Chapter 21
Better Together: Field-Building Networks at the Frontiers of Ecohealth Research

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Ecosystem approaches to health frame systemic relationships across scales and accentuate a range of interactions between various actors, from the local to the global. In their transdisciplinary and participatory implementation, ecosystem approaches to health reveal both the richness of bringing together multiple perspectives and the power of collaboration and partnership. It is not surprising that many ecohealth research practitioners place considerable value on networking as a means of expanding knowledge and enhancing capability to bring about change.

Taken together, the experiences illustrated by the case studies exemplify lessons learned from the application of the six principles outlined in Chap. 1. These principles inform the practice (or doing) of ecohealth research (transdisciplinarity, systems thinking, and multistakeholder participation) as well as inform ecohealth research goals (sustainability, equity, and the application of scientific knowledge to guide change). The case studies focus on what happened, and illustrate how these principles were applied and manifested by different research teams in a range of contexts. They neither dwell on the principles nor on how they were relevant or built on throughout the research process. This chapter explores how the six principles are closely linked with processes of working and learning together.

In addition to applying principles of ecosystem approaches to health in individual projects, many of the case studies presented in this book share other relationships. The importance of transdisciplinarity and participation is evident in collaborations between projects and researchers in networks and communities of

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practice (CoP). This chapter explores how networks are also a manifestation of ecohealth principles, and how they have contributed to the evolution of ecohealth as a field of endeavor newly recognized in science. The phenomena of collaborative association and partnership that are typical of ecohealth research practice are also situated in broader scientific trends and literature ranging from the theoretical basis of fields in sociology (Fligstein 2001) to field-building experiences in public health (Ottoson et al. 2009) and evaluation (King 2010).

Field-building is an intuitive process that seems very much informed by hindsight. There is no clear moment when a sub-speciality becomes a field in its own right. Rather, a new field or domain appears to achieve recognition when sufficient numbers of experts engaging in related activities affiliate themselves with this domain, and produce sufficient collective high-quality evidence of their particular contribution to be recognized as distinctly valuable by their peers. There is no recipe to build a field, and the idea that there may be criteria and other elements required to build a new field is relatively new. Because fields tend to evolve into being, there are very few examples of new fields having been deliberately built from the outset (although ecohealth may be one such example). In any case, having a group of peers engaged in promoting excellence and in advancing a field with a unique contribution appear to be minimum requirements. The establishment of a journal or society is indicative of a peer group (e.g., Green 2009; McBride et al. 2004). Other characteristics of a field include the use of common competencies and standards of practice (King 2010). The establishment of the International Association for Ecology & Health and the journal *EcoHealth* is among other favorable indications that ecohealth is emerging as a field – the result of converging lineages of scholarship and practice that include work that is the focus of this book as well as others' (Aguirre et al. 2002; Waltner-Toews 2004; Webb et al. 2010; Wilcox et al. 2004).

This chapter examines the process of field-building in ecohealth by drawing on lessons from individual case studies, and linking these with insights gained when experience is shared through networks and CoP in ecosystem approaches to health. The field-building contribution of the case studies and networks is their relevance to complementary developments in literature and scholarship. A matrix of key concepts is presented and discussed, drawing attention to the broader implications of ecohealth approaches in relation to knowledge integration, different facets of participatory processes, and the role of research as part of larger processes of collaborative learning and action.

The chapter presents some of the challenges and opportunities that arise in a transition from individual studies to CoP, action, and scholarly impact. These field-building lessons from across the spectrum of ecosystem approaches to health are seen as contributions to addressing the twenty-first century challenge that: *the escalating complexity of science and engineering is moving research toward a collaborative mode, with greater focus on intellectual integration* (US National Science Foundation 2001).

Networks and Communities of Practice in Ecohealth

The evolution of ecohealth as a field has been marked by collaboration and collective endeavor. Bringing different people and their contributions together in pursuit of a shared goal is a widely recognized strategy to harness capacity to address complex societal challenges (Brown 2007; McKnight and Kretzmann 1996; Pohl 2008). The case studies in this book illustrate examples of research and impact being enhanced by partnerships among researchers, community members, and other stakeholders.

The examples from Kathmandu, Nepal, and Ekwendeni, Malawi, demonstrate that strong and lasting partnerships can emerge from research-oriented collaborations and lead to substantially improved health and well-being for the communities under study. These partnerships arise from local, and sometimes informal, relationships between a research team (at least initially) and civil society groups, government, and other organizations with a stake in the issue. In other words, the processes of association and joint work are key characteristics of transdisciplinary, participatory multistakeholder research that characterize ecohealth research and enhance its outcomes (Mertens et al. 2005).

IDRC's nearly10 years of support to network initiatives in ecohealth informs both the exploration of their contributions to field-building and reflection on the trade-offs that these expanded forms of knowledge production and use entail. Before the 2003 International Forum on Ecosystem Approaches to Human Health in Montreal, IDRC's Ecohealth program led an electronic consultation with more than 60 research and donor organizations around the world to address needs and expectations in furthering ecohealth research. The consultation was prompted by feelings of intellectual isolation apparently widely shared among researchers, and a need for joint learning and cooperation to overcome the many challenges of ecohealth research (De Plaen and Kilelu 2004). IDRC responded with targeted support to networking and capacity-building initiatives (Table 21.1). These investments were intended to foster the development of an ecohealth peer group including North–South and South–South knowledge exchange and partnerships. The consultation identified three core functions of any ecohealth network or community of practice in ecohealth (CoPEH) (Flynn-Dapaah 2003).

