as mentioned Méndez et al. (2011) by connecting empirical evidence of health with life patterns and social processes which determine these immediate events. Consequently, the adoption of a multidimensional perspective leads to proposals for comprehensive actions. In Africa, for example, a project about HIV/AIDS considers the disease as a set of biological, cultural, economic, political and behavioral factors related to health. In summary requires:

Tracing the pathways of complex chains of causality that link an individual man from a rural village community in any of several southern Africa countries who leaves his home and family behind and joins the circular labor migration trail to, on the one hand, the postcolonial labor system and more recently to multinational bank imposed neoliberal structural adjustment policies, and on the other hand, to emergent patterns of sexual relations. These patterns, in turn, are directly linked to specific risky sexual practices, and to the rapid and widespread transmission of HIV/AIDS and other linked infections (Singer, 2011, p. 22)

This holistic and dynamic approach is also illustrated by Lam et al. (2015) in an experience in Canada about the study of vector-borne diseases (i.e., Lyme disease, West Nile disease and others) and the conditions that determine their potential growth. In this experience, the team proposed an understanding of the dynamics of vector populations through primary and secondary information to build indicators at various levels and dimensions. For example, the project registered data about: biodiversity, wetlands, water quality, energy consumption, greenhouse gas emission levels, residential waste, agriculture and livelihoods, land, air and climate change. This information was analyzed using the framework of the driving forces also known as DPSEEA (Driving forces-Pressure-State-Exposure-Effect-Action) to identify environmental and health trends linked to potential growth of the vectors.

2.3.2 Socioecological relationships

The documents emphasize the interaction between social dynamics and the environment. In accordance with Leung (2012), the incorporation of multiple perspectives address to a better understanding of health, focusing on the interconnections between the components rather than the structures. This is theorized in an Oceanic experience of Bunch et al. (2014, p. 19) in which they affirm: “*health and well-being are emergent properties of interrelated social and biophysical processes (coupled human and natural systems)*”. By extension, the health of the ecosystems is presented not only according to biophysical features but also due to their socioeconomic conditions and processes. For example, in the technical report of *Ecosad* (2013) about social medicine, governance and Ecohealth in Latin America and the Caribbean, biophysical factors are understood as: climate, atmospheric chemistry, energy of materials, food and soil fertility; while the socioeconomic aspects include: to sustain the economic activity, social services and human health.

Another relevant component between society and ecosystems is that they can be understood if their consequences are positive or negative for health. In a positive sense, as Belanger et al. (2008) expose in a project that addresses the small and large scale benefits of plants, it indicates at the local level, that individual tree species can be appreciated for its shade and protection from rain, while on a large scale, vegetation influences climate, carbon cycle and global warming. While others highlight the negative aspects of this relationship between human beings and ecosystems, such as Arguello (2014, p. 341) in a case about vector-borne diseases in Latin America, mentioning that the transmission of the disease is related with:

Cultural habits such as the accumulation of waste in the yards, because they serve as vector breeding sites (for the case of dengue). Also, in the malaria case, the attraction of the Anopheles is associated among other factors, to the accumulation of dirty clothes at homes, because it is attracted to the pheromones impregnated on them.

2.3.3 Health, environment and community

Ecohealth projects to control Chagas disease in Latin America and the Caribbean exemplify how understanding the interrelationships among health, environment and community are vital to incorporate a system vision. In this sense, Pellecer et al. (2013, p. 638) present the importance of how the construction and maintenance of housing by the community influences the control of disease vectors:

First, houses are often built using forest materials that contain insects and introduce vectors into the home. Second, many rural houses have characteristics that make them attractive for insect vectors. Cracks in the walls or clutter provide ideal hiding places, and dust from the dirt floors is used by some species such as camouflage and often to house their eggs.

Another convergence regarding this attribute is the necessity to integrate indigenous knowledge and traditional wisdom with scientific approaches. In the words of Wahbe et al. (2007, p. 476) *“as a strategy to promote health, the management of resources and conservation”* and is manifested in a comment by an indigenous person in Oceania, who adds about the integral care of the environment *“It’s not only nature, it’s us, because that’s where we came from. We are the dust of our lives and that’s where we going to go back. So, our land where we live, it’s our mother”* (Johnston, Jacups, Vickery, & Bowman, 2007, p. 494).

2.3.4 Facilitators

The incorporation of system thinking is facilitated by the transdisciplinary vision of Ecohealth and by the request of the participation principle. In this vein, it is frequent that the documents highlight how ecosystems are defined by the interrelationship between their elements and not by the structure of their isolated components. As a consequence, there is a need to analyze the links between the pressures of human activity on ecosystems and their effects on health of ecosystems and people.

System thinking in the analysis of human health is a task that requires addressing the complexity in socioecological, socioeconomic and cultural terms. That is why an indispensable facilitator is the search of multiple information sources from different points of view. For example, in North America, a project established the DPSEEA analysis framework in relation to system thinking and complexity. This framework requires the integration of diverse dimensions of data: the driving forces (i.e., population growth, economic development and technology); the pressures (i.e., production, consumption, waste release/emissions); the states (i.e., natural resources, natural hazards, pollution); the

exposures (i.e., absorption of doses, dose of objective organs, education, awareness and external exposures) and the effects (i.e., welfare, morbidity, mortality and actions) Lam et al. (2015).

2.3.5 Barriers

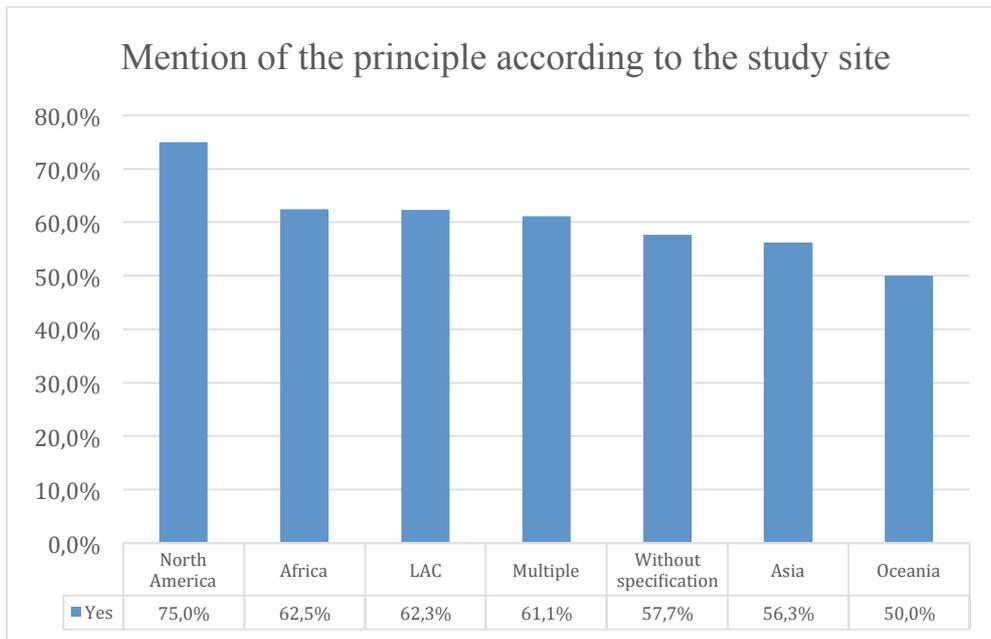
The effort to integrate information collected from different dimensions, requires new ways to analyzing and understanding. In Latin America, for example, one of the projects indicates that *“the analysis of complex interactions remains to be resolved. It is a challenge for researchers to analyze multiple interactions between social and environmental variables. New statistical and non-statistical models are needed, new forms of explanation to account for complex problems and changes generated by interventions”* (Mboera, Mfinanga, Karimuribo, Rumisha, & Sindato, 2014, p. 20).

Additionally, a study in Argentina about Chagas disease by Llovet and Dinardi (2014), draws attention to the difficulties encountered to integrate and appropriate knowledge and practices proposed in the complex local and government scenario in an effective manner. In particular, to ensure the continuity of strategies to control the disease, there were inconvenient in the monitoring phase once the project was completed, since there were difficulties in sustaining epidemiological surveillance due to the weak articulation of the agencies in charge of vectorial control with primary health care systems in the provinces.

2.4 Transdisciplinarity

It proposes to approach and explain a problem from all possible perspectives, starting from the interaction among actors, knowledge areas, beliefs and diverse knowledge, but with an understanding not only considering a sum of disciplinary efforts, but in the creation of a conceptual and action framework to generate new knowledge. Transdisciplinarity seeks to articulate scientific knowledge, decision makers, stakeholders and traditional or popular knowledge, promoting consensus and cooperation (Charron, 2012).

Graph 7. Mention of transdisciplinarity in the documents



Transdisciplinarity is mentioned in more than half of the documents analyzed. By regions, it was more frequent to find it in texts of North America (75%), Africa (62.5%) and Latin America and the Caribbean (62.3%).

The analysis of this principle is presented in two of its attributes, one focused on knowledge integration and the other on community knowledge and practices; in addition, its facilitators and barriers are presented.

2.4.1 Knowledge integration

Iris (2014) expose that the incorporation of diverse perspectives and practices is not only a pretension to explore different positions, but a concern to bridges between areas of knowledge and its methodologies. Likewise, Mikhailovich (2009, p. 326) proposes that the involvement of actors requires decision makers, academics, the community and those who contribute to the problem or can be part of the solution, suggesting that one of the objectives of this integration is to achieve a common understanding of the roles, functions and tasks of those who conform the group.

