The Long Road to Transdisciplinarity

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INTRODUCTION

This paper discusses the state of transdisciplinary research in Philippine social science, or specifically the developments and issues relative to research collaboration between Philippine social scientists and natural scientists as well as the permeation of social science values in other branches of knowledge. A distinction is also made of the multidisciplinary, interdisciplinary, and transdisciplinary research approaches which are considered more desirable than the disciplinary approach, but with the transdisciplinary approach being considered the most rewarding in solving complex problems, albeit the most challenging to conduct. A review is made of truly transdisciplinary research projects in the country. It includes a description of the specific nature and participants of the collaborative effort, the integrative conceptual and methodological framework(s) employed, and the significance of the research undertaking. Towards the end of the paper, the transdisciplinary research output in the country is assessed and the major issues and barriers attendant to the conduct of the unique research approach are discussed.

It may be observed that the division of labor in human groups began long before industrialization, but with the advent of the Industrial Age as well as that of the post-Industrial Age which characterizes the current stage of world history, an increasingly complex and technical world has unabatedly pursued knowledge specialization to unprecedented levels. However, with this overspecialization, the need for people who can "think outside the box" and see beyond their own narrow disciplinary specializations has never been greater. This is so because this fragmentation of knowledge into disciplines has become entrenched to the extent that scholarship is being stymied. A need also arose to construct conceptual bridges between disciplines that have become strangers to each other and which have become unable, acting alone, to solve many of the world's complex problems. A way out of these dilemmas has been offered by transdisciplinarity and its closely related approaches of interdisciplinarity and multidisciplinarity. Of these three approaches, transdisciplinarity is considered the most desirable, being intellectually and pragmatically rewarding, albeit the most difficult

to employ. These three approaches can be found in academic texts as early as the mid-20th century; however, transdisciplinarity has received greater appeal as a superior answer to the inadequacies of specialization. Evidences of this recognition are the setting up in recent years of transdisciplinary research institutes around the world and the holding of events like the First World Congress of Transdisciplinarity in Portugal in 1994. Although the three related approaches are often used interchangeably, certain authors have seen the need to distinguish them from each other.

Multidisciplinarity

Multidisciplinarity is the act of joining together two disciplines without the process of integration, i.e., where each discipline produces specific outcomes while integration, if attempted at all, would be assigned to a third party observer. An example of this research approach is a panel presentation of the many information about the AIDS pandemic from disciplines like medicine, politics, epidemiology, in which each section is given an independent exposition. There is no shared vocabulary among the research team members and between their respective reports (*Wikipedia,* Interdisciplinarity, n.d.). In the *Handbook of transdisciplinary research*, Pohl and Hirsch Hadorn (2008) point out that multidisciplinarity approaches a problem from the perceptions of a range of disciplines but each discipline performs in a "self-contained" way with a minimum of "cross-fertilization among disciplines, or synergy in the outcomes." Rosenfeld (1992) provides a succinct description of multidisciplinarity by saying that "researchers are from different disciplines and they *work independently or sequentially"* (emphasis mine). Each participant presents his/her own disciplinary perspective in a research report. This approach of solving a common problem but presenting results in a compartmentalized manner without the benefit of participative interaction among team members has been the mode of science for hundreds of years. But in a world full of complexity and intractable problems, this approach is now losing ground to the more rewarding approaches of interdisciplinarity and transdisciplinarity.

Interdisciplinarity

In interdisciplinary research, there is a reference to a form of "coordinated and integration-oriented collaboration" between researchers from various disciplines (Pohl and Hirsch Hadorn 2008). A terse description is that of Rosenfeld (1992), who points out that in interdisciplinary research, participants come from disparate disciplines and they *"work jointly"* (emphasis mine). Each researcher remains rooted to his own field but the research findings show *"some" (*emphasis mine*) or a limited degree of integration of diverse disciplinary perspectives*. In her description, however, Rosenfeld does not specify whether the participating disciplines are all social sciences or all natural sciences or a combination of both branches of knowledge. The adjective "interdisciplinary" is frequently used in educational circles when researchers from two or more fields pool their approaches and modify them in order to suit the problem in question. For purposes of the present study, the interdisciplinary approach will be taken to mean collaborative researches done only within one branch of knowledge—be it the social sciences, the natural sciences or the humanities.

In the case of teaching, faculty members team-teach a course where students are required to comprehend a certain course in a somewhat integrated manner from multiple disciplinary perspectives. The teacher tries to describe or define a concept from the understandings of disciplines relevant to the concept with an effort to reveal the cognitive structure of the concept. The concept of land use, for instance, may appear differently when examined by different disciplines such as geography, economics, biology, or political science. Or the term "value" may be defined differently from the viewpoints of economics, sociology, anthropology, and philosophy and somehow the teachers try to interrelate, with varied results, the different disciplinary understandings—a procedure that involves pointing out similarities

and differences. This concept of interdisciplinarity is also the one employed behind the teaching of Makabayan in Philippine elementary and secondary schools, but the difference is that the subject is taught by a single teacher who, more often than not, lacks the ability or the preparation to integrate or connect the many humanistic and scientific content materials included in the subject.

The practice of the generic term "interdisciplinarity" has historical antecedents, most notably from Greek philosophy. Klein (2008) avers that the origin of the concept is traceable to the ideas that resonate through modern theoretical discourse, i.e., the notions of a unified science, general knowledge, synthesis, and the integration of knowledge. Gunn also observes that the Greek historians and dramatists borrowed elements from other fields of knowledge like medicine and philosophy to further understand and enrich their own creations (1992). Interdisciplinary programs sometimes develop from a shared belief that the traditional disciplines are unable or unwilling to address an important problem. For example, for most of the 20th century, sociology and anthropology did not give much attention to the social analysis of technology. This resulted in many social scientists with interest in technology joining science and technology studies programs handled by scholars from different disciplines. (This type of activity may now be considered to cross to the realm of transdisciplinarity.) Interdisciplinarity may also be brought about by new research developments that cannot be studied without combining the methodologies of two or more disciplines. A good example is the development of nanotechnology that led to the derivative development of quantum information processing, an amalgamation of quantum physics and computer science. Another derivative field is that of bioinformatics that combines molecular biology with computer science. Many foreign higher educational institutions today offer accredited degree programs in interdisciplinary studies (*Wikipedia*, Interdisciplinarity, n.d.).