- *Create an ecohealth peer community.* Provide opportunities for researchers to learn and exchange ideas in ecohealth. Capture and share existing tacit knowledge, improve scientific rigor and relevance of research by the formation of peer groups, share experiences using ecohealth and like-minded approaches, and foster dialogues among research, policy, and practice.
- *Develop research capacities in ecohealth.* Further develop skills in ecohealth research and transdisciplinary methods and techniques, and help young researchers, project teams, and policymakers understand and use ecohealth approaches to achieve intended outcomes in their projects and programs.

Table 21.1 Ecohealth networking initiatives co-funded by IDRC (2004–2010)

Network name	Initiation date	Case study in this book	Network web page (active)
CoPEH-LAC (Community of Practice in Ecosystem Approaches to Human Health in Latin America and the Caribbean)	2004	Mercury in the Amazon Manganese in Mexico Gold mining Ecuador	http://www.una.ac.cr/copehlac/
SIMA (Systemwide Initiative on Malaria & Agriculture)	2004	Malaria in Tanzania and Uganda	
RENEWAL (Regional Network on HIV/AIDS, Rural Livelihoods and Food Security)	2004	N/A	
CoPEH-MENA (Community of Practice in Ecosystem Approaches to Human Health Middle-East and North Africa)	2005	Water quality Lebanon	
CoPES-AOC Africa (Communauté de practique écosanté en Afrique de l'Ouest et du Centre)	2006	Sanitation in Cameroon	http://www.copes-aoc.org/
IDRC-TDR (WHO Special Programme for Research and Training in Tropical Diseases) – *Eco-Bio-Social Research on Dengue Fever in Asia*	2006	Dengue in Asia	
IAEH (International Association for Ecology and Health)	2006	Example in this chapter	http://www.ecohealth.net/
APEIR (Asia Partnership on Emerging Infectious Diseases Research)	2007	Example in this chapter	http://www.apeiresearch.net/main.php
CoPEH-Canada (Community of Practice in Ecosystem Approaches to Human Health – Canada)	2007	Example in this chapter	http://www.copeh-canada.org/index_en.php
CDLAC (Communicable Diseases in Latin America and Caribbean)	2007	Chagas in Guatemala	
IDRC-TDR (WHO Special Programme for Research and Training in Tropical Diseases) – *Eco-Bio-Social Research on Dengue Fever and Chagas Disease in Latin America and the Caribbean*	2009	N/A	

- *Enhance the uptake of ecohealth research and its influence on policy and practice*. Foster opportunities for dialogue, dissemination of tools, and development of capabilities of both researchers and research end-users to enhance the uptake of findings by policy, community, and relevant professional practices (e.g., in public health and environmental management).

With these aims in mind, IDRC eventually supported four Communities of Practice in Ecosystems Approaches to Health (CoPEHs) in Canada, Latin America

and the Caribbean, the Middle East and North Africa, and West and Central Africa, and a number of additional networking activities (for example, the Asian Partnership on Emerging Infectious Diseases Research [APEIR] and the International Association for Ecology & Health). In parallel, other networks developed independently from IDRC, but with a focus on ecosystem approaches to health, generating cross-fertilization and scholarly debate among different networks. Examples include work initiated by the Network for Ecosystem Sustainability and Health (Waltner-Toews and Kay 2005), and the development of the project Sustainably Managing Environmental Health Risks in Ecuador (Parkes et al. 2009).

A community of practice is an alternative model to traditional academic networking (De Plaen and Kilelu 2004). As initially described by Lave and Wenger (1991), a community of practice promotes a shared *domain* or common interest (in this case, ecosystem approaches to health), a sense of *community* among participants or members, and a shared purpose of building a *practice.* Practice, in this sense, refers to the agreed-upon ways of formalizing and implementing collectively developed knowledge and solutions that further the community's mission (Wenger et al. 2002). CoP generally involve: *groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly* (Wenger et al. 2002, p. 4).

As in previous chapters, the diversity and unique experiences of networks and CoPEHs are illustrated with different examples around the world. They share what Bunch et al. (2008) describe as a "family of origin" in ecosystem approaches to health and illustrate the sense of momentum and worth created by researchers coming together to learn in ways that they had not previously attempted or imagined.

Most networks or CoPEHs developed around two main purposes: doing better research on a specific theme linking health and environment, and teaching others how to do ecohealth research. The CoPEH in Latin America and Caribbean (CoPEH-LAC, Example 21.1) initially became organized around both research on environmental toxics and ecohealth (as well as relevant specific disciplinary) training. CoPEH-LAC introduced and adapted ecosystem approaches into existing research projects; provided numerous short courses (e.g., on an ecosystem approach to health, and on methods for detecting sub-clinical neuro-behavioral effects from chronic exposures to heavy metals); and is now developing transdisciplinary graduate and undergraduate curricula throughout the LAC region.