Overall, the experiences demonstrated an effort to address the problems and contexts taking distance from the unidisciplinary viewpoints and promoting a convergence between disciplines, as Connell (2010), emphasize, it is an overlap of the disciplinary domains, while the specialties contribute from their potentialities.

The definition of a common language is one of the main strategies, as mentioned Lebel (2003) due to the conditions and characteristics of the transdisciplinary work, highlighting that from the first phases it is necessary to establish communication strategies and work protocols that are known and approved by each of the participants.

Transdisciplinarity dialogues with holistic perspectives and complex thinking, then, as Crawshaw et al. (2014) the study of health needs a dynamic and integral vision, the cooperation of disciplines, stakeholders and the work of those who do not usually meet for a common goal. Mariapia et al. (2015) also mention that the search is therefore necessary to involve the community in order to deepen understanding of the context and to recognize community perceptions and experiences. One of the cases which illustrates this idea was found in Peru, where academics, state officials, farmers, and regional and international cooperation organizations met to conduct a modification of the usual irrigation system for drying rice changing it to short periods of growth cycle. The aforementioned, reduced the population of mosquitoes which transmitted diseases and allowed to obtain additional benefits by reducing water consumption and improve rice production by 25% (CIID, 2010). Another example displayed by Sherwood, Cole and Crissman (2007) in Asia, where the integration of local experiences, perceptions and practices, the abuse of pesticides and highly toxic products was recognized.

2.4.2 Community knowledge and practices

According the documents reviewed there is an effort to involve the community, because as Dakubo (2013, p. 38) notes, *"hybrid research that integrates local and traditional perspectives has been useful in understanding ecological and social processes in a historical context."* Marruffo (2014, p. 4) displayed how during an experience on dengue prevention in Venezuela, training of people that built a community epidemiological surveillance, was crucial in the identification of potential breeding sites by the contributions of these leaders from their knowledge and daily practices.

In particular, in Oceania, the incorporation of indigenous knowledge and practices was observed, highlighting close connections of these communities with the biophysical environment that make visible what goes unnoticed by academic work (Charron, 2012). In the same way this idea is found in the text of Gascard (2002, p. 3) by noting that the indigenous point of view comprises health in a holistic way and differs from the hegemonic vision in the West, in which "the white man has all the answers, but the natives know what they are doing". This discussion between academic and community methods can recognize the unnoticed and give clues to an innovation towards the unexplored (Charron, 2012).

At the same time, local knowledge requires a questioning to determine its accuracy, completeness, replicability and applicability. In the words of Dakubo (2013) there is an openness for transdisciplinary participation, in which knowledge is not hierarchized, nor ranges are established to determine that one position is better than another, but it is a co-operated work where all parties complement each other to generate new knowledge.

2.4.3 Facilitators

Transdisciplinarity is based on the construction of a common language and a research protocol to assign functions, roles and tasks is fundamental, hence, it is recognized that each actor contributes knowledge and practices, but this kind of strategies are required to facilitate

dialogue, promote integration among those who participate and leads actions towards a consensual objective (Charron, 2012)

In experiences like Parkes (2017) he proposes a transdisciplinary connection not only in an academic sense, but in spaces of sociability related to those who investigate, stakeholders and interested parties to promote recognition of diverse perspectives.

A recurrent facilitator in the documents is related to the strategies during the integration of actors involved. As an example Arroyo (2011) concludes that establishing connections among the academy and the NGOs is a way to promote social commitment and is an input to find solutions to social and environmental problems. However, according to the author, these connections must be made while taking into account a scientific rigor approach.

2.4.4 Barriers

Transdisciplinarity aims to encompass diverse perspectives, conceptions, and values, and therefore, requires an elaboration of a research protocol, knowledge exchanges and integrate all of them (J. Spiegel et al., 2005). Consequently, some authors note the need for a broad synthesis for this set of positions and promote collaboration, highlighting that "*the critical 'barriers' can be better considered as those that arise (...) from the differences in values between the makers of policies, citizens and scientists, that interfere with the exchange of knowledge and transdisciplinary cooperation*" (J. Spiegel et al., 2005, p. 277).

Another barrier is the limited theoretical and methodological discussion on transdisciplinarity, as mentioned Dakubo (2013), thus, justifying the incorporation of diverse visions with a transdisciplinary foundation requires more than just a mention.

On the other hand, from Latin America it is emphasized that this principle faces as a barrier a university education that follows unidisciplinary models, hence authors mention among the limitations "the structure of universities that favor hyperspecialization and, administratively, difficulty for work team up (Betancourt, Mertens, & Parra, 2016, p. 175).

Finally, lack of trust between involved parties constitute a barrier to the development of transdisciplinary work. Therefore, as mentioned by Nguyen et al. (2014) it is key to engage community from the earliest phases of the project and to build step by step processes with local population ; in this way, their voices will influence new decisions that will address the experiences in Ecohealth.

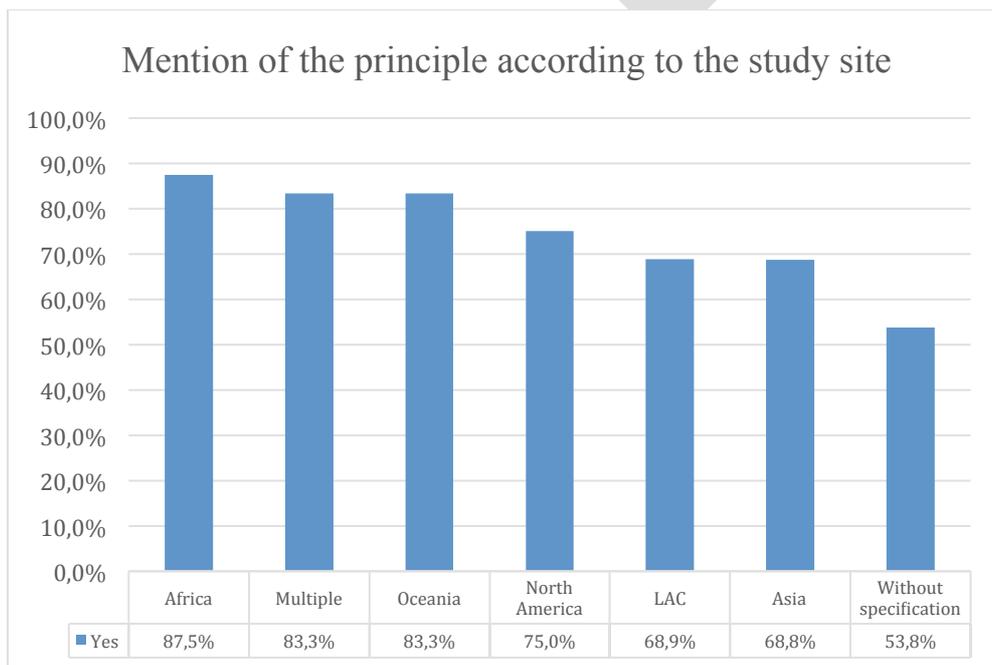
2.5 Participation

The participation of multiple actors is fundamental to generate new knowledge and facilitate actions which are part of the research or are its consequence. It is a process in which social actors with different roles, interests, positions and resources converge, in other words, researchers, population, decision makers or interested parties. One of its attributes,

based on participatory action-research, consist of involving the affected as part of the process of defining the problems and their solutions. The dialogues between the diverse actors, are obtained from the consensus, the communication and the strategic planning which allows to generate new knowledge. (Charron, 2012).

The principle of participation was the most enunciated among the different experiences consulted, perhaps because it is one of the founding pillars of Ecohealth, which highlights the importance of involving all interested parties. Just over half of (53.8%) the documents without a specific place of study mention the principle. In particular, this revision underscores some texts from different experiences in Venezuela in which the principle at a theoretical level is discussed and its understanding is enriched as an educational process, of public incidence that requires social mobilization and that can lead to the strengthening of the decision-making capacity of the communities (Bonilla, 2014; Briceño & Ávila, 2014; Carrillo, 2014; Castro, 2009; Cruz, 2014; Guevara, 2014; Llovet & Dinardi, 2014; Perdomo, 2014; Vargas, 2014; Villaroel, 2014).

Graph 8. Mention of participation in the documents



There are two attributes presented for this principle: community strategic planning and social participation strategies; in addition to its facilitators and barriers.

2.5.1 Community strategic planning

One of the frequent strategies to incentivize participation is to start contacting key players. In that sense, Mertens et al. (2012) they argue that existing networks, such as those from person to person, between groups and institutions, are in principle an option that implies lower resource costs and tend to be more effective when the first contacts are established. Likewise,

these networks are not just an access method, but, as is proposed by Caprara et al. (2015), make possible the promotion of discussion, the appropriation of knowledge and the extension of proposals to involve new actors.