At another level, interdisciplinarity is viewed as a countervailing force against the undesirable effects of unbridled specialization. It is assumed that the integrated approach is better able to solve complex problems as it views reality in a holistic manner, where the variables studied are not just those which one discipline is familiar with. When a collaborative study is able to develop new solutions to a certain problem, information is channeled back to the various disciplines involved, in the process enriching their theories and methodologies. The Spanish philosopher Jose Ortega y Gasset has criticized the tendency toward overspecialization as the "barbarism of specialization," implying the need for a liberal knowledge that humanizes and broadens the scope and potential of the mind (1992). Ashley also observes that amidst the fragmentation of knowledge through overspecialization, research efforts tend to prove stale and problems requiring the understanding of more than one discipline remain unsolved. In place of more suitable epistemological and methodological approaches, experimental science is put forth as the most effective avenue in solving problems beyond its scope. This inadequacy is seen, for instance, in the difficulties experienced with the reductionist approach in studying living systems, in place of a systems biology or similar integrative approach (2006). It may be mentioned, however, that some views consider interdisciplinarity as indebted to the specialists in one field of study, i.e., in the absence of specialists, intedisciplinarians would have no information and no notable experts to consult. It is acknowledged that specialists are useful in pushing the frontiers of science or of knowledge and, in the process, producing important new information. Thus, a more balanced view is that both disciplinarians and interdisciplinarians are seen as complementary to one another (*Wikipedia*, Interdisciplinarity, n.d.).

Transdisciplinarity

With regard to transdisciplinary research and transdisciplinarity, again Rosenfeld's taxonomy offers a succinct description vis-à-vis multi-disciplinarity and interdisciplinarity, i.e., *from a polemic perspective,* transdisciplinarity refers to *a*

process in which representatives of different disciplines work jointly for extended periods to produce novel and shared conceptual frameworks that have the promise of generating transcendent theoretical avenues (1972). Implied here is a deeper mode of integration, compared to the process marked by "some integration of diverse disciplines" that characterizes interdisciplinary research. However, Rosenfeld, in her description of interdisciplinary research, is not explicit as to whether the participating disciplines are wholly social science or wholly natural science in orientation—or a mixture of both orientations. Still, in line with the polemic view, the process is a deliberate transgressive dislocation of disciplinary conventions with the aim of achieving novel insights or expanding traditional disciplinary capabilities *(Wikipedia*, Interdisciplinarity, n.d.). It stresses engagement, investigation and participation in dealing with current problems in a manner that clearly "destabilizes disciplinary boundaries while respecting disciplinary expertise." It is built around the concepts of "transformative praxis, constructive problem-solving and real-world engagement" (*Wikipedia*, Transdisciplinary studies, n.d.). The approach involves *rethinking and restating problems from the point of view of several disciplines*, in the process providing a cohesive platform for solving scientific conundrums that are increasing in complexity (Palmes-Saloma as cited in Manalastas, 2010).

From a *less polemic viewpoint*, a second description of transdisciplinarity implies *the act of adopting available concepts/theories and methods that exist independently of several disciplines and employing them to organize and comprehend different fields.* This is based on the assumption that knowledge and methodology cannot simply be claimed by any discipline as its own creation. An example of this would be the application of Marxist philosophies to fields such as art history or literature, thus applying philosophies of sociology, economics, politics, etc. embedded in a trandisciplinary theory like Marxism to the investigation of these areas (*Wikipedia*, Interdisciplinarity, n.d.). The shared derivative conceptual framework arising from a collective insight provides an immense value for addressing and comprehending complex issues that transcend disciplinary parameters (Nicolescu, 2002). This interpretation conforms with the earliest definition of transdisciplinarity as a common postulate that transcends separate disciplinary viewpoints as exemplified by the holistic synthesizing capability of general systems theory and ecological science (OECD, 1972).

The third description of transdisciplinarity involves the practical and inclusive understanding of the concept that is characterized by the processes of integration and recursiveness in solving societal problems, where the scope of integration would involve more the broad-based and grand-scale or what is called the *vertical* form of transdisciplinarity that involves disciplines with more divergent epistemologies such as the "hard" and the "soft" sciences. More specifically, the outgrowth of this process would be the high degree of *integration of the theoretical and methodological approaches of the social and natural sciences, the proactive permeation of social science values into the epistemic and methodological foundations of the physical sciences, or the conduct of cooperative research endeavors between the social sciences and the natural sciences to solve complicated problems* (Pohl and Hirsch Hadorn, 2008*).* Thus, this also embraces the *polemic view of transdisciplinarity* cited above where *there is an intentional transgressive dislocation of disciplinary conventions with the goal of achieving novel and shared insights.* As defined in the *Handbook on transdisciplinary research* (Wisemann et al., 2008, p. 5),

> *Transdisciplinary research is research that includes cooperation within the scientific community and a debate between research and the society at large.* ***Transdisciplinary research therefore transgresses boundaries between scientific disciplines and between science and other societal fields*** *and includes deliberation about facts, practices and values (emphasis mine).*

Elucidating on the process, the handbook says that "the canon of participating disciplines and competencies from the *natural, technical and social sciences, and the humanities as well as from the life-*

world (emphasis mine)" that is needed in addressing pressing problems cannot be predetermined. It has to be defined during the research process that will reveal which bodies of knowledge have to be integrated and taken into account, i.e., whether it will be systems, target or transformation knowledge. Transdisciplinary research investigates complex empirical questions (systems knowledge), aims at formulating goals that will effectively address problems (target knowledge), and analyzes how prevailing practices can be changed (transformation knowledge) (Wisemann et al., 2008, pp. 5-7). Martin and Peterson (1997), writing on medical practice research, describe transdisciplinarity as the participation of different disciplines in developing new solutions for complex primary health care problems. The research process might integrate ideas and patterns revealed by mathematical modeling and the *qualitative interplay of influences as discerned by culture, politics, economics and social organization.*