As a long-standing network, CoPEH-LAC represents some of the key benefits of this model of network, notably its capacity to evolve strategically while strengthening interactions within the network. CoPEH-LAC formally examined changes over time among collaborative relationships between members (e.g., co-publishing; co-organizing a conference, a course, or similar events; or working together on a project). By year 2 of the CoPEH-LAC project, there was a remarkable increase in the size of the membership and a shift in the pattern of collaborative relationships, which moved from being centered on the Canadian node to a more "horizontal" pattern of collaboration between all regions of Latin America (Fig. 21.1). Research on the development and progression of the types of relationships between members

Example 21.1 Communities of Practice in Ecosystem Approaches to Health in Latin America and the Caribbean (CoPEH-LAC)

In August 2004 in Santiago, Chile, 13 people debated how to respond to a Canadian call for proposals to establish a Canada–Latin America collaboration for a CoPEH-LAC. Five years later, CoPEH-LAC has centers (nodes) in Mexico, Central America and the Caribbean, the Andean region, the Southern Cone, Brazil, and Canada. This cohesive community of 150 people from academia, NGO, and governmental organizations share the goals of incorporating ecohealth concepts of interdisciplinary methodology, gender and social equity, and community participation into research and public policies. Members are involved in regional and inter-regional workshops and collaborations on research and training, curriculum development, participation in government-organized research or programs, public health debates, outreach to community groups, and active participation in regional, national, and international events. Success has depended on CoPEH-LAC's decentralized structure, which provides for autonomous nodal planning and implementation that is grounded in the social, political, and environmental realities of each region. Each node has evolved to build on regional strengths and capacities. The network has grown in size and complexity, with horizontal communication growing between nodes, creating a resource network for ecohealth research in the region.

(e.g., from information exchange to a diversity of collaborative endeavors) was an explicit CoPEH-LAC objective, and these research findings have informed the evolution and work of the CoP throughout. Inspired by CoPEH-LAC, CoPEH-Canada is engaging in a similar self-evaluative research.

External catalysts often provide the motivation and means for network formation. Sometimes they are convened to address a policy issue (international research on avian influenza for APEIR, for example) or a particular opportunity – CoPEH-LAC was born out of a joint call for proposals by IDRC and the Canadian Institutes of Health Research (CIHR), prompted by IDRC's global consultation described earlier. The strength of participating research teams and the leverage of their resources were also important in the success of this CoPEH. Several case studies in this book informed the development of, benefited from, and were influenced by CoPEH LAC. Three case studies in the environmental pollution section were led by leaders of this community of practice: gold mining in Ecuador; manganese mining pollution in Mexico; and mercury in the Amazon. Indeed, the neuro-behavioral assessment tools first used to diagnose subtle impairments among fishing communities of the Amazon, and the methods used to link these to mercury exposure, were also applied in Mexico

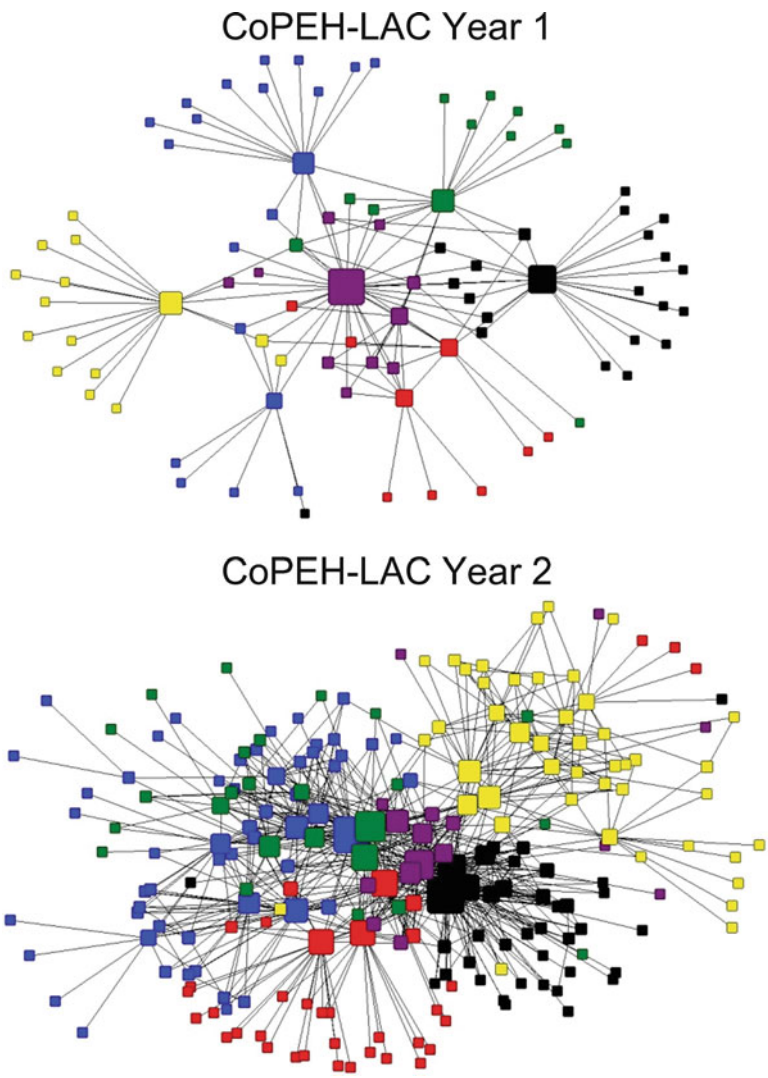

Fig. 21.1 Changes over time in collaborative relationships between members of CoPEH-LAC. The larger the symbol, the greater the number of collaborative relationships. The different shades of the *symbols* represent different sub-regions in the network

and in Ecuador, among other places. Supported by CoPEH-LAC, researchers in one country traveled to train researchers in other countries. At the same time, further refinements were made to guiding concepts and the application of ecosystem approaches to health. This learning was then integrated and applied in other research projects and also in direct collaboration with policy partners who were active participants across all regions of CoPEH-LAC.