In the projects whose objective was to suggest and develop specific initiatives to benefit society, the environment, health and community strategic planning was one of its pillars. Specifically, as is exposed by Waleckx et al. (2014), it is decided to coordinate and relate the attention programs with the feelings, practices and knowledge of all the participants, to arouse an adjustment of the programs to the interests, searches or perspectives of the actors. Two cases illustrate this idea: Nguyen (2014) proposes the need to link the community since the earliest stages and discuss the new findings and contribute to decision making with them; and Berbés-Blázquez et al. (2014) they say that participatory processes are a valid path for the population to appropriate the knowledge, to empower themselves and to internalize sustainable practices. An example of the last idea is the case reported by Spiegel et al. (2005) about miners exposed to mercury in Africa, Asia and Latin America, in which training strategies were developed for some members of the community to assure a sharing of the responsibilities of the information gathering process. Similarly, Nguyen et al. (2014) registered the training of local community research assistants and leaders in Ecohealth.

Finally, one of the challenges of such strategic planning is to conciliate the diverse interests among the local population, researchers, social and business associations, since they tend to be divergent. One of the experiences which demonstrate the effort to reach an agreement is mentioned by Charron (2012) regard to the exploitation of manganese in Mexico or stone crushing in India, places where large companies were involved in shared actions to address community health problems and they did not focus only on their particular economic interests.

2.5.2 Social participation strategies

The instruments to gather information in relation to the principle of participation are constructed to characterize the places and actors related to the initiative which is been developed. Two types of participation are identified, as is explained by Hamilton (2005): on the one hand, an evaluative / passive participation, which inquires about the context at a general level referred to a problem, in addition to perceptions and opinions; on the other hand, a participatory action research that potentially provides a more accurate information and is interconnected with the improvement of human health, natural resources management and the development of new practices.

Generally, the revision evinces that despite being participation a principle which is mentioned in the texts, it tends to be passive due to the processes are concentrated in data collection and assessments around a problem through different methodological instruments (i.e surveys, informal talks, workshops, interviews, focus groups), but there is no a preoccupation to foment the appropriation of knowledge and practices of those who in principle are the direct parties involved. However, as a contrast there are two examples of active participation

strategies aimed to empower the population, such as: volunteer training workshops in Ecosalud, as is detailed by Sripa et al. (2017) about the experience in a village in Thailand, where members of the community and the work team visited door-to-door to other residents of the locality, to sensitize them about the infection of the opisthorchiasis; or the case displayed by Harper et al. (2012) in Canada with the Inuit, an indigenous population who participated in each phase of the study, which means: writing, data gathering, analysis, interpretation and results presentation.

Finally, stimulating the linking of the actors was a challenge due to the diversity of interests, values, practices or perspectives. That is why the review recognizes that the strategies of participation in the experiences consulted, endeavored to adapt them to each context and to think about them in a pedagogical way, such as the designing of a calendar with indigenous from Colombia using strategic data to allocate actions and resources according to the season (SantoDomingo, Castro-Díaz, & González-Uribe, 2016); courses and educational instruments for teachers, schools and students in Venezuela on dengue (Guevara, 2014); the creation of neighborhood groups in Cuba for the prevention of dengue (Díaz et al., 2009); mapping and taking pictures of everyday places by members of a population in an experience with informal settlements (Bunch, 2016); conducting social entertainment activities to promote strong relationships among all participants and not only emphasize in investigative actions (Sripa et al., 2017); and taking advantage of previous successful experiences, which due to its results, can motivate the community to participate in new studies related to Ecohealth (Fang et al., 2011).

2.5.3 Facilitators

Effective communication stimulates the participation of different populations. Feagan (2015) recommend that during the work with local population they are invited to express themselves in their everyday language, which means they can take ownership of what they say and generate bonds of trust. Likewise, Bunch (2016) emphasizes that the recognition of the particular interests of the populations, is a way to encouraged their participation, as is illustrated in their experience about the mapping of informal settlements of low income, where the population was involved in the production of multimedia and georeferenced content through photographs and photovoices of places and situations of their own community that they perceived as relevant, to in a next step, explain their reasons and meanings to the project members and include this data in the final map.

The review of documents also demonstrates an effort to validate local knowledge, proposing as a strategy, to become the residents as agents of change by promoting practical initiatives with an Ecohealth approach. An example of this idea is illustrated by Chimbari (2017) in one case in Africa, where the community was involved in the financial discussions of the project, which meant they were implicated in each phase of the process. Similarly, a dengue control experience in Brazil opted for a joint administration of the project in which *“the objective was to empower the community and establish a co-management group, emphasizing*

individual and collective responsibilities for the prevention of dengue , so that they can act as multipliers in the community” (Caprara et al., 2015, p. 100).

Another facilitator in accordance with Mertens et al. (2012), is that to obtain positive results in this principle, it is necessary to recognize the existing networks among the interested parties, identify opinion leaders and, based on the findings, encourage participation. As an example, the experience of Anticona et al. (2013, p. 3) with indigenous people from the Peruvian Amazon, proposed some steps to facilitate the participation: “(1) to become aware of the study’s historical context, the partnership members and, other stakeholders, (2) to cultivate a common understanding of the problem among all the ORC delegates, (3) to achieve agreement on the rules of participation, and (4) to establish preliminary contact with the affected communities”.

2.5.4 Barriers

Despite the efforts to contextualize and characterize the populations and territories, a weakness in the experiences is the lack of historicization of the study object. An example of this situation is mentioned by Waleckx et al. (2014) in an experience in Mexico related to Chagas disease, where the population did not perceive their condition as a risk situation. Therefore, a sensitization phase was necessary for local residents, while for researchers, it implied to understand that the explanations of the phenomenon are not only comprehended from the perceptions gathered during the early phases of the research, but by deep-rooted local visions of how to comprise the world. On the other hand, in Ghana some focus groups were conducted to assess how men and women perceive their health, these groups had to be separated, due to the fear of the participants to show themselves as *weak* in relation to the other gender:

The focus groups were disaggregated by gender because it was found that women were reluctant to talk about their health issues in the presence of men, for fear of being called 'lazy wives'. Similarly, men were reluctant to talk about their health issues to women for fear of being perceived as a 'fragile' male figure (Dakubo, 2013, pp. 35–36).

Another potential barrier for the participation principle is suggested by Dakubo (2013) regarding to the existence formal and informal rules which influence public actions and opinions, and therefore have to be considered when formulating participation strategies. For example, an experience in Mexico to control Chagas disease, reported by Waleckx et al. (2014) coincided with the development of local elections, and this led the population to perceive the study as an initiative linked to local government. Consequently, it was necessary to move the actions and strategies of the study to schools and health centers in order to highlight “*the non-political nature of the intervention for the control of the vector*” (2014, p. 147).

In some Ecohealth studies the local population considered that due to they participated in the studies, they would have the opportunity to obtain economic benefits. Anticona et al. (2013) present an experience of exposure to heavy metals in the Peruvian Amazon, which part of the local population expected a compensation from the oil company and even those who had not been affected by the situation were annoyed about not being contaminated. Another similar event occurred in Ecuador with farmers who deemed a project as an opportunity to access to cheap credit, seeds and agrochemicals:

Engineer, I would like to ask you if it is possible to get some sacks of fertilizer as a gift from the institution [INIAP] for a new plot. I know you want to have a lot of FFS [Farmer Field Schools] everywhere, and we are the ones who will represent the results, and will tell the others that we have had a good experience. I think we can also say that the institution gave us good support. That is why we are asking for some help (Sherwood et al., 2007, p. 185).

Communication problems were a barrier and it was evident when participants did not speak the same language. An example of this is illustrated by Johnston et al. (2007) in a case with an indigenous population in Oceania, where there was not the support of translators and it was necessary for the youngest to act as interpreters, but this implied that it was not possible to deepen into the interviews. Similarly, researchers in Canada underscored that transmitting an academic message to decision makers is a challenge. Because of that, to facilitate the discussion of the Ecohealth initiatives as possible proposals of the government agenda, it is necessary to not only present them in an academic sense, but also in a practical manner and easy to be integrated into public policy, in order to generate closeness with the message which is being exposed (Leung et al., 2012).

In relation to trust, some documents identify among the obstacles for a work team the lack of credibility of the community if new researchers were arriving to a territory which was part of another investigation before. The case of Anticona et al. (2013) in the Peruvian Amazon with indigenous populations, since the early phases of the project there were obstacles because local residents perceived that they were only used to gather data during other past experiences. Therefore, the work team chose to develop and maintain relationships based on trust among all interested parties, a process that was complex and constantly re-evaluated.