Still a feature of the vertical form of transdisciplinarity is the idea that knowledge production is not limited to academic disciplines but to varieties of organizations and collective entities outside of the academe. Knowledge generation outside academia includes those produced by organized structures, communities, groups and even individuals. As pointed out by Alvarez-Castillo, folk knowledge is actually a reliable type of knowledge, contrary to the view of scientists. Scientists are not the only ones who have the capacity to organize and produce knowledge. Ordinary folks possess the capacities for comprehending, explaining and reacting to social problems which, in many instances, have proven to be even more sufficient and appropriate than those of experts. This is because people construct their knowledge as part of the larger activity of living. Unlike the scientists who, through the process of research delimitation, only assemble certain types of information to explain some aspect of social reality, ordinary people look at and explain the whole of reality. Their manner of analysis is both a conscious and unconscious activity and intertwined with the other facets of life. The processes of knowing and living are not dichotomized in people's lives (2004, pp. 21-22). Another far-fetched and uncommon interpretation of transdisciplinarity can also be seen as including individual research pursuits. This assumes the existence of an ideal transdisciplinary professional who has degrees in many disciplines and experience in many professions. A truly transdisciplinary person may also be said to possess all the distributed knowledge of the people in a community or in a research project (Schneider, 2003; *Wikipedia* Interdisciplinarity, n.d.).

The above third practical and polemic description of transdisciplinary research, which is considered most distinct, will be used here in searching for studies that fit the approach and are unmistakably different from the interdisciplinary and multidisciplinary approaches. Thus, the article will focus on researches where the social sciences and organized folk structures, on one hand, and the natural sciences, on the other, vertically cooperate and collaborate in a conceptually integrative and/or transgressive manner. This should also include the idea of the ethos of the social sciences and organized community structures proactively permeating that of the natural sciences with the aim of understanding and solving complex societal problems. The first two descriptions of transdisciplinarity cited above that pertain to the production of novel and shared conceptual frameworks as well as the adoption of existing independent theories, concepts and methods will not be used *by themselves* as selection criteria but will be considered only as reinforcing and elaborative features of the third description. If these two approaches are used as additional exclusive criteria, they can present classificatory problems in relation to the interdisciplinary approach which is also described by Rosenfeld as a joint conduct of a research undertaking marked by a limited degree or "some integration of diverse disciplines" (1992). The distinction between "some" integration in interdisciplinarity and creating "a shared conceptual framework" in transdisciplinarity as conceptualized by Rosenfeld

is still fuzzy and can create typological conundrums. Thus, the social science-natural science crossdisciplinary collaboration distinctly identifies trans-disciplinarity and delimits the focus of the paper. Other delimitations of the present article include the non-inclusion of researches involving transdisciplinary professionals. Although still part of the vertical and polemic orientations of transdisciplinarity, this feature appears to be more radical and as yet uncommon in usage. At any rate, unique transdisciplinary researchers are still relatively few all over the world. The succeeding paragraphs will also discuss the postmodern and metaphysical view of transdisciplinarity and this will be considered as the philosophical overview of the research type.

On a more postmodern, metaphysical level, Nicolescu (2010) in his book *Manifesto of transdisciplinarity*, points out that trans-disciplinarity is radically different from multidisciplinarity and interdisciplinarity on account of its goal which is the *understanding of the present complex world with its several "levels of Reality,"* (emphasis mine) *in which one of the imperatives is the unity of knowledge.* Thus, transdisciplinarity, as distinguished by the prefix "trans," is concerned with that which is "at once between the disciplines, across the disciplines, and beyond all disciplines" —a perspective that allows it to deal with several levels of "Reality" that can lead to holistic knowledge and a better understanding of the present complex world. In the presence of several levels of reality, the space between disciplines and beyond disciplines is full and has a discontinuous structure. Trans-disciplinarity concerns the dynamics created by the action of several levels of Reality at once. However, the insights to these dynamics pass through disciplinary knowledge or are nourished by disciplinary research. In turn, disciplinary research is illumined by transdisciplinary knowledge in a novel, fertile way. Viewed from this light, disciplinary and transdisciplinary research are not in conflict with, but are actually complementary to, each other.

By way of amplifying the metaphysical meaning of transdisciplinary research, the "Charter of Transdisciplinarity" as adopted by the First World Congress of Transdisciplinarity of Convento da Arrabida, Portugal in 1994 calls for a paradigm shift in the manner of viewing the present world which is riddled with conflict verging on self-annihilation, a world where the secular and spiritual and the scientific and humanistic are disjointed and incapable of communicating with each other. The fifteen articles of the charter reject a group of forces that threaten humanity, namely, the reduction of human beings to "formal structures" and of reality into a "single level governed by a single form of logic;" cultures that "strive for mastery;" a science that lays "claim to total objectivity;" the refusal of "dialogue and discussion;" and claims to primacy by certain groups, market economics, and particular fields of study. Thus, the transdisciplinary vision offers hope for humanity with its advocacy of an "open-minded rationality *that embraces the natural sciences, social sciences and humanities* (emphasis mine);" the "spiritual experience;" a "transhistorical horizon;" "transcultural" meaning; and "transnational" citizenship (*Wikipedia,* Transdisciplinary studies, n.d.).

TRANSDISCIPLINARITY RESEARCH IN THE PHILIPPINES

Presented in the following pages are brief descriptions of researches conducted in the Philippines that fall under the transdisciplinary genre as delimited in the present article. Researches of this type as conducted in the country are still rather scanty, considering the many obstacles involved in its conduct.

Health-related researches

Health is one topic which has attracted a number of transdisciplinary researches in the Philippines. A volume that merits some elucidation because of its plea for and rationalization of transdisciplinary research in the Philippines is the one produced by the University

of the Philippines-Manila entitled *(Re)framing old issues, bridging divides in health*: *Intersectoral and interdisciplinary work in the Philippines.* The book, which was edited by Alvarez-Castillo (2004), focuses on the concept of *health social science* that constitutes a paradigm shift in medical practice, advocating the integration of social determinants in health interventions such as those practiced at the Philippine General Hospital. Authored by representatives of both the medical and social science professions, the volume makes a plea for greater understanding and collaboration as well as for greater respect among the disciplines for each other's theoretical and methodological competencies. In particular, the social scientists, following the process of proactively permeating the intellectual realm of the medical sciences, criticize the close-minded, elitist, condescending and judgmental posture of Filipino medical doctors in relation to Philippine folk healing systems and to the bearers of traditional treatments. Alvarez-Castillo et al. (2008) says that this arrogant attitude toward indigenous health systems are colonial legacies traceable to the American occupation of the Philippines during the first half of the 20th century. The training of former colonial medical students in the universities in the West such as those in the United States was effective in transferring the ideology of knowledge specialization and compartmentalization based on the positivist-experimental tradition that looks down on value-laden interpretive science and shuns a trans-systemic methodological perspective.