Example 21.2 Canadian Community of Practice in Ecosystem Approaches to Health (CoPEH-Canada)

CoPEH-Canada began in 2007 with ten investigators in the Universities of Guelph, Quebec in Montreal (UQAM), and British Columbia. In the first 3 years, the three "founding" universities expanded to include the University of Moncton and University of North British Columbia. Previously, these academics constituted a loose, unevenly distributed and poorly linked network of people working on ecohealth research. Many had never met, but were linked through common interests and experiences in ecosystem approaches to health. Some were involved with international ecohealth networks and CoP. CoPEH-Canada's initial raison d'être and focus was the collective design and delivery of an intensive course on ecosystems approaches to health. In the initial phase of CoPEH-Canada (2008–2010), the design and delivery of the graduate-level course was hosted by one of the three founding universities each summer, and provided key opportunities to foster links at the local level. This was achieved through the inclusion of instructors and experts from regional, academic, government, private, and community organizations, and helped to attract outstanding students and working professionals from across the country. The skills and experiences of the members were therefore complemented by locally engaged guests who shaped each iteration of the course and have also become part of the emerging community. Although the short course is the most obvious "product" of CoPEH-Canada, it is far more than a project output to this community. Rather, the annual course has become a feeding ground for creating a community of practice where practitioners, policymakers, and scholars (both students and faculty) share practices and ideas and confront common challenges. The short courses provide a rare opportunity for all participants (teaching team and students) to experience transdisciplinary, systems-oriented and participatory approaches to teaching and learning, with a view to sustainable and equitable solutions to local and global ecohealth challenges in Canada and beyond. CoPEH-Canada embraces its diverse cultural legacy through a commitment to bilingualism and emphasis on aboriginal perspectives.

Relationships and forms of collaboration continue to expand and increase in scale, progressing to increased interactions between ecohealth teams, and more recently between networks. Cases in point are the relationships between the LAC and Canadian CoPEH (Example 21.2) that share key members and CoPEH-LAC's participation in a nascent consortium of regional organizations aiming to strengthen scientific ecohealth leadership in Latin America and the Caribbean (LAC) on prevention and control of vector-borne diseases.

CoPEH-LAC and CoPEH-Canada both have a strong identity and a mission promoted by a core cadre of researchers. They are typical CoPEHs in this regard. They have adopted similar "nodal" structures that favor horizontal interactions between community members within regional nodes, while being committed to creating opportunities for interactions between these regions.

Nodal structures have proved useful to enabling progressive development of CoPEH's but are also seen in other kind of networks, such as the three nodes of activity focused around the provincial universities involved in the project in Ecuador on Sustainably Managing Environmental Health Risks (Example 21.3). APEIR was built around several related multi-country research teams (Example 21.4), and also developed a national nodal structure in most of the member countries to enhance national coordination and exchange of ideas between teams. In each of these examples, what began as nodal interactions among researchers involved in distinct research projects grew and expanded, to create increased awareness of innovations, facilitate new and expanded research collaboration, and strengthen ecohealth research.

In networks focused on training, such as CoPEH-Canada and the Sustainably Managing Environmental Health Risks initiative in Ecuador (Examples 21.2 and 21.3), collaborative relationships were oriented toward the collective design and delivery of ecohealth training programs. These led to new research collaborations. Cross-fertilization has also begun to occur between these initiatives. A workshop for the launch of a new phase of a master's program at the Universidad de Cuenca in Ecuador brought together program alumni and members of CoPEH-LAC and CoPEH-Canada with a common agenda to build the field of ecohealth at the regional, national, and international levels. This event also included raising awareness of related opportunities for networking, including growing opportunities for involvement with the International Association for Ecology and Health (IAEH).

The ability to tackle challenging and complex environmental health problems from an integrated and transdisciplinary perspective is neither intuitive nor easy – hence the importance of education in building the field of ecohealth. Students represent the future of any field in science. Their engagement with concepts, challenging questions, and eventual leadership in applying and further developing the field are all essential to its continued relevance and effectiveness. The Student Section of the IAEH has provided a hub for cross-fertilization among different networks and CoPEHs, and a common emphasis on the value of capacity building, mentoring, and exchange among different "generations" of ecohealth researchers and practitioners.

The 2008 International EcoHealth Forum in Mérida, Mexico, co-convened by IDRC and IAEH, brought students from around the world to mix with the 600 researchers participating in the Forum. This event provided a new realm of networking opportunities, including fruitful interaction between mentors and students. This new generation of researchers and practitioners is playing a leadership role and is supported by peers faced with similar challenges.

Following the Mérida Forum, the international reach of the IAEH's active and diverse student membership expanded from 5 to 19 countries. Interest in maintaining fertile interdisciplinary exchange in the field of ecohealth has led CoPEH-Canada

Example 21.3 Training a New Generation of Ecohealth Researchers in Ecuador

The Sustainably Managing Environmental Health Risks project in Ecuador was launched in 2005. It has trained a new generation of researchers across different regions of Ecuador. They are involved in community-based, policy-relevant research that is informed by an ecosystem approach to health. Through a network involving four Ecuadorian universities, ten centers at the University of British Columbia, and institutions from Cuba and Mexico, this 6-year initiative was established to build human resources and institutional capabilities to reduce health impacts in areas such as pesticide poisoning, heavy metal contamination, solid waste pollution, sanitation, air pollution, and vector-borne disease. By 2009, a nationally accredited Master's in Health with an Ecosystem Focus, based at three provincial universities in Cuenca, Machala, and Guaranda produced ten graduates per university, enhanced the capacities and qualifications of an equal number of instructors and community members, and produced research that engaged more than 1,200 participants in 15 different communities. A second cohort was launched at the University of Cuenca in 2009, with graduates from the first cohort participating in the international faculty team. The network was strengthened by the introduction of an innovative PhD program (Collective Health, Environment, and Society) at the Universidad Andina Simón Bolívar in Quito with 19 doctoral students from the Andean region, including graduates of the master's program.

alumni to establish a virtual-poster forum for peer-to-peer exchange to help refine their graduate research with an ecohealth orientation. A variety of educational, training, and mentoring strategies are being adopted and implemented in the name of next-generation field-building in ecohealth. Some graduate programs are informed by ecosystems approaches to health (Example 21.3; Parkes et al. 2009). Ecohealth training, using intensive hybrid approaches such as field schools, summer schools, and professional development workshops, is also multiplying and providing graduate or professional development credits where possible.