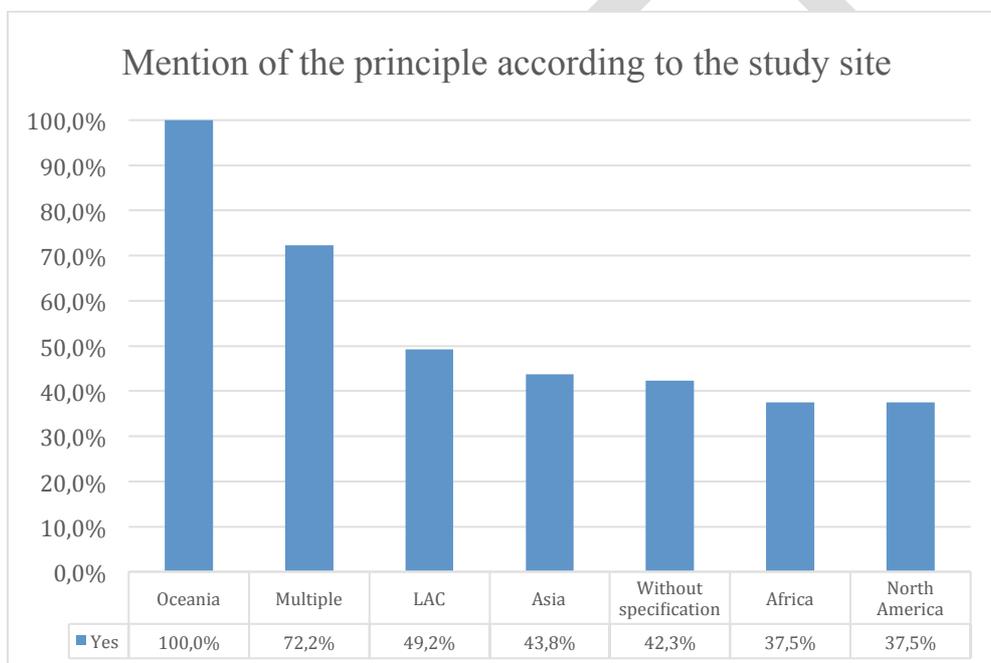
One of the biggest obstacles faced by the projects reviewed was to involve the community in participatory action research processes to promote the appropriation of changes in practices and knowledge. In this regard, in a case to prevent dengue and Chagas disease, Boischio (2009) who indicates that the participation of local actors tends to be subordinated to decisions already made -without participation- where agencies and organizations act without truly compromising the community. This is an obstacle also highlighted by Lebel (2003, p. 37) by stating that: *"nearly 95% of participatory programs remain at the level of passive participation, where researchers only tell people what they plan to do. In these cases, people simply provide information and answer questionnaires"*.

2.6 Sustainability

It proposes a harmony between research and actions to influence the environment in a balanced and lasting way, protecting the biological, social, cultural, political and economic scenarios that are fundamental for human health and wellbeing for both present and future generations future (Charron, 2012).

The principle of sustainability is mentioned in all Oceania documents. In the others, it is referred in less than 50%, with the exception of the category of various continents with 72.2%.

Graph 9. Mention of sustainability in the documents



To analyze the sustainability principle, two attributes are characterized below: sustainable social and environmental changes and lasting policies and practices. In addition, its facilitators and barriers were identified.

2.6.1 Sustainable social and environmental changes

In accordance to Charron (2012) sustainable environmental and social changes involve the notions of the Brundtland report (World Commission on Environment and Development, 1987) about the capacity of society to satisfy its current and future basic needs, in addition to the multidimensional links among health, society and the environment. Thus, sustainable societies are defined by the capacity to produce working conditions and a fair, healthy and dignified life.

In that sense, these changes conciliate with the satisfaction of human needs without risking the ecosystem in the long term. Rapport and Singh (2006) affirm that human being has a fundamental role in caring for their environment, because there is a close interdependence between society and the environment. Likewise, they emphasize in their text that the favourable changes in this relationship are: reduce greenhouse gases, restore degraded land, stop the loss of biodiversity, maintain forests, water channels and wildlife.

2.6.2 Lasting practices and policies

In the initiatives identified by the revision as sustainable, it is reiterated the promotion of organic agriculture and the reduction of the use of pesticides, with the aim of contributing to the ecosystem care and life quality of small producers. Lebel (2003) synthesizes this idea by noting that proposals with an Ecohealth focus aim to foment a synergy between sustainable changes in agricultural practices and human health, to ensure the continuity of viable agricultural ecosystems. Cole et al. (2011) exemplify this purpose in a project in the Central Andean region (Ecuador, Peru and Bolivia), where the agroecosystems of vegetables and potato crops are investigated, the impact of the use of pesticides on the biodiversity of beneficial insects for crops, pests in relation to planting stations and strategies to promote the natural regulation of agroecosystems. This experience demonstrates that there are phytosanitary problems in potatoes crops and vegetables exposed to the intensive use of chemical fumigations, which lead to problems such as fungal diseases that are also treated with insecticides. As a result of this situation, the work team and the community identified the main crops pests to: train farmers in their recognition; intervene in a healthy and sustainable way; and encourage the sustainable commercial production and articulation of organic products.

One element to underscore in the revision around sustainable proposals is related to the necessity of the participation and commitment of the communities in terms of promote an appropriation of the knowledge and practices in accordance with the findings so that changes are meaningful and lasting. In Africa, for example, Mwesigwa & Maina (2007) expose in one of the reports about some discussion workshops with an Ecohealth focus, a strategy which was proposed to conduct home visits to foster favourable health practices such as: avoid releasing human waste from latrines through the use of sanitary batteries and using drainage channels. The community, therefore, was involved in the cleanup of the area and the local government trained community leaders to educate and sensitize the rest of the population.

On the other hand, the importance of the public authorities actions is mentioned in the documents, in such a way that the work initiatives are not reduced to community participation. In Asia, Fang et al. (2011) mentioned that China government encouraged the importance of “*green vegetable*” promoting its cultivation, with standards for its production which included a healthy, productive and technological environment, and a reduced use of fertilizers and pesticides. Consequently, among the benefits of the strategy it is highlighted that the contamination of water by toxic pesticides decreased. In another similar experience

about pesticide research, in northern Ecuador, Sherwood, Cole, & Crissman (2007) suggest that the reduction of the use of pesticides and insecticides decreases the toxics in the environment and benefits human health, impacting positively on the population and productivity.

2.6.3 Facilitators

In the documents consulted, the use of sustainable technologies and the actions of the population were highlighted as relevant factors. Fang et al. (2011) enunciated in a case about the use of technologies such as the drip irrigation and the strengthening of community participation scenarios to influence government decision-making.

Another of the facilitators present in the revision is the identification of local leaders to be trained in Ecohealth, support their empowerment processes and promote activities from and for their own communities. For example, Cole et al. (2011) in an experience of the Central Andean region (Ecuador, Peru and Bolivia) considered the need to assess the solidity and sustainability of nutritional knowledge by the community, by enriching the understanding the value of vegetables use produced by farmers. For that purpose, the nutritional component was worked altogether with the health establishments and community participation spaces were strengthened with the Ministry of Health support, with the objective of encouraging organic production, improving incomes, promoting food security and to associate small peasant in the region.

Finally, some documents question the deep-rooted knowledge and practices which affect life quality and the environment of the populations, emphasizing that, not only for being a community custom it is necessarily beneficial for the ecosystem. With that in mind, Lebel (2003) reflects at a theoretical level about practices and habits with a negative impact on the ecosystem and human health that should be eradicated. For example, this document refers to an experience in Southwest Asia, where plantations of rubber, oil palm and fruit trees created even more favourable conditions for the growth of the dengue vector.

2.6.4 Barriers

One the challenges for Ecohealth is to be make more visible the principle of sustainability, partly because as is underlined by Lisitza y Wolbring (2016) more discussion is needed around the notion of sustainable development, since the term is rarely mentioned and is rarely discussed or questioned in a conceptual way. The document also states that an effort to relate sustainability to the protection of ecosystems predominates, while their complex nexuses with humans are a secondary issue.

On the other hand, Sarkar (2010) found as an obstacle the insufficiency of the public health authorities actions and the lack of association with the community. Specifically, access to alternatives that are sustainable can be limited by the absence of political willingness of decision makers and the incipient community organization which is necessary to develop and maintain effective programs. Likewise, Charron (2012) warns that sustainability is also

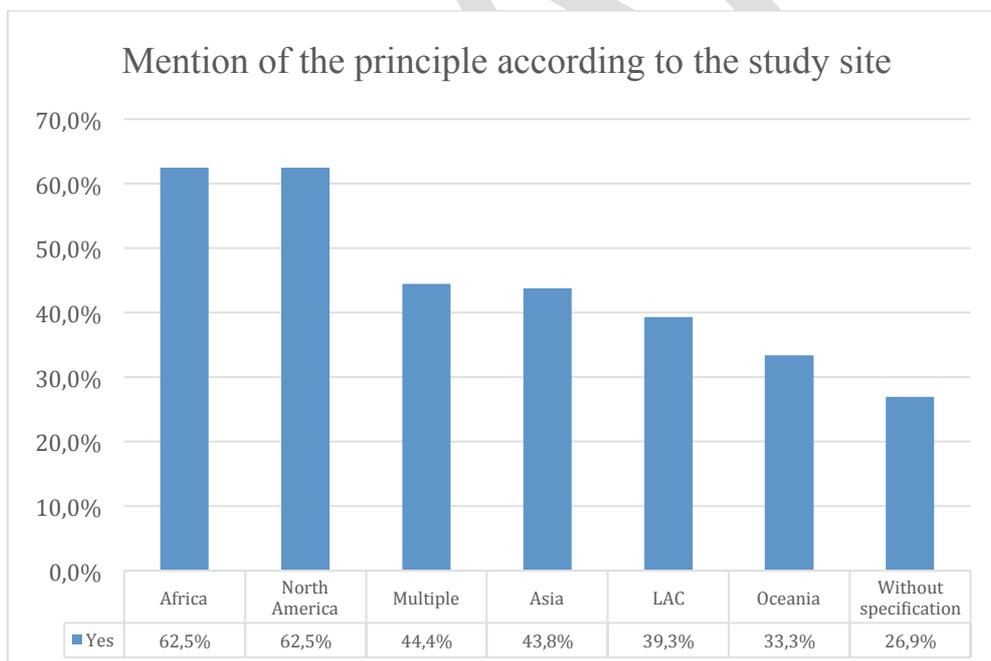
hampered by economic and environmental inequalities, due to changing these structural situations is a challenge when populations have a limited access to resources and livelihood. Thus, sustainable alternatives are not linear strategies but life possibilities which community and political structures themselves must modify and appropriate them according to their own interests.