Thus, the book achieves a transdisciplinary perspective in the sense that the participating physician-writers appreciate the need to effect a transgressive dislocation of their western-oriented, behaviorist and dualist mind-set. Social scientists, too, admit their narrow-minded adherence to dualism as positivist thinkers who treat intersecting phenomena as opposing domains, i.e., reason versus emotion, folk versus scientific methods, and social versus medical (Oakley and Gursoy as cited in Alvarez-Castillo, 2004, p. 3). The research output is also transdisciplinary in character in the sense that there is a participation of the social and natural sciences and a deliberate permeation of social science values and attitudes in the physical sciences. Thus, as Alvarez-Castillo (2004, pp. 1-7) observes, the study adopts a trans-systemic and a methodological multiplicity perspective. On one the hand, there is a rejection of dualist assumptions of opposites and exclusivity, of the assumed superiority of the behaviorist-positivist approach, and of a colonialist and militarist tradition of medical practice in the Philippines. On the other hand, there is the recognition of the interconnectivity of factors in health and illness, the cultural rootedness of science, the contribution of folk healing systems, community-based medicine and education, people-oriented (in addition to technology-oriented) intervention, and that health and illness are both intertwined social and biological phenomena. As one advocate points out, biological and social scientists jointly engaged in health and illness would have chances for discerning the intersections of the different factors that result in either health or sickness. In sharing their understandings, insights and experiences, they will be able to comprehend better the complexity of illness particularly in places deficient in health services (Higginbotham as cited in Alvarez-Castillo, 2004, p. 1).

The prolific researches of Michael Tan (1984, 1994, 1999, 2008**)**, either done singly or in collaboration with natural scientists on health and illness, fit into the category of transdiciplinary research in that he uses and combines existing concepts and methodologies intended to organize and comprehend the disparate fields of medicine and anthropology or of scientific healing and traditional medicine, for that matter. Thus, using health and illness as focal points, he constructs cognitive frameworks to bridge the gap between the "professional" and the "lay" perceptions of health and illness. Using particularly ethno-linguistic analysis, he constructs three theoretical frameworks or typologies of illness causation as based on existing literature. These typologies are "mystical theories of illness causation,

personalistic theories of illness causation, and the naturalistic theories of illness causation." Thus, Tan is the epitome of the transdisciplinary researcher who employs and weaves together phenomenological, social interactionist, political economy and cultural ecology, and theoretical and methodological perspectives. The phenomenological perspective deals with the meanings of illness in a particular social context and historical period. It uses linguistic analysis of local terms for illness elicited through dialogues with communities. In the process, a wealth of nuances and connotations of people's concepts of health and illness is unearthed. The social interactionist perspective examines the way people interact to form and reform notions of health and illness. The approach uses "discourse" or the verbal exchange between people where culture is being looked at as being like theater. Discourse also includes media materials from print, radio and television. The political economy perspective looks at ideologies and power relationships and how these are connected to the economic system. Ideologies are examined as to how they are linked to certain interests, social classes, and stakeholder groups. The cultural ecology approach looks at how people use culture to deal with the challenges they face in the natural environment. It also examines the way people use their physical environment as the source of their medicines as well as explanations for their illnesses and good health.

A detailed transdisciplinary research entitled "Mainstreaming indigenous health knowledge and practice" was conducted jointly in 2001 in the Cordillera villages of Northern Luzon by five women from both the social and natural sciences (Castro-Palaganas et al., 2001). Supported by the Center for Integrative and Development Studies (CIDS) of the University of the Philippines-Diliman, the study particularly fits the transdisciplinary genre in that it is practical, issue-oriented, cross-sectoral and generates knowledge from stakeholders whose health knowledge and practices are under threat from external forces. Thus, it is a feminist participatory research conducted in response to the urgent need to capture and record indigenous health knowledge and practices before they are undermined and effaced by the intrusion of modernity. It uses a research paradigm based on epistemology, ontology and methodology as well as a research approach that although not necessarily eschewing the positivist-empirical philosophical tract, gives more emphasis on the hermeneutical / dialectical and critical / constructivist approaches. The authors' aim is not simply to explain phenomena but to understand and "to reconstruct the constructions that people—the community, the women of Badeo, and ourselves—believe in." Advocacy and activism are the key concepts applied in confronting the contested problem. Thus, the method of destabilizing disciplinary boundaries and employing transformative praxis further imbues it with a transdisciplinary character. The significance of the research is that, even as it has given due importance to the need for modern health care in the region, it has uncovered the inadequate health delivery system of the government. It also emphasizes the value of simultaneously nurturing and promoting the medically-sound indigenous health knowledge and practices of the region and contextualizes them against the backdrop of the macro-social structures of indigenous peoples' rights, gender roles and women's multiple roles, and the life cycle approach.

A transdisciplinary study entitled "The burden of disease, economic costs, and clinical consequences of tuberculosis in the Philippines" was conducted by four researchers from the medical and economic sciences (Peabody et al., 2005). The study appeared in *Health Policy and Planning*, a transdisciplinary journal published by the University of the Philippines-Manila. The research aims to provide a comprehensive analysis of the impact of tuberculosis in a high-incidence country from the natural science and social science perspectives or, more specifically, from the perspectives of the national disease burden, the economic costs, and the clinical consequences. Fieldwork as well as epidemiologic and econometric analyses are the methodologies

applied. The data sets fulfill the eligibility criteria of completeness, accessibility, and concurrence with other data. If these criteria have been met, two more have been applied: do they support the analyses from more than one of the analytic perspectives and are they suitable for concurrent analysis? Thus, the research process sees to it that there is integration of the three perspectives through the use of compatible data sets. The study finds that juxtaposed against the large economic loss due to TB are relatively modest costs for diagnosis and treatment of the disease. Thus, the net benefit supports the recommendation for increased resources to lessen the personal and economic consequences.