Training and capacity development was also an important dimension of networks organized around a specific theme or entry point such as health impacts of toxic substances in the environment (CoPEH-LAC) or avian influenza (H5N1) in Asia (APEIR). With APEIR, IDRC's intent to foster regional collaboration among agencies responsible for research coincided with, and complemented a need for, policymakers and researchers to build a regional research agenda to guide disease prevention.

Example 21.4 Building Strong Social Capital Against Emerging Infectious Diseases

The Asian Partnership on Emerging Infectious Diseases Research (APEIR) includes researchers from a range of disciplines (e.g. public health, veterinary medicine, sociology, political sciences, and economics) and official leaders from several sectors (e.g. health, livestock, and wildlife protection). The partnership involves six countries (Cambodia, China, Lao PDR, Indonesia, Thailand, and Vietnam) and was conceived in 2006 in response to the spread of Avian Influenza (H5N1). By 2009, it had expanded to examine a range of emerging infectious diseases (EIDs). Its vision is to be the leading knowledge and research network in Asia for EIDs based on ecohealth concepts by 2013 (www.apeiresearch.net). Directed by a Steering Committee of senior officials and researchers from each country, APEIR has expanded to 30 partner institutions engaged in multi-country applied research. APEIR is focused on bridging the research–policy interface and addressing the determinants and consequences of EIDs. An emphasis on socio-economic, environment, and health links makes lessons from avian influenza research applicable to new and future emerging diseases. Understanding the drivers of disease emergence, prevention, detection, and control are all crucial to address EIDs. APEIR aims to facilitate the flow of information and knowledge and foster multi-sector collaboration throughout the region.

Like many of the networks in Table 21.1, both APEIR and CoPEH LAC developed internal relationships and common ground over a short time. Trust, respect, and common understanding of shared goals have grown, and in both these cases, supported an expansion over time to a wider thematic focus. These changes reflect the emerging capacity and priorities of their members. This evolution may also increase the potential influence and impact of the missions of such networks.

Principles, Processes, and Capacities for Ecohealth

The field of ecohealth is partly defined in relation to other fields, and by its contribution to a wider body of scholarship. Current conceptualizations of integration, participation, and collaboration that address capacity to deal with complex health, environment, and equity concerns are of particular relevance.

Integration of perspectives, knowledge, and methods; full participation of stakeholders; and a wide range of collaborations are instrumental in the production and

use of knowledge that is grounded in social–ecological systems thinking (Bunch et al. 2011; Parkes et al. 2010; Waltner-Toews 2009; Williams and Hummelbrunner 2010). As discussed in Chap. 1, framing research in a (complex) systems perspective demands a focus on interrelationships between people and their environment; engagement with a diversity of views in understanding and facilitating change; scrutiny of boundaries set around systems and subsystems; understanding change as a dynamic process; and an awareness of interactions and links across scales (social, geographic, and temporal). The resulting innovative research and action crosses disciplinary boundaries and integrates different forms of knowledge; engages multiple actors with different interests, needs, and potential contributions; and approaches change as a collaborative, adaptive, and learning-oriented endeavor.

The concepts of integration, participation, and collaboration help situate aspects of the practice of ecohealth in a broader scholarly debate (see Parkes and Panelli 2001; Brown et al. 2005; Brown 2008; Pohl and Hirsch Hadorn 2008; Parkes et al. 2010). As shown in Table 21.2, there are many points of intersection between the three concepts and ecohealth principles, processes, and capacities. It also connects the field-building contributions of networks with these concepts. Knowledge integration, participation, and collaboration are linked to related concepts in CoP (Lave and Wenger 1991; Wenger et al. 2002) and expanded forms of scholarship (Boyer 1997; Woollard 2006). Table 21.2 highlights convergences and makes explicit links to broader literature that can inform what it means to be "better together" when applying ecohealth approaches.

This focus on integration, participation, and collaboration is intended to link the "how to" of the ecohealth principles described in Chap. 1 with other, similar concepts, and demonstrate their applicability across different approaches. The principle of *transdisciplinarity* depends on knowledge integration, with new knowledge arising through the synthesis of diverse participant knowledge (disciplinary, experiential, and tacit). Where, how and to what extent stakeholders become involved influence these processes. The principle of *multistakeholder participation* addresses the processes of building relationships and negotiating explicit roles and responsibilities for action. The principles of *knowledge-to-action, equity*, and *sustainability* pertain to an iterative process of change based on collaborative learning and action toward common goals.

The benefits of networking in ecohealth can therefore be seen to relate to integration (that which is being "combined to form a whole"), participation (different dynamics of taking part and sharing), and collaboration (working together). These interrelated concepts feature in scholarly discussion of interdisciplinarity and transdisciplinarity (Hirsch Hadorn et al. 2008; Jantsch 1972; Klein et al. 2001; Somerville and Rapport 2000; Wilcox and Kueffer 2008), collaborative innovation (Gross Stein et al. 2001), communication models and knowledge communities (Campos 2003), integration and implementation sciences (Bammer 2005). Similar emphasis can be found in a review of 10-years of research proposals to NSF for integration across and beyond disciplinary boundaries to encourage innovation and development in research and technology (US-NSF 2001), (STEPS Centre 2010).