2.7 Gender and social equity

Gender and social equity identify situations that undermine human beings according to their ethnicity, social position and gender in order to promote ways of research and action sustainable and fair. Gender seeks to recognize situations that violate women and men throughout their lives based on an analysis of roles, responsibilities and influence in decisions. This principle aims to establish how these situations affect health and well-being conditions and seeks to contribute to their solution (Charron, 2012).

The principle of gender and social equity is mentioned in only 27% of the documents without a specific place of study, highlighting that this approach in the texts is theoretical and a practical experience is not developed.

Graph 10. Mention of gender and social equity in the documents



The description of this principle includes the analysis of power relationships understood as: opportunities and decision-making power, roles and social and gender inequities. Finally, their facilitators and barriers are addressed.

2.7.1 Power relationships

The review demonstrated two factors, one conceptual and other practical, to analyze this attribute. In the conceptual sense, García (2014) notes that gender approach reveals social inequalities with deep roots in socioeconomic patterns resistant to change. In the practical sense, Mwesigwa and Maina (2007) evince that those patterns are the distribution of roles, responsibilities and tasks between men and women. Therefore, it is necessary to recognize opinions and promote conditions of opportunity, decision and action of the least favored for their empowerment

The experiences with Ecohealth approach presented by Charron (2012) present the differences between men and women, which the latter persistently face for unfairly less access to opportunities and health. In particular, women suffer higher levels of violence and malnutrition as do their children; they own less land, wealth and property; they bear the double burden of care responsibilities (from the home: children and elderly); they are penalized when family needs or their own health prevent them from working; and, finally, the pressures and fatigue that occurs as a result, expose women to greater health risks.

Charron (2012) It also suggests about this differentiation that women tend to fulfill traditional domestic roles and perceive few or no income. Likewise, work of men is perceived as more important because they generate income, which implies that their position prevails in decision-making. Women have few or no possibilities of participating, they maintain a passive attitude that exacerbates the conditions of inequality, since they assume that they can not change their situation. An experience that accounts for these gender inequities by collecting different HIV research backgrounds in Africa, is taught by Singer (2011) exposing how women, due to their situation of poverty and dependence on men, are at risk of HIV infection. For example, in the face of precarious food availability:

Under conditions of shrinking food availability, women were forced to travel long distances to visit grain mills where they were allowed to collect maize bran left behind by others after milling their grain. At such sites, women were more apt to also engage in commercial sex with mill workers. Resulting demoralization, they argue, led to increased drinking among women, which put them at further risk for participation in risky sex (Singer, 2011, p. 11).

The reviewed documents addressing gender issues, demonstrated that roles and tasks are distinguished between women and men that evidence social division of labor. Frederic Mertens, Saint-Charles and Mergler (2012) illustrate in a case of the Brazilian Amazon this type of distinction about fishing activities, cultivation, harvest and food diet. For example, distribution of fishing depends on man when defining what is intended for household food or for sale, while role of women is limited to deciding the way in which meals are prepared.

Regarding perceptions by gender, Lebel (2003) mentions that in South countries, when discussing influence of pesticides, women think about long-term effects (children's health and the environment), while men worry about wages and providing food and roof to their families, assuming with this long working hours. The different attitude between men and women of concerning pesticides showed imaginary in which, in general, it is considered that pesticides cannot cause harm to a "strong man", even though both are exposed and vulnerable: men they are exposed during their work field, while women and children are in contact with dangerous substances in their homes because the contaminated clothes of men are stored and washed there.

Power relationship analysis expands to other social inequalities. For example, regarding to impacts of urban transport, Marko et al. (2004, p. 43) analyze differences in perceptions of social groups around the fact that there are and build highways, according to sociodemographic, cultural, economic or health conditions. In that sense *"because communities closest to freeways are more adversely affected by air and noise pollution, cohesion, and real estate values compared to communities further away from freeways"*

2.7.2 Facilitators

In terms of the promotion of equity, reviewed text finds as facilitators recognition of human rights: capacity of public powers to guarantee them and capacity of affected communities to claim them.

Regarding incidents of government actions in favor of equity, Spiegel et al.(2005), They presented in an experience located in America continent and the Pacific region of Asia, in which is highlighted the State as the ideal instance to provide community with information and access to essential resources for their well-being. In addition to State actions, it is also important generate processes to empower community networks. Marko et al. (2004) Concerning a case study about impacts of urban transport, it stresses that encouraging community participation means appropriation and internalization of knowledge and continuity of actions. In this sense, documents refer to awareness processes of community about the respiratory conditions associated with the growth of the vehicle fleet and to explain that there are alternatives, in this case, suggesting as an option to promote the use of public transport and apply sustainable strategies.

On the subject of incidence of communities to recognize and to reclaim their rights, an example occurs in Honduras on the disease of Chagas written by Rodriguez (2014), who explains that those women with better socioeconomic conditions have different possibilities of accessing new knowledge. Therefore, options for decision making is broadened, and these allow individuals to contemplate different factors of their realities and be aware of opportunities for their well-being.

Finally, identification of community leaders with the aims of designing educational strategies that recognize local and popular knowledge is a recurrent facilitator according to the review.

As an example, Valadão (2010) inquires about the role of community leaders in health and environmental projects in communities of the Tapajós River in Brazil, indicating that the incorporation of the gender perspective identified leaders and allowed community emancipation to problematize situations sensitive to the reality of women that did not emerge when discussing together with men. Besides it encouraged the emergence relevant topics to them: *“the discussion networks on agriculture and health demonstrate (...) that women have a preponderant importance for health discussions, while men are key to discussions in agriculture”* (Orozco & Cole, 2013, p. 43).

Another example was given in an experience presented by Santo Domingo et al. (2016), located in Colombia with the indigenous peoples of Barí and Wuayuu, that sought to understand the functioning of two agricultural systems through "Calendars" designed to organize seasons of ecological sowing and harvesting in accordance with ancestral knowledge and practices of these people . Thus, from community discussions, citizen mobilization, democratization and socialization of knowledge were promoted.

2.7.3 Barriers

At the macro level, dependency relations between countries are obstacles highlighted by documents reviewed. For example, Vansteenkiste (2014) states that in his experience in Haiti, food production systems of traditional communities dedicated to agriculture and grazing must compete in conditions of inequality with food produced abroad by large companies. In this sense, when competing in an unequal market, there are conflicts over the distribution of land, difficulties in accessing health centers, increase in the use of toxic pesticides (which are detrimental to the soil and biodiversity of the earth). weak infrastructure (housing, animal facilities, waste systems, water supply), individual capacities and climate change

At the micro level, attitudes, imaginaries, perceptions and behaviors of populations, can be a difficulty to modify harmful practices for health and even, they are factors that exacerbate social inequalities. For example, in an experience about Chagas disease, ethnic identities of a rural community in Argentina according to Llovet and Dinardi (2014) influenced reinfestation process because population was adapted to the vector presence and because of their way of conceiving the world they did not know the relationship between the insect and the risk of the disease, naturalizing the presence of the vector. Therefore, the population did not adopt preventive attitudes in their homes, did not demand specific medical attention and had a passive stance related with the vector presence in a domestic sphere.

Overall, document reviewed by the Community of Practice about the Ecosystem Approach in Human Health in Latin America and the Caribbean (COPEH-LAC) recognizes difficulties of the ecosystem approach to incorporate the principle of gender and social equity. Therefore, they make recommendations on this limitation in two ways. The first is related to the research team, which indicates the importance of sensitize and train from the gender perspective, using an inclusive and non-sexist language, guaranteeing the participation of both genders,

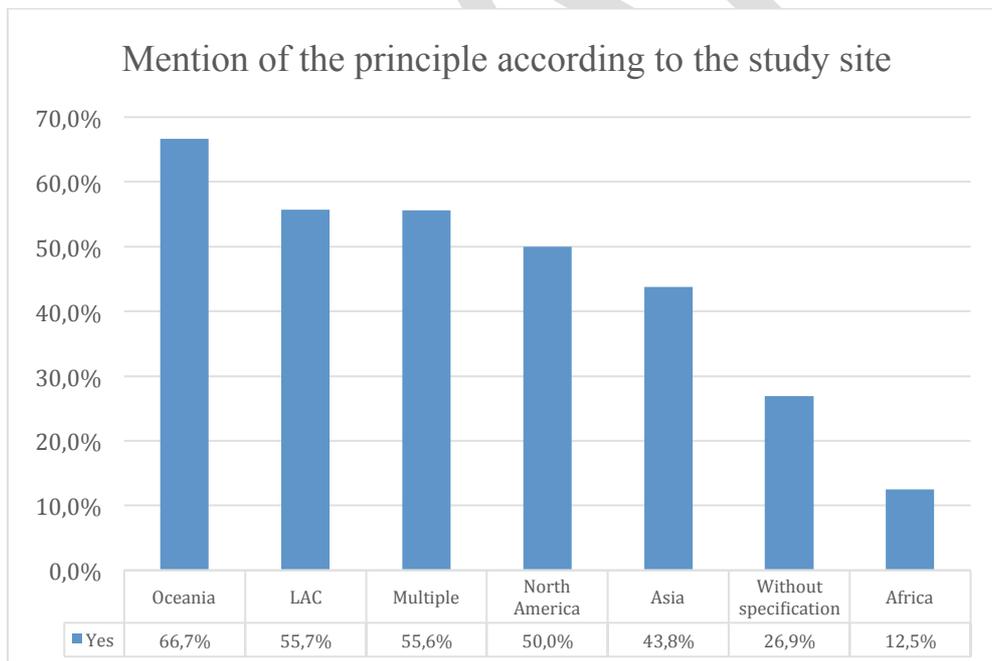
promoting access to resources and a equitable distribution of benefits. The second way refers to the research project, accentuating the importance of identifying daily activities, as well as experiences, customs and practices of men and women, considering their health indicators, investigating the manner in which each gender perceive and relate the research problem, among other specific aspects to promote the participation of both genders (Betancourt et al., 2016).