Closely related to the work of Alvarez-Castillo et al. (2004) on bridging divides between medicine and the social sciences under the emerging field of health social science is the study conducted by the De La Salle University Research Institute of Tropical Medicine (RITM) entitled "Eco-bio-social factors of vector density: Developing effective approaches to dengue control in the Philippines" (Marco, 2000). At a glance, it is clearly a transdisciplinary type of inquiry in the sense that it was conducted by entomologists, a clinical epidemiologist, a sociologist, a data manager, and community workers who want to understand the ecosystem-related, biological and social determinants of dengue that will aid in the formulation of a community-centered ecosystem intervention scheme directed at decreasing vector larval habitats through intersectoral actions. The study was influenced by what the World Health Organization discerned at the end of the 20th century, i.e., the need for the integration of the ecological, biological and social determinants of health. This approach gained significance early in the 21st century when it was realized that the causes of social and ecological change were also the major drivers of emerging infectious diseases (EIDs) and that a piecemeal approach to disease control was often insufficient and, in certain cases, even worsened the original problem. Thus, one aspect of the transdisciplinary approach conceived by the study as applied to the dengue problem considers the health issue as an open, dynamic system operating at different levels. In other words, the EID problem is better understood and targeted based on the nested and interdependent nature of social and ecological systems. The study also addresses the need to include different types of integration with the aim of transcending disciplinary boundaries. Thus, it considers "horizontal" integration across disciplines as well as 'vertical" integration that includes a variety of community stakeholders such as women and children. The author reveals that their transdisciplinary research was feasible and productive because the research team maintained an "open attitude to learn, share, and…contribute" despite the diversity and fundamental differences in their value systems, frameworks, discourses and terminologies.

At the Philippine General Hospital (PGH) a study was conducted from 1997 to 2000 by (Sugue-Castillo, 2009) entitled "Legal outcomes of sexually abused children evaluated at the Philippine General Hospital Children Protection Unit." It describes the legal uses of verbal evidence derived from children's disclosures of sexual abuse as recorded by participating hospital physicians. It employs a mixed transdisciplinary research design combining longitudinal cohort and qualitative methods. Data were gathered by chart review, in-depth interviews of key informants, and analysis of legal documents. In a sense, this is a case of a natural science discipline (medicine) permeating a social science field of study (law). Thus, children's disclosures and physical findings documented by the PGH Child Protection Unit serve as entry points into the child protection system and highlight the role of medical assessment in "initiating the community response to child abuse" and in delivering justice and protection for abused minors.

Environment-related researches

A research undertaking that fits well the features of transdisciplinarity was one conducted from 1993 to 1997 on the coastal resources of Bolinao, Pangasinan. The project, "Paving the way

for coastal resources management: The Bolinao experience (1993-1997)" (Talaue-McManus et al. 2001), was a tripartite collaboration among the University of the Philippines' Marine Science Institute, the University of the Philippines' College of Social Work and Community Development, and the Haribon Foundation with funding from the International Development Research Centre of Canada. More than the integration of the theoretical and methodological specializations of the natural and social scientists, the project also incorporates, following an interactive process of public consultations, the views and practical experiences of the coastal communities and people's organizations (POs). The collaborative project aims to provide a basis for the formulation of a community-based coastal resource management (CBCRM) scheme to protect the town's coastal resources and insure their sustainable use against deleterious activities such as the planned establishment of a pollutive cement plant in the area. It employs a novel and shared conceptual framework characterized by a transgressive dislocation of disciplinary conventions aimed at constructive problem-solving and real-world engagement. The framework has a particularly vertical transcendent character in the sense that knowledge generated outside of academe is included. Thus, the wide transformative compass of the research framework includes the following six components: community organization, people's institutionalization, environmental education, resource management, livelihood development, and networking and advocacy. These components are integrated by the processes of conceptualization, documentation / evaluation, and implementation.

The successful CBCRM advocacy experience of the UP Marine Science Institute particularly against the planned establishment of a cement plant in Bolinao, Pangasinan has also spawned coastal resource management tools. One of these is *Coastal development planning* by Aliño (2001) produced through a collaborative effort among marine scientists, community development planners, the local government unit (LGU), fisherfolk, people's organizations (POs), the private sector and nongovernment organizations (NGOs). This manual describes the steps in the formulation of a coastal management plan and follows the CBCRM framework used by the Marine Environment Resources Foundation (MERF) Inc. of the UP Marine Science Institute. Another coastal resource management tool entitled *An orientation on marine protected areas* (Arceo, 2001), shows how to establish, implement, and manage Marine Protected Areas (MPAs). Following the integrated coastal management approach practiced by the UP Marine Science Institute in large basins of water such as the Lingayen Gulf and Batangas Bay, the module collates lessons learned from the successes and failures of existing MPA initiatives like those in the Philippines and neighboring countries. The manual preparation follows a bottom-up process which starts with the gathering of experiences at the grassroots level, i.e., at the level of stakeholders in the barangays and municipalities.

An undertaking entitled "The Sagip Lingayen Gulf Project" was conducted in 2008 along both a horizontal transdisciplinary research involving natural scientists from the UP Diliman Marine Science Institute and the UP Los Baños College of Agriculture, and a vertical transdisciplinary line involving local government units (LGUs) and people's organizations (POs). Following a postmodernist notion of transdisciplinarity that also characterizes the above researches organized by the UP Marine Science Institute, the project integrates knowledge generated inside the academe and knowledge produced by organized structures outside of academe. The project is transdisciplinary in nature being a fusion of the understandings of ecologists and marine scientists, on one hand, and of law practitioners and enforcers and the stakeholders, on the other. The project formulates a multi-dimensional enforcement system or framework that operates at three levels: at the intervention level (Marine Protected Areas and mangroves), LGU, and inter-LGU levels. It involves a combination of "hard" (pure enforcement) and 'soft" (information,

education and communication) approaches as well as an institutionalized legal component (Solibaga et al., 2008).