Table 21.2 A framework for analyzing the added value of networks and communities of practice with the concepts of integration, participation, and collaboration, and their relationships to other constructs from the literature

	Integration	Participation	Collaboration	References
Process	New knowledge generation through the synthesis of participants knowledge and understanding	Type, place, and mode of participation … an explicit process of defining and negotiating roles and responsibilities	Collaborative learning and actions are an iterative process rather than an endpoint, determined by the approach to integration and participation	Adapted from Parkes and Panelli (2001)
Some principles of ecohealth	Transdisciplinarity requires awareness of diverse knowledge relevant to the systemic understanding of health and environment issues – goes beyond academic disciplines, and leads to new types of participation and processes for knowledge generation	Multistakeholder participation requires value and respect for different perspectives, roles, and responsibilities – involves sharing within and between communities, researchers, and decision-making groups and also among them	Achieving knowledge-to-action requires learning and working together, a process which also demands attention to equity and respect for diversity, with explicit focus on gender disparities and variations among social groups involved. Equity between generations supports ecosystem sustainability	See Chap. 1
Communities of practice	Domain – group identity defined by a shared domain of interest. Membership implies commitment to that domain and a shared competence	Community – the social fabric of learning, and relationships that enable them to learn from each other	Practice – a shared repertoire of resources (experiences, stories, tools, ways of addressing recurring problems) – in short a shared practice	Lave and Wenger (1991) and Wenger et al. (2002)
Expanded definitions of scholarship	Scholarship of integration consists of making connections across disciplines and, through this synthesis, advancing what we know	Scholarship of engagement connects (other) dimensions of scholarship to the understanding and solving of pressing social, civic, and ethical problems	Scholarship of application asks how knowledge can be practically applied in a dynamic process whereby new understandings emerge from the act of applying knowledge through an ongoing cycle of theory-to-practice-to-theory	Boyer (1997) and Woollard (2006)
Dictionary definition	To combine with another to form a whole	To be involved, take part	To work jointly on an activity or project	Oxford Dictionary (2010)

In the public health and environment fields, these same concepts are reflected in: increased demand for integrated, community-based, participatory, and collaborative approaches to research and practice (Barten et al. 2007; Israel et al. 1998; Koné et al. 2000; O'Fallon and Dearry 2002; Sauvé and Godmaire 2004); calls for multistakeholder processes (Hemmati 2002); and growing attention to knowledge translation and exchange (Lavis 2006; Roux et al. 2006). The explicit contribution of nonacademic voices to integration, participation, and collaboration has focused attention on designing processes of collective action that span researchers, communities, policy, and practice (Brown 2007, 2008; Brown et al. 2005) and recognition of the complex terrain of crossing different knowledge cultures (McDonell 2000; Melin 2000; Ziman 1994). These developments in contemporary literature provide an important backdrop to any reflection on the field-building contributions of ecohealth, for example Lebel's presentation of the three pillars of an ecosystem approach to health (Lebel 2003), Wilcox and Kueffer's (2008) treatment of transdisciplinarity and its application, and the concepts and thinking advanced in this book.

The experiences of ecohealth networks and CoPEHs, as well as those in the earlier case studies, challenge the idea that integration (or participation or collaboration) is an end unto itself. Rather, in the context of ecohealth, collaboration is a process that results from – and facilitates – integration across disciplines and ways of knowing, and is founded on the participation of different stakeholders. Returning to the examples of capacity building and training within the CoPEHs and networks, researchers focused on participation go beyond convening a multistakeholder gathering, and pay explicit attention to which participants, and what kinds of knowledge are being included or excluded. New cadres of ecohealth researchers are challenged to see collaboration as more than a period of interaction, and instead as a basis for joint learning among the different knowledge bases of participants. The capacity to combine integration, participation, and collaboration goes beyond "traditional" definitions of academic scholarship (discovery and teaching) and places increasing value on the scholarship of integration, engagement, and application.

From Concepts to Practice: Ecohealth Networks

Capacity building for transdisciplinarity and integration of knowledge was a shared orientation and priority across each of the four network examples given in this chapter. The example networks illustrate that the need to integrate knowledge among previously dispersed groups can be a prime motivation for bringing different people together. In addition to the integration of knowledge that enhances the experiences and brings benefits into specific projects, each ecohealth network points to the added value of group processes that maintain integration through collaborative learning, interaction, and exchange beyond an isolated research project.

Each network made explicit and implicit decisions about participation, including for whom, and with whom to develop research, training, or policy. This leads to decisions about who is included in the participatory process (type of participant), where participants take part, share, and exchange (place of participation), and how different participants will be involved, including structure, roles, and responsibilities (mode of participation) (Table 21.3).

The example networks demonstrate a wide range of *types of participants*, who span disciplinary, sectoral, and national boundaries, in direct reflection of the complexity of health issues grounded in both social and ecological systems. Beyond listing different groups, some authors have found it helpful to distinguish participants according to their different knowledge cultures. Brown (2007, 2008) distinguishes individual, community, specialized, organizational, and holistic knowledge; whereas, Pohl and Hirsch Hadon (2008) refer to the importance of both abstract–theoretical, and case-specific–practical knowledge as features of transdisciplinary participatory processes. Boelen's "partnership pentagram" (involving policymakers, administrators, communities, academic institutions, and professionals) also helps to focus on the types of participant who may influence capacity for integration, engagement, and application of knowledge (Boelen 2000; Woollard 2006).