2.8 Knowledge to action

It seeks to close the gap between research and action, as well as between community, institutions and researchers. In this sense, it is intended that findings derived from research influence community, decision makers and researchers, promoting common spaces of learning and practice that promote translation of knowledge in formulation and implementation of strategies, programs and public policies (Charron, 2012).

This principle was slightly frequented (12%) in documents from Africa, but it was found in $\frac{2}{3}$ parts of the Oceania documents and in more than half of Latin America and the Caribbean (66.7% and 55.7%, respectively).

Graph 11. Mention of knowledge to action in the documents



There are two attributes to describe this principle: influence on social policies and practices and methodologies that were carried out in diverse experiences. Finally, their facilitators and barriers are developed.

2.8.1 Influence on social policies and practices

Closing the gap between research and action is one of the key issues for the principle of knowledge to action. In this regard, Lisitza and Wolbring (2016) consider that at the

theoretical level this principle aims to improve interactions with ecosystem, health and well-being of human beings through changes in practices and knowledge that occur both in intimate and everyday spaces (relational level), for example within families and communities, as in those of decision-making on a large scale (structural level), for example decision-making spaces of a state nature. Likewise, Velásquez et al. (2015) add about the influence on policies from these relational and structural levels, that their precise approach of new methods, proposals and technologies. Therefore, innovations, actions and changes, involve multiple actors, sectors, organizations and agencies.

It is recurrent to find actions related to this principle are centered within the Ecosalud projects searching to influence public policies, however, it is found that this incidence does not imply questioning power relationship. An example on health policies of Ecosalud experiences in Latin America and the Caribbean written by Ecosad (2013) reference that impacts on the social policies and practices of this case, starting from an approach that is not militant, because in most cases, scope of the changes affects specific issues such as health services, agriculture and mining but transformations are not structural. In the words of those who prepare the technical report: "a considerable part changes of projects with Eco-health approach, even those that managed to transcend the sphere of public policies, have promoted changes in practices, but without questioning the in-depth causes that originated problems that were sought to be solved" (Ecosad, 2013, p. 70).

In this sense, in passage from knowledge to action should be distinguished, according to Velásquez et al. (2015, p. 3), two components:

Macroimplementation, which refers to generation and fulfillment of the conditions that make a policy viable in a given area; and micro-implementation, which consists of set of specific services contemplated in a policy and conducted by local organizations and agents with their management and performance patterns to serve a specific population.

An example in Latin America that portrays macroimplementation is exposed by Méndez et al. (2010), in which set planning exercise involved diverse functional areas of governmental and official dependencies of the city, thus consolidating a municipal action plan for prevention and control of dengue. Hence, it is importance to engage stakeholders before, during and after the investigation (Méndez et al., 2010; Rodríguez, 2014). Also, according to theoretical discussions on the principle like those made by González (2014) in Venezuela, by resignifying knowledge generated in research from other epistemic perspectives to propose sustainable production methods in order to take care of health of communities and ecosystems.

Regarding changes in daily life people, that is, the micro-implementation, Rodríguez (2014) outline in a study about Vector-borne diseases in Brazil, that participation and adaptation to agroecological and social context allowed people to relate to proposal and adjust according to their perceptions, knowledge and possibilities, according to their cultural patterns and

behavior. One more fact that exemplifies this conceptualization was developed in Latin America and the Caribbean in an experience on Chagas disease developed by Gurtler et al. (2015) including the following daily interventions: mosquito nets; education about cleaning kitchen; beds and objects on walls and chicken coops (for raising poultry); application of insecticides including roofs and walls; participatory education about the disease; risk factors and training in the control of rodents; management of organic waste in conjunction with productive activities; wall covering with a mud mixture; remove animals from houses, especially poultry. Finally, a similar case is documented by Berbés-Blázquez et al. (2014) in Nepal, where community leads sanitation practices that transformed polluted riverbanks and infections that pollution triggered.

2.8.2 Methodologies

Participatory action research provides an effective framework to incorporate population in translation of knowledge, being one of the strategies that are privileged for development of knowledge to action in documents reviewed. In that sense, Musesengwa, Chimbari y Mukaratirwa (2017) noted in Zimbabwe that in an activity designed to develop a community-based early warning system to predict weather patterns and thus reduce transmission and control malaria and schistosomiasis the study team decided to resort to popular wisdom, the decision was made to resort to:

Community elders to collect data on indicators of weather conditions that may exacerbate malaria. They are also able to indicate the plants, animals and astronomical signs that are used traditionally to predict rainfall patterns and quantities and to relate the indicators to the occurrence of malaria. To motivate participation of these elderly volunteers, the MABISA [*Malaria and Bilharzia in Southern Africa*] project will award the participants “citizen certificates” to recognize their efforts. They too will then become a community resource and will assist the community with weather predictions (Musesengwa et al., 2017, p. 6).

Likewise, there are experiences in which translation of knowledge was conducted through teaching strategies, as shown by Harper et al. (2012) referring to dissemination of leaflets, stickers, banners and posters in Canada on the transmission of dengue at home, vector reproduction habitat and prevention options, to inform and motivate action.

Another method referred in the texts was to stimulate circulation of information and experiences of projects, by discussing findings of research with the local population, decision makers and interested parties. Garcia (2014) documents the way in which georeferencing systems were used as a technological tool that facilitated understanding of geospatial location - epidemiological and stratified - of population affected or at risk of becoming ill with dengue. In turn, different topics on dengue were discussed with workshops in meetings between the various stakeholders. Quesada et al. (2011) exemplify that from these discussions it is possible to publish results based on narrative reports of community

experiences, interdisciplinary technical team in the field, interviews with leaders, notebooks with research notes, among other results.

Also, dynamics of discussion given from the initiatives of courses and workshops, it is highlighted that it facilitates generation of knowledge and exchange of learning according to context and socio-environmental conditions. Among populations that participate in courses or workshops, Betancourt, Mertens, & Parra (2016) mentions groups of rural women in Mexico; community mothers in Colombia, groups of waste pickers in Peru and community associations in defense of water in Costa Rica.

2.8.3 Facilitators

One of the strategies that facilitate development of this principle is to conduct an initial analysis based on transdisciplinary work of stakeholders and to characterize general situation of a problem, as Gurtler et al.(2015) suggest, it makes possible to determine conditions of a situation and its tendencies, with the purpose of systematically collecting and classifying information that channels purposes of project and guides designs of research-action strategies and connections of community.

Documents emphasize on the importance of two-way relationships and commitments. That is, cooperation is necessary in each of the project phases of all actors (academics, decision makers and communities), development of a common language for decision-making and permanent communication. In a Canadian case, Leung et al.(2012) whose objective was to analyze how holistic are the approaches of One Health and Ecohealth, it is noted among its conclusions, that it requires a close collaborative work that really engage a transdisciplinary effort among scientists, politicians, community and stakeholders from these approaches.

As it is an objective to close the gap between research and action, commitment of all interested parties is sought around a problem to develop transdisciplinary strategies that result in a distribution of roles and tasks that facilitate step from findings to actions. For example, Spiegel et al. (2011) explain that in Ecuador, an experience that seeks to establish dialogues and practices among researchers, professionals, public policy makers and communities, managed sustainable ways of managing environmental risks, in which a work methodology was proposed, guided by a commitment of "bottom up" and "top down", that is, those responsible for local policies and master students who developed their thesis in the context of research process, financial sectors, indigenous organizations and peasant coastal producers were involved. One of these forms is consolidation of academic programs such as diplomas, masters or doctorates related to health problems for the preparation of academic research with the aim of presenting a panorama of a situation of interest and proposing actions for its resolution. For example, one results of a master thesis, which was part of the construction of innovative networks among health programs of population, observatories of collective health, of environment and society, for Andean region within framework of a project in Ecosalud, studied rurals areas of San José de Balzay, Ecuador, and identified that a community producing clay tiles and artisanal roofing materials was affected by lead poisoning (from the

glass used in the production process), of materials and work practices. To provide a solution, networks and channels of action of this project worked:

With local community organizations and active national Non-Governmental Organization, *Acción Ecológica*, The University of Cuenca, interpartnership with the UASB and UBC launched (in December 2010) a new form of “eco-health Centre” (*Clinica Ambiental del Sur*) based on the linking of prevention at a population level with primary care clinical attention in underserved areas (J. M. Spiegel et al., 2011, p. 4).