A transdisciplinary research work similar to the above studies conducted along the postmodern approach marked by a sense of urgency to understand and deal properly with a complex problem is described in the book *Philippine coastal marine habitats at risk: A case study of Guimaras Island* (Babaran and Ingles, 1997). Supported by the Institute of Marine Fisheries and Oceanology of the UP-Visayas and the UP Center for Integrative and Development Studies (UP-CIDS), the study was conducted mostly by marine scientists, but supported by social science representatives, i.e., a land use and environmental planner and the Provincial Planning and Development Coordinator (PPDC). The research aims to provide a baseline reference on the island's coral reefs, seagrass beds and mangroves under stress from natural and anthropogenic causes. The first four chapters of the book are more the work of the marine science experts as they describe the coastal waters and the coral reef, mangrove and seagrass ecosystems of the province. The last chapter—"Managing the Coastal Marine Habitats of Guimaras Province"—reflects the greater participation of planners even as they employ the conceptual and methodological inputs of the natural scientists in the planning process.

Another good example of a transdisciplinary research undertaking is the one conducted in 2006 on the valuation of the multi-faceted damages resulting from the NAPOCOR Power Barge 106 oil spill which occurred in December 2005 on the coast of Semirara Island, Caluya, Antique. The spill occurred when the barge was grounded by the strong winds of tropical depression Quedan and two fuel tanks were ruptured, in the process releasing 364,120 liters of bunker fuel into the sea. The participating researchers based at the UP Visayas include an economist, an agricultural economist, a resource economist, one who had a background in community health and epidemiology, and an environmental scientist. The result of the study was published in a supplement issue of a transdisciplinary journal—*Danyag: A UPV Journal of Humanities and Social Sciences*. The study employs a novel integrative conceptual framework that ties up the different valuations of the components of the concept of total economic value (TEV). Under TEV, there are use values and non-use values. Use values include direct use value and indirect use value. Non-use values comprise option value, quasi-option value, bequest value, and existence value. These concepts are operationally defined throughout the whole report (Subade et al., 2006).

Combining environment, architecture and health, the research "Designing healthy communities: The health impact of street vendor environments" (Akers and Akers, 2010) was conducted in Baguio City from 1999 to 2006 by an architect-planner and a public health specialist. The study looks into the impact of architecture and the environment on the health of street hawkers in Baguio City. Multiple research methods were employed to study the architecture and easements of buildings, the slope of the vending areas, the pollution level of the atmosphere, and the health conditions of the vendors. The results show the close relationship between health and the built environment, leading the authors to recommend changes in the transportation system, the architecture of the buildings, the hawking location of vendors and their manner of vending, and the physical layout and use of the Central Business District (CBD).

Pressures of urbanization: Flood control and drainage in Manila edited by Liongson, Tabios and Castro (2000) is a compilation of papers read during two conferences held in 1997 and 1998 on Metro Manila floods which were sponsored by the UP-CIDS. The 1998 conference decided to add two more papers that widened the disciplinary dimension of the perennial flooding phenomenon in the metropolis, with one of the two additional papers written from a social science perspective. Of the eight articles included in the volume, three were written by social scientists from the disciplines of geography, sociology and public administration while five were written by

hydrologists and engineers. Although the compilation may not really have the most important attribute of transdisciplinarity of employing a novel and shared conceptual framework that explicitly destabilizes disciplinary boundaries, it fits the characteristic of engagement in transformative praxis and participation in addressing a recurrent problem that causes great losses in terms of life and property, as demonstrated recently by floods generated by typhoons Pepeng and Ondoy in 2009. A concluding section tries to interrelate the contents of the papers particularly on how to mitigate the disasters caused by flooding in Metro Manila based on a holistic and concerted scheme that is well-informed by the social sciences.

Socioeconomic Researches

Food security research

The book *Food security in the Philippines,* jointly published and funded by the Institute of Strategic Planning and Policy Studies (ISPPS) of the University of the Philippines-Los Baños and the UP-CIDS, is a product of transdisciplinary research involving the use of a common conceptual framework and the collaboration between natural and social scientists with specializations related to agriculture (Cabonilla and Paunlagui, 1999). The book features articles that explore the various dimensions of the food security issue but are actually integrated by the common framework that food security must be viewed from the economic perspective of supply and demand, considering that, despite conditions of national food surpluses, there is still a great possibility for families to suffer from food insecurity. Overall, the book shows that the concept of food security goes beyond the common understanding that it is a condition marked by surpluses in food supply and a desirable departure from a state of food sufficiency. Food insecurity can still occur as explained by the concepts of availability and affordability. The book deals with demand-related issues such as the global market for cereals, food needs of an increasing population and the concept of food security viewed from the household perspective. It also discusses issues concerned with the supply side like land resource management, watershed and water management, technological solutions, rural infrastructure, use of on-farm water reservoir for enhancing productivity, and hydroponics. The ramifications of the devolution of powers granted by the Local Government Code to the agricultural sector are also discussed.

Community participation and health policy

"Community participation in Local Health Boards in a decentralized setting: Cases from the Philippines" is a pioneering transdisciplinary study linking concepts like local participation, empowerment, decentralization and health policy. It was participated in by scholars representing the fields of psychology, political science, clinical epidemiology, history and health social science and working either at the University of the Philippines-Manila or the World Health Organization. The research analyzes the role of local health boards in improving community participation and empowerment under a decentralized system of governance in the Philippines. Also, local government units (LGUs) with functioning health boards are compared with LGUs whose local health boards do not meeting regularly as required by law. Results show that in LGUs with functioning local health boards there are more consultations with the population, more fund-raising drives and health enhancement initiatives, and greater per capita expenditures on health (Ramiro, 2001).

Socioeconomic development plans

The field of planning, which usually includes urban, regional, transportation, land use, real estate and related types of planning generally aimed at promoting the socioeconomic development of certain areas, can be said to produce documents that are results of transdisciplinary research. The planning discipline produces such numerous existing documents as municipal comprehensive land use plans, provincial physical framework plans, regional

physical frameworks plans, urban master development plans, transportation master plans, tourism master plans and other types of areal development plans. These plans usually include components like social, economic, political, environmental, infrastructure and land use plans. The consultants recruited for the first three components often belong to the social sciences while those for the other three usually come from the physical sciences.