For each of the examples in Table 21.3, *place of participation* is a key consideration. Both the Ecuador training network and CoPEH-Canada designed graduate-level education and training initiatives to engage with national issues and priorities. To achieve this, the initial phase of both projects was based around three universities in different provinces. Hosting the course in these different locations encouraged engagement with the specific issues, people, and relationships arising in each place. Although resource intensive, such a combined national and regional approach has created a stronger collective capacity than might have been achieved in a single location.

Responding to the challenge of field-building across even larger geographic areas, APEIR and CoPEH-LAC both highlight the importance of building nonhierarchical, inclusive, and trust-based relationships between participating individuals and organizations. There are benefits of face-to-face interaction (however brief) to develop and nurture relationships in all ecohealth networks. Many of these groups (notably the IAEH Student Section) are using electronic means such as social networking, interactive websites, virtual classrooms, and blogs to continue and expand their relationships. Although online communications were a strong focus for early CoP (Johnson 2001; Sherer et al. 2003), the CoPEHs and related training courses have also highlighted the value of planning activities that bring people together to engage with the specifics of place for teaching and research planning.

The different network structures reflect different *modes of participation* described in Table 21.3. The functions and roles match the needs and priorities of each group. These considerations are apparent in the nodal structures of CoPEH-LAC and CoPEH-Canada. In addition to the perceived benefits of the nodal structure outlined above, CoPEH-Canada alumni have developed links between nodes, roles, and working groups through collaboration. Student approaches to adapting traditional

Table 21.3 Key characteristics of example networks relative to founding theme and to aspects of participation

	Example 1: Community of practice in ecosystem approaches to health in Latin America and the Caribbean	Example 2: Canadian community of practice in ecosystem approaches to health	Example 3: Sustainably managing environmental health risks in Ecuador	Example 4: Asian partnership on emerging infectious diseases research
Founding theme, problem field or domain	Link ecohealth research to reduce exposure to toxic substances in the environment	Collective design and delivery of a pan-Canadian ecohealth short course	Capacity for community-based environmental health research in Ecuador	Regional research-to-policy collaboration on avian influenza in Southeast Asia
Types of participant	Academic research, policymakers, nongovernment and government organizations	Researchers, policymakers, practitioners, educators, and students (alumni)	Researchers, practitioners, educators, students in master's program in health with an ecosystem focus	Researchers from multiple disciplines, policymakers, and politicians
Place of participation	Fourteen countries with nodes in Mexico, Central America – Caribbean, Andean Region, Southern Cone, Brazil, and Quebec (Canada)	Three nodes in Western Canada, Ontario, Quebec-Atlantic-Acadian. Course rotates among core university hosts	Three hubs in Ecuador provincial universities and one in Quito	Cambodia, China, Lao People's Democratic Republic, Indonesia, Thailand, and Vietnam
Modes of participating (includes structure of the group)	Nested nodal structure, with local network developed around each core member – many teleconferences and research planning meetings within or between nodes	A short course for graduate students delivered by core faculty team, other ecohealth researchers, alumni, and working groups involved with nodal, national, or course activities – field work bursary program	MSc and PhD training program delivered by faculty team jointly across four universities, with alumni becoming faculty	Five different multicountry research projects involving 22 participating institutions – country and regional meetings with steering committee and country focal persons

governance structures for their own needs offer valuable glimpses to future developments.

The example networks illustrate ecohealth practices and applications that range from research and education to policy, and blur distinctions among them. For example, through its steering committee, APEIR helps link researchers to decision-making processes. CoPEH-LAC has engaged diverse policy, nongovernmental, and research organizations and individual actors through research projects, and training and dissemination workshops, to consolidate and share experiences about ecohealth. But documenting policy influence (and all the intermediate steps on the way to policy change) is a challenge for CoPEH-LAC, indeed for most networks striving for broader uptake of research results (Carden 2009). The combined challenges of revisiting priorities for the future and evaluating progress over time are an integral part of becoming "better together."

Trade-Offs of Working Together

Involvement with ecohealth networks and CoPEHs accrues benefits and costs at several levels – that of the individual members, the network as a whole, and the research outcomes. Because the costs of interaction are not negligible for members or the network, and researchers have generally overcommitted schedules and resources, it should follow that the benefits of association with ecohealth networks must be worth the effort and costs.

The nature and amount of investment required vary across the networks and CoPEHs. In general, active research networks incur costs in time and other resources such as coordination, travel, meetings, self-promotion, and dissemination. They may also demand different social skills of their members, especially in CoP where collaboration is a fundamental *raison d'être* of the network, and require a range of tacit and learned skills such as flexibility, ability to negotiate and compromise, ability and capacity to convene, and communication skills. The magnitude and distribution of costs depend on the priorities and activities of each network. Some groups place greater emphasis on formal in-person meetings to achieve their goals; others may focus on training programs or on a mix of presence-based and virtual interactions between members. Some networks and CoPEHs have formal coordination structures with inherent, but variable, operating costs.

Benefits to individual members include: overcoming feelings of intellectual or practical isolation; furthering professional relationships; learning (e.g., easier and faster access to state-of-the-art thinking by peers, ideas on how to deal with challenges, avoiding reinventing the wheel, and access to new tools and methods); exposure to experiences in different contexts (e.g., geographic and thematic); broadening professional opportunities (e.g., different types of collaboration, pursuit of joint funding, co-publishing, and joint supervision of students); motivation and peer support; and increased voice and influence. It follows that these benefits are primary sources of motivation for individuals to become engaged in formal CoPEHs and networks.