Another actions in academic teaching, is outlined by the COPEH-LAC document, which highlights an experience in Brazil in which formal undergraduate and postgraduate programs were incorporated. One of these courses was “basics of the Ecosystem Approaches in Human Health”, at the University of Brasilia, Brazil, which were studied cases related to community interventions, risk reduction for human health in agriculture, hydroelectric, mining, and urban development

2.8.4 Barriers

Among barriers related to this principle, documents evidence external and internal obstacles in experiences with Ecohealth. Regarding these external barriers, financial constraints, sociopolitical contexts, experience or will of politicians to execute strategies posed from investigations are highlighted. In Costa Rica and Nicaragua, for example, Berbés-Blázquez et al. (2014) emphasize that there is sufficient evidence that relates uses of agrochemicals with negative impacts on health, but that in general terms, bilateral trade agreements interfere with their regulation. In a similar development in Canada, tense relations with the administration and political sectors were identified as an obstacle. This was manifested through:

Communication barriers between scientists and decision makers (“as a scientist, it becomes really hard, you know a lot of the work that we do to inform policy has to be put into a very politic way to move forward”); political or jurisdictional barriers limiting the powers of public health practitioners (“So sometimes we can’t do anything because of bureaucracy”); and finally, the difficulties in negotiating the role of public health practitioners in policy development while under a governing political framework (“but we are public servants, so we are going to help facilitate that process, we can’t articulate that policy ourselves”). (Leung et al., 2012, p. 9).

Documents indicate as an obstacle that beliefs and deeply rooted cultural habits they resist changes. Velásquez et al (2015) In an experience in Colombia about control and prevention of dengue, they states that cleaning habits of population changed to prevent development of vector, but other cultural practices persisted, such as allowing animals to remain in their

houses. Finally, an experience in Ecuador titled as *potatoes, pesticides and people*, documented by Tracy (2007), highlights a precarious incidence of community participation, a dependence on external technicians and indifference to plans, objectives, monitoring and evaluation of the project, both for individuals and institutions.

3. Reflections and significant learning

3.1 ¿ What is the context in which the Ecohealth approach is applied?

The experiences analyzed in this revision were registered mostly in countries from the South in territories as Latin America and the Caribbean, Africa and Asia (see *Graph 4*) that altogether they represent 61% of the total of the consulted documents. Some integrate different cases or projects about the same disease or problem, to evaluate what happened in different places in accord with similar strategies. These reviews of experiences were related to diverse topics such as: vector-borne diseases, climate change, environmental pollution, food systems, health services and sanitation.

Ecohealth emphasizes its character of research and action. 17% of the documents were classified without a specific place of study, and discussed at a theoretical level the approach, in some cases trying to integrate other similar movements and fields such as One Health while in other cases, with methodological proposals such as *community engagement* or *resilience thinking*. Thus, there is a concern to reflect on its principles considering different perspectives and to establish dialogues with other approaches that may mean a contribution to deepen the conceptualization of Ecohealth and its methods. However, Nguyen et al. (2014) warn that there is currently no consensus on the concepts of Ecohealth in relation to other similar holistic initiatives such as One Health, Global Health, Planetary Health and the application of these concepts is often specific to the context, which is why the meaning of Ecohealth and its experiences is varied. In the authors words:

An explanation of the process as it was implemented is required, as it is not intuitive, to give readers the ability to understand and evaluate a study that is classified as Ecohealth. Future research should concentrate on the reporting and evaluation of processes to more rigorously guide Ecohealth to develop from concept to practice (Nguyen et al., 2014, pp. 12–13).

Apart from that, there is a warn around the need to characterize in historical terms the population involved in the research, which means, the emphasis is on historicizing the community, decision makers, stakeholders and researchers themselves. In this respect, Saint-Charles et al. (2014) add that it is necessary to situate in historical terms the situations and populations to understand and adjust the work projects, highlighting that the same strategy is not always applicable in multiple contexts.

3.2 Systems thinking

System thinking is recognized as a strategic principle in the Ecohealth approach because of its capacity to strengthen the capacity analysis of the team, identify socioecological relationships and the close link among society, ecosystems and health. In this regard, the experience of Bunch (2016, p. 629) demonstrates that *“we also need to strengthen the ability of Ecohealth practitioners to think and act in terms of systems, and to include more people with training and experience in systems thinking on Ecohealth project teams”*.

In this sense, it proposes that beyond the responsibility of the individuals in terms of their health and well-being, an understanding of their interrelation with the community and the environment is needed. One of the main challenges of this principle is to generate research and action strategies which allow the integration of the different systems that go through the problems, and monitor them in a sustainable manner with the participation of the community and public authorities.

3.3 Transdisciplinarity

Transdisciplinarity emphasizes that there is no discipline superior to the others, and recognizes the heterogeneity of knowledge and the weaknesses and strengths of each perspective, including academic and non-academic knowledge. Thus, traditional knowledge is integrated and is part of the transdisciplinary approach which implies incorporating other knowledge even if they are not adjusted to the way of understanding the world that is common from the academic sectors.

The consulted documents mention that incorporating local knowledge and practices is an arduous task to develop projects, both to generate commitment in the population, as well as to avoid that one discipline could be conceived better than another. In addition, the revision evinces the interest of the experiences to link the community who is living the problems directly and integrate their knowledge and experiences to the purposes in Ecohealth, without hierarchical distinctions. Hybridization is then necessary and understanding that everyone learns and all teach. In this regard, local knowledge in many cases tends not to distinguish between concepts and practices, but is holistic, a characteristic of systemic thinking and cast doubt on those researchers who classify it as scientifically weak because it does not conform to the parameters of academic understanding.

Transdisciplinarity implies that the participants have capacities for assertive communication, consensus, negotiation, and financial and logistical skills. Due to this consideration, are expected skillful researchers both in their knowledge and academic practices, as well as in experiences with community work, mediations with decision-makers and the promotion of dialogue and action channels which facilitate the participation of all interested parties.

3.4 Participation

Cruz (2014) proposes an integration of the processes and results of studies with community purposes in health and the environment, including other kinds of activities (recreational, artistic or leisure) which allow to benefit people who is involved with the projects and permits to create or reinforce lasting bonds of trust that go beyond the research.

In relation to the population participation, the revised documents warn about the importance of implicate diverse stakeholders in each one of the phases of the projects, since its research-action nature is one of its pillars. In spite of this, in the experiences reviewed, the emphasis is on working with communities, while decision-makers and other guilds (i.e. financial, commercial, industrial, etc.), are usually involved during the final phases of the project when they are thinking about *translating knowledge* and influencing public policy. In connection to *key actors*, the contact is mainly with NGOs, environmental conservation authorities, municipalities, social leaders and, sometimes, with international institutions that finance the projects. This type of relationship assumes promoting co-responsibility and allowing co-management of projects with diverse interested parts.

It is important to be noted that participation is iterative, which means if it is an active participation, implies a constant reevaluation of significant learning, because according to the context as the phases of the project are developed, new decisions or apply adaptations can be taken to the strategies already defined.

3.5 Gender and social equity

Lam et al. (2015) suggest there is a need to disaggregate the data in order to think in terms of equity, which means that, research must recognize the population heterogeneity and make visible issues as: poverty, ethnic-racial and socioeconomic position. A report of the IDRC (2006) exposes that the conceptual framework of gender and social equity requires a broad discussion, due to many aspects of inequalities go unnoticed.

One of the barriers to addressing gender issues in Ecohealth is the emphasis about roles, responsibilities and actions in public and private spheres of relationships between men and women. Although some figures are mentioned to describe inequalities or in qualitative studies inequities are described, not all facets of gender concept which go beyond differences by sex are developed. Other possibilities to reinforce next investigations could be the incorporation of issues related to the social organization based on ancestral knowledge, the development of unpaid work, occupations, sexual orientation or socioeconomic conditions. In other words, there is no problematization of that differentiation, but rather a sexual binarism which is a constraint to analyze, compare or study others alternatives if it is recognized that there is a multiplicity of options to understand gender.

In spite of this, one of the contributions of the approach is that it invites social and gender inequalities to be considered within the framework of socioecological relationships, which makes it possible to expand the comprehension of the decision-making power and the

opportunities of the actors involved in the Ecohealth projects, and specially, allows to characterize relationally the genders in accordance to their educative level, the community to which they belong, the ethnic identity and the job position, among other characteristics of the context.

3.6 Sustainability

This principle warns about the impacts of human activities and decisions on ecosystems in order to satisfy the needs of current generations without compromising future generations. In that sense, it is an anthropocentric concept linked to the traditional notion of development and production, although it emphasizes on health and taking care of ecosystems.

Sustainability requires the appropriation of the knowledge and practices which emerge as a result of the research findings. Therefore, the documents reviewed allows to conclude that it is necessary to consider this principle from the first phases of the projects, the participation of the involved parties and thinking in the *knowledge translation*, sustainability should be contemplated as a transverse principle for the approach. If these conditions are met, there will be an impact on public policies, sustainable social and environmental changes.

Finally, one of the facilitators to promote the viability of sustainable proposals is based on the use of technology and innovative ideas to change practices and knowledge that are negative for health, environment and the community, for example Cruz (2014, p. 265) in a case of malaria control in which the technique of rice flooding was modified and it was proposed to use another method by irrigation with intermittent dries, the *“results, were very beneficial for the farmer, there was a reduction of the larval densities of the Anopheles albimanus of the III and IV stage in 87.5%; Water consumption reduction by 57%, and a 25% increase in rice production.”*

On the other hand, it is necessary to achieve a balance between innovation and ancestral knowledge to assure lasting changes, because there is a risk of idealizing innovation and technology as elements to offer changes which are always beneficial, therefore researchers must have a cautious and responsible attitude, without considering that one way of thinking is better than another.