While plans are not strictly research reports, the two are closely related since plans are also products of research done by team consultants who employ research methods in gathering secondary and primary data to be used in the preparation of their particular sub-plans. In the preparation of the whole plan, the consultants get involved in an iterative process of integrating their sectoral plans based on the structural frameworks, goals, objectives and targets of the plan as initially set forth in the planning process. When the draft plan is completed, it is subjected to further integration by stakeholders in public consultations and public hearings. Usually, the integration of the different sectoral plans is also manifested physically in the land use plan. Thus, plans are basically transdisciplinary research outputs since they involve the interactive participation of social scientists, natural scientists, sometimes humanists and the community as well as the use of the methodologies of goal formation, integration and recursiveness to reveal the complex problems of the real world. In fact, the very holistic and polemic nature of the planning process that deals with the totality of reality reflects the postmodern metaphysical level of transdisciplnarity that tries to achieve an understanding of the present complex world with its several "levels of Reality"(Nicolescu, 2010).

ASSESSMENT

To date, only few studies have been done in the Philippines along the lines of the research genre. The ones reviewed in this paper belong mostly to collaborative social science-medicine and social science-environment researches, with a few on socioeconomic-natural science studies. Related to these researches are the pioneering transdiciplinary educational programs established in the University of the Philippines and De La Salle University dealing with the integration of the social sciences, on one hand, and the health and environmental sciences, on the other. Health social science is actively pursued through the initiative of social scientists in UP-Manila, a health and social science campus where the College of Medicine and the College of Arts and Sciences are physically proximate to each other (Tayag, 2004, p. 50). Thus, it may be noted further that the health-related researches demonstrate the proactive permeation of the values of the social sciences in the physical sciences. To recapitulate, the delimiting multi-dimensional criterion used is that the researches should involve the participation mainly of both the social sciences and the natural sciences in terms of the deep vertical integration of their theoretical and methodological approaches; the proactive phenomenological permeation of the social sciences in the physical sciences; and the conduct of collaborative researches addressing complex issues by the representatives of both fields of knowledge as well as those of folk knowledge. Implicit in this criterion is also the participation of the humanities.

Many researches have been done on peace, conflict resolution and human rights, such as those sponsored by the Commission on Human Rights, and some have multiple authorships. However, the participants all belong to the social sciences such as sociology, social work, public administration and law. Some employ an integrating conceptual framework but again only the social sciences are involved, such that these may be properly identified only as interdisciplinary researches. Many collaborative studies have also been conducted in the area of women and gender but after close perusal they are found to be conducted only by social scientists such as those belonging to community development, social work, psychology, sociology, demography and history. Some employ shared and

transgressive conceptual frameworks but these are wanting of the participation of natural science disciplines (or of the humanities) and may just be considered either as multidisciplinary or interdisciplinary studies. A number of related interactive studies on agrarian transition, sustainable agriculture, land reform, rural development and natural resource management have been examined but these were participated in only by social scientists and some just have single-author chapters (multidisciplinary approach) or integrated topics using a shared conceptual framework (interdisciplinary approach).

A current large international undertaking, for instance, entitled "The challenges of agrarian transition in Southeast Asia" includes 23 researchers from 18 universities in many parts of the world and employs four integrating conceptual perspectives. However, the participating disciplines come only from the social sciences, namely, economics, anthropology, history, sociology, women's studies, urban studies, planning, and environmental geography. The last discipline may come close to representing the natural sciences, but its orientation is still basically in the social sciences (De Koninck, 2004). Studies on labor migration, educational reform, and the youth and the elderly such as those either funded or coordinated by the Philippine Social Science Council (PSSC) and the UP-CIDS are mostly multidisciplinary in nature with their compartmentalized compilation of articles with single authorship although dealing with a common complex problem. Even the landmark UP-CIDS-funded three-volume study edited by Alejandro Herrin (1994), *Population, human resources and development,* is only a multidisciplinary study consisting of 31 single-author chapters grouped according to certain topics and written mostly by social scientists. Four natural science authors from the health and nutrition disciplines participated in the project but there was no integration of their findings with those of the social scientists. The same can be said of a series of major socioeconomic studies, the *Human Development Report,* published by the Human Development Network (HDN) and The United Nations Development Programme (UNDP) (2005). This is a compilation of articles written by Filipino social scientists but bereft of either a novel or borrowed integrative conceptual framework. It must be mentioned that there are also other multi-authored studies on health and the environment but these were done wholly either by social scientists or natural scientists and with or without an integrating conceptual framework.

Indeed, most collaborative studies focusing on the Philippines are only either multidisciplinary or interdisciplinary in approach. And one could have wished that there were more transdisciplinary researches focused on socioeconomic and politico-administrative problems of the country—in particular problems related to poverty, inequality, unemployment, poor national governance and local government administration, and undeveloped institutions and values. Like the focus on health problems, education, too, should have been given more attention, given its potential for enhancing the quality of the country's human resource sector. One rich field, for instance, for transdisciplinary research is the investigation of the role of the country's interrelated spatial, natural resource and physical features in the promotion of national socioeconomic development. The foregoing assessment points to the common difficulties or obstacles in conducting transdisciplinary researches, which are also applicable to the Philippines.

ISSUES

On a more theoretical level, the dearth in transdisciplinary researches can be traced to the concept of dualism which is a theoretical construct that views the world in terms of disconnected or even contrasting properties and considers the study of nature and society as separate and opposite entities. Dualism looks at the world in terms, for instance, of such attributes as physical and social, reason and emotion, male and female,

objective and subjective knowledge, health and illness, and folk methods and scientific methods. Dualism views natural science as objective science and social science as subjective science, thus society cannot be investigated with the "objectified detachment that is the cultivated attitude of natural scientists" (Alvarez-Castillo, 2004, p. 18). While in reality the two branches of knowledge provide an intertwined view of reality and the perceived dichotomies are actually intersecting phenomena, the narrow theoretical orientation exudes a pronounced partiality for the scientific culture. The scientific method and rationality are considered to be the only reliable ways of understanding the real world and that feelings and folk knowledge are impediments to the scientific pursuit. In truth, however, there is science in folkways just as there is superstition in scientific cognition (Oakley and Gursoy as cited in Alvarez-Castillo, 2004, p. 3). Thus, the misconception about the theoretical and methodological capabilities of the sciences, including the condescending positivist attitude of the natural sciences, has impeded the cultivation of a culture of collaborative research undertakings.

Disciplinarization is another obstructionist intellectual trend that attaches importance to the development of specialized disciplines and placing them in compartmentalized academic structures termed departments. The process is institutionalized through the university as a permanent structure where ways of producing and reproducing knowledge became standardized. Departmentalization along disciplinal orientations was an academic practice bequeathed by the Americans to the Filipinos (Alvarez-Castillo, 2004, p. 19). The practice was rationalized on grounds of pragmatism. "No one can learn or teach what is known about human society, and therefore, it is necessary to divide the many ways in which human beings interact with each other into manageable and reasonably coherent units of study" (Mackenzie, 1966, p. 7). However, the position taken by the transdisciplinary approach is that discipli-narization abets the compartmentalization of knowledge, disregards the interlinkages of objects, acts and processes, blocks the complete comprehension of complex phenomena, and decreases the likelihood of solving problems effectively.

On a more practical level, certain situations in research practice present barriers to the conduct of transdisciplinary research. One situation is when transdisciplinary research is viewed as "soft" i.e., either bereft of rigor or ideologically motivated. These impressions put barriers in the career trajectories of those who want to pursue transdisciplinary work. For instance, transdisciplinary grant applications are usually refereed by peer reviewers coming from established specialized disciplines, such that transdisciplinary researchers may face difficulty in securing funding support for their research. The same bias against transdisciplinarity may be experienced by transdisciplinary faculty when they seek promotion and tenure. In cases like these, there is a need for the school administration to educate or enlighten the minds of traditionalist faculty on the value of transdisciplinary, and even of interdisciplinary, research (*Wikipedia*, Interdisciplinarity, n.d.).

A second barrier is when transdisciplinary research is not given sufficient autonomy. For instance, when transdisciplinary faculty are recruited to a joint appointment with traditional disciplinary faculty and the latter is given the power on tenure decisions, the new transdisciplinary faculty will be hesitant to pursue their line of research. In this case, the school administration should provide for a sharing of decision-making powers among the participating faculty.

A third problem lies in the neglect of the diversity of goals, values, expectations and power groups in both society and science. The disregard for mutual learning of sociocultural diversity and the participatory process among participants can result in mere symbolic participation and the hardening of roles and positions along traditional disciplinary lines. To avoid this problem, there is a need to build on approaches of mutual learning that bridge roles and positions. Thus, instilling the

participatory process would involve the conduct of carefully structured, sequenced and selected negotiations and interactions (Wisemann et al., 2008).

A fourth issue lies in the collaboration to integrate the theoretical and methodological perspectives of various disciplines, involving particularly problem formulation and definition of terms as well as the other aspects of the whole research process. Throughout this process, a whole range of difficulties can arise as when efforts are confined to mere exchange of communication or when the synthesizing process is postponed towards the end of the research operation. The stumbling blocks may also surface if the integration process is assigned to only one of the participating disciplines which may employ a stringently designed conceptual framework that will not allow room for participating disciplines to maneuver. This is related to the problem of lack of variables that are comparable between disciplines as well as the expertise to combine them. A way out of these stumbling blocks is to start the integration process early and engage the whole transdisciplinary team following a recursive or circular process that from experience has proven to be successful. Team communication may be facilitated by "bridgers" between actors who have good communication skills (Wisemann et al., 2008; Pfund et al., 2006).

A fifth barrier has to do with leadership and management structures that tend to become complex and overloaded with the participation of a range of partners and institutions. Due to the recursive nature of problem definition and conceptual integration, participating disciplines and institutions may change or vary over time and present problems of leadership, management and coordination. Moreover, what creates a further toll on efficient leadership and management is the pressure placed on project management to provide sufficient time, space and resources that would insure the accomplishment of mutual learning and the recursive research process. Thus, the efficient management of a transdisciplinary research undertaking should strike a balance between periods of intensified collaboration and integration and phases of less intense activity—in the process allowing disciplinary participants to elaborate on their specific contributions to the project (Wisemann et al., 2008).

One of the most important stumbling blocks to transdisciplinary research pertains to the divergent and often conflicting values of participating researchers and stakeholders. Values strongly influence the design and recursive process of transdisciplinary collaboration, as in, for instance, deciding on who is included or excluded in the research team or on how the interpretation and application of findings and outcomes will be done. As a way of paying attention to values and preventing their divisive effects at all stages of the transdisciplinary process, the collaborations and negotiations should be permeated by a mutual learning attitude. "This is best promoted by adequate time allocation, by creating broad ownership of the problems and by building value-consciousness through reflexive processes among researchers" (Wisemann et al., 2008).

SOLUTIONS

There is also a need for researchers to cultivate the habit of mindfulness or a reflexive examination of the failings of the intellectual traditions of both the social and natural sciences that will enable them to recognize their deep values and mindsets. This emancipatory paradigm shift from mindlessness to mindfulness about their divisive intellectual cultures should help the sciences recognize the intellectual blind spots they had assumed for so long to be reality. The emerging paradigm shift also informs the sciences to respect and integrate into their epistemological systems the knowledge contributed by hitherto excluded sectors—women, the poor, indigenous communities, activist structures, and local stakeholders subject to social and environmental hazards.

A methodological trans-systemic perspective is also prescribed to make the two sciences come out of their rigid intellectual boxes. This

perspective employs certain concepts as analytical devices in investigating various knowledge systems in order to reveal hidden logic and thought processes that run through them. It shuns the dualist consideration of opposites and exclusivity and, more importantly, the exhibition of intellectual arrogance in modern science (Castro-Palaganas, 2004). Thus, the prescriptions for reflexibility and trans-systemic perspective to eliminate one of the most important barriers to transdisciplinarity presented by traditional value systems brings the discussion back to the postmodern and metaphysical meaning of transdisciplinarity