The examples presented earlier also point to benefits that accrue at the network level. These include enhanced creativity and innovation (asking better research questions and defining relevant research agendas) and development of the field. Networks can also: enhance recognition of project results and uptake of results on a wider scale than could be achieved by individual projects; debate for the advancement of the field and furthering of theory and concepts; offer greater visibility and recognition of the field; and develop a greater pool of trainers and opportunities for graduate study and new researchers.

There is clearly a need for more formal assessments of the value and impact of the networks and CoPEHs. CoPEH-LAC's first cycle evaluation (Willard and Finkelman 2009) commended the learning- and trust-based aspects of their activities and the high level of collaboration, but found the need for more strategic approaches to joint action, particularly for greater policy influence and diversification of the funding base.

How are these costs and benefits, as well as added-value assessed? CoPEH-LAC and CoPEH-Canada have adopted internal evaluative processes informed by social network analysis to guide their evolution, along with longitudinal qualitative analysis of learning and collaboration. Similarly, APEIR has performed a self-reflection exercise with all of its members to achieve a qualitative and quantitative review of the impacts of the partnerships, and to form the foundation for a strategic thinking process to guide its future development. Although precedents for long-term analysis of collaborative processes are rare, they would contribute considerably to validating the benefits (as well as cost and effort required) of such groups. Gross Stein et al. (2001) propose a series of questions to assess added-value:

- Would we know less if this collaboration had not been created?
- Would we know differently if collaborators had not had the opportunity to work together?
- Would we have known what we know more slowly or less widely if the knowledge had not been disseminated by the research?

Given the action-research aspect of ecohealth, two further questions could be added to those posed by Gross Stein et al.:

- Would we do differently or not as well in the absence of collaboration?
- Would our actions have been fewer, slower or less widely applied if we had not had the opportunity to work together?

The combined insights from ecohealth networks suggest an affirmative answer to these questions. Each of the groups examined in this chapter resulted in opportunities to know more, differently, more quickly, and more widely than if they had not existed. In addition each contributed to field building at a higher level through knowledge integration, participation, and collaboration. Their practice of ecohealth research was also changed for the better because of opportunities and synergies provided in doing things together and learning from the process. Ecohealth networks can be seen to facilitate a move from "doing (the same) things better" to "doing better things" (Kravitz 2005).

On the whole, the examples in this chapter demonstrate three benefits of becoming and doing 'better together' by:

- *Strengthening peer groups through a shared learning commons* – the field becomes stronger when diverse ecohealth initiatives combine to create a foundation for debate, consolidation, and critique that leads to a deeper understanding of the principles, approaches, and tools of ecosystem approaches to health.
- *Learning beyond individuals or isolated projects* – new levels of impact become possible when collective experiences create opportunities for learning and exchange that would not otherwise have been possible, while leaving individuals feeling challenged, valued, enabled, motivated, and better equipped to engage with new types of challenges.
- *Fostering innovation and systematization* – creativity and imagination are essential if ecohealth is to thrive in the face of traditional academic and decision-making structures that emphasize individual, disciplinary expertise and orientations, despite demanding greater integration across sectors. Investments in collaborative ecohealth networks and communities provide a web of pathways, relationships, knowledge, trust, and courage to innovate in ways that might not otherwise have been imagined.

These benefits highlight an ongoing creative tension for those engaged in ecohealth research, education, and practice. Those who participate usually do so in an individual capacity, and usually not as representatives of their organizations. Although participants can share experiences, they cannot commit their organizations to a course of action. This is borne out by experience, wherein the different networking initiatives have achieved greater levels of knowledge sharing and capacity building than might be expected from single institution-led research projects. But, they have also had to reassess their functioning to better achieve enhanced uptake of research findings and proposed changes in new contexts, or at different scales. Ecohealth networks and CoPEHs offer an enabling, supportive, and practical means of developing new concepts, new knowledge, and new skills. They also allow their members to work within their own organizations to facilitate positive changes for more relevant and impactful development research and to build capacity to respond to future challenges.

Conclusion

Working together across sectors and disciplines to tackle complex interactions between health, environment, and equity is now widely recognized to be beneficial in development research. Yet, such research has tended to be single discipline or sector driven. More than ever, new means of facilitating knowledge exchange, co-learning, and collaboration between individuals and groups need to be found. In this sense, the proactive approach to supporting the networking initiatives presented in this chapter represents progress toward expanding policy and practice horizons.

The benefits of ecohealth research networks and CoPEHs are substantial, and worth the sometimes considerable investments and inconvenience to their membership. Each example provided glimpses into this culture of interaction and learning. Networks, and CoPEHs in particular, enhance the application of at least four ecohealth principles – those emphasizing the "how to" of ecohealth research: transdisciplinarity; participation; social equity; and research-to-action. The concepts of integration, participation, and collaboration were used to explore why members engaged in these communities, and what added value is achieved though this working together.

Shared benefits arising from ecohealth networks were described in relation to a shared learning commons, the potential for learning, knowledge exchange and application beyond the scale of the project, and opportunities for innovation, and institutionalization. The case studies and examples throughout this book also represent contributions to the development of ecohealth research as a new field. Without an active peer group seeking to expand and refine their understanding, methods, body of knowledge, and skill-set, any field of endeavor can be expected to stagnate. Ecohealth networks and CoPEHs are expanding and evolving and appear to be key to the further growth of the field. With this growth comes new challenges of fostering integration, participation, and collaboration within an ever-larger group, while developing relationships that provide the support, courage, and resources to explore new frontiers and increase innovation in ecohealth research for development.

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