3.7 Knowledge to action

A notable attribute of this principle is its effort to close the gap between research and action, that is to say, it is interested in generating dialogues between knowledge and practices of the diverse actors and institutions involved, to influence both private and public spheres. However, it is necessary to clarify that the postulates of this principle do not intend to change the political and social structures. Hence, the strategies of action that arise from this principle can find obstacles to establish changes and innovations since they are in contradiction with economic, political and social models.

This incidence must be analyzed in two levels, with different strategies and implications. On the one hand, a micro level which includes practices and perceptions of the day to day that take place in the school, domestic sphere, and are part of the same population; and, on the other hand, a macro level that comprise: relating decision-makers, public authorities, NGOs or the international community to promote changes with conceptual, practical or economic supports.

Finally, an important characteristic of this principle consists of relying on ancestral or local knowledge to facilitate that new initiatives can emerge to benefit health and wellbeing of the population and ecosystems. In addition, this principle highlights its pedagogical and didactic resources which invite to act both communities and decision makers.

3.8 General assessment of the principles and the approach

The revised documents demonstrate that the principles are a flexible guide to develop Ecohealth studies. However, to encourage the generation of significant learning in these experiences, it is essential that those who investigate avoid establishing barriers among the principles. On the contrary, each principle must be interpreted transversally and in its relationship with the others; this is, for example, make more complex the principle of gender and social equity considering what is postulated by system thinking; transdisciplinarity implies a constant implementation of participation strategies according to the logic of the approach; knowledge to action requires of community participation strategies, linking decision makers and think in sustainable and innovative terms, in order to influence policies and social practices in private and public areas; among many other examples that may arise and that will emerge as long as other Ecohealth experiences would be developed.

Finally, the scoping review recognizes that the principle of participation is the most theorized and developed therefore is a strength of Ecohealth. However, if the approach is considered consistently, a systemic view is needed in which actions are not overloaded in one or another principle, because certain topics and phenomena may go unnoticed, as has been mentioned around gender and social equity.

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Table N°1: Research questions and operational definitions

Research questions	Operational definitions
<ul style="list-style-type: none"> • ¿How do the principles of systems thinking, transdisciplinarity and participation contribute to change? 	<ul style="list-style-type: none"> • System thinking <ul style="list-style-type: none"> ○ Socioecological. ○ Environment, health and community. ○ Holistic and dynamic approach. • Transdisciplinarity <ul style="list-style-type: none"> ○ Exchange and integration of knowledge. ○ Researchers, community and decision-making people participation. ○ Consensus and cooperation. • Participation <ul style="list-style-type: none"> ○ Decision-making power, local and scientific wisdom ○ Active and passive participation. ○ Strategic planning.
<ul style="list-style-type: none"> • ¿ How the principles of sustainability, gender and social equity and knowledge to action contribute to change? 	<ul style="list-style-type: none"> • Sustainability <ul style="list-style-type: none"> ○ Changes: environmentally and socially sustainable. ○ Conservation, preservation and protection of the environment. ○ Environmental balance and natural resources. • Gender and social equity <ul style="list-style-type: none"> ○ Access to resources and opportunities ○ Responsibilities, influences and decisions of social and gender roles ○ Social and gender inequalities • Knowledge of the action <ul style="list-style-type: none"> ○ Innovations, changes, actions. ○ Technology transfer ○ Knowledge translation: Know-how. ○ Influence on social policies and practices. ○ Implementation, intervention and efficiency. ○ Scopes map
<ul style="list-style-type: none"> • ¿What is the context in which the ecosalud approach is applied? 	<ul style="list-style-type: none"> • Population, sample. • Institutions, organizations, federations, individuals, social groups, communities, public or private sector, academics, scientifics. • North-South relationship, place, study scales.
<ul style="list-style-type: none"> • ¿ What are the barriers and facilitators for the implementation of the Ecohealth approach? 	<ul style="list-style-type: none"> • Barriers <ul style="list-style-type: none"> ○ Structures of power, local elites. ○ Doctrines ○ Administratives. ○ Geographic. ○ Conflicts of interest. • Facilitators <ul style="list-style-type: none"> ○ Appropriation of the participatory process. ○ Economic, social, administrative, political benefits.

	<ul style="list-style-type: none"> ○ Geographic. ○ Agreements, alliances.
<ul style="list-style-type: none"> ● ¿How has the implementation of the principles of Ecosalud been evidenced? 	<ul style="list-style-type: none"> ● Agreements. ● Publications, disclosures, events. ● Intervention, development, impact on public policy. ● Changes in the socioecosystem. ● Everyday, local, global, communicative practices.

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Anexx 2

Table N°2: Search strategy in the databases

Concept	Operational definition	Query
Ecohealth		ecohealth
	perspective OR approach OR practice OR implementation OR research	((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))
System thinking	system thinking OR holistic thinking OR dynamic thinking OR complexity thinking OR complexity analysis OR system analysis OR system approaches	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research)))) AND (system thinking OR holistic thinking OR dynamic thinking OR complexity thinking OR complexity analysis OR system analysis OR system approaches))
	socioecological OR socio-ecological OR socio ecological	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research)))) AND (system thinking OR holistic thinking OR dynamic thinking OR complexity thinking OR complexity analysis OR system analysis OR system approaches))) AND (socioecological OR socio-ecological OR socio ecological))
	health AND community AND environment	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research)))) AND (system thinking OR holistic thinking OR dynamic thinking OR complexity thinking OR complexity analysis OR system analysis OR system approaches))) AND (health AND community AND environment))
Transdisciplinary	transdisciplinary OR transdisciplinary research OR interdisciplinary OR multidisciplinary OR transdisciplinary approach	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research)))) AND (transdisciplinary OR transdisciplinary research OR interdisciplinary OR multidisciplinary OR transdisciplinary approach))
	knowledge sharing OR exchange of knowledge OR participation OR decision-making power OR agreement OR	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research)))) AND (transdisciplinary OR transdisciplinary research OR interdisciplinary OR multidisciplinary OR transdisciplinary approach))) AND (knowledge sharing OR exchange of knowledge OR participation OR decision-making power OR agreement OR consensus OR cooperation OR collective opinion))

	consensus OR cooperation OR collective opinion	
Participation	participation OR social participation OR community participation OR stakeholder participation OR population participation	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (participation OR social participation OR community participation OR stakeholder participation OR population participation)))
	decision-making power OR policy-makers OR political activism OR decision-making power OR social movements OR public polic* OR social change OR social practices	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (participation OR social participation OR community participation OR stakeholder participation OR population participation))) AND (decision-making power OR policy-makers OR political activism OR decision-making power OR social movements OR public polic* OR social change OR social practices))
	strategic planning OR traditional knowledge OR local wisdom OR scientific knowledge OR scientific understanding	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (participation OR social participation OR community participation OR stakeholder participation OR population participation))) AND (strategic planning OR traditional knowledge OR local wisdom OR scientific knowledge OR scientific understanding))
Sustainability	sustainability OR program sustainability OR sustainab*	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (sustainability OR program sustainability OR sustainab*)))
	social changes OR preservation OR conservation OR natural resources	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (sustainability OR program sustainability OR sustainab*))) AND (social changes OR preservation OR conservation OR natural resources))
	health AND community AND environment	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (sustainability OR program sustainability OR sustainab*))) AND (health AND community AND environment))
Gender equity and social equity	gender equity OR social equity OR equity OR inequality OR social inequality	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (gender equity OR social equity OR equity OR inequality OR social inequality OR gender inequality OR gender perspective)))

	OR gender inequality OR gender perspective	
	opportunities OR social roles OR gender roles OR ethnic	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (gender equity OR social equity OR equity OR inequality OR social inequality OR gender inequality OR gender perspective))) AND (opportunities OR social roles OR gender roles OR ethnic))
Knowledge to action	knowledge to action OR knowledge translation OR knowledge exchange OR knowledge management OR knowledge-to-action OR knowledge in action OR knowledge into action	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (knowledge to action OR knowledge translation OR knowledge exchange OR knowledge management OR knowledge-to-action OR knowledge in action OR knowledge into action)))
	technological transfer OR know how OR know-how OR influence OR government policies OR public polic* OR social practices	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (knowledge to action OR knowledge translation OR knowledge exchange OR knowledge management OR knowledge-to-action OR knowledge in action OR knowledge into action))) AND (technological transfer OR know how OR know-how OR influence OR government policies OR public polic* OR social practices))
	deployment OR efficiency OR innovation* OR involvement	(((((ecohealth) AND (perspective OR approach OR practice OR implementation OR research))) AND (knowledge to action OR knowledge translation OR knowledge exchange OR knowledge management OR knowledge-to-action OR knowledge in action OR knowledge into action))) AND (deployment OR efficiency OR innovation* OR involvement))

Anexx 3

Africa

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Estudio con enfoque de Ecosalud sobre condiciones de trabajo, entornos ambientales y salud de los trabajadores que manipulan residuos sólidos y sus familias- MIRR 2008-2011: informe final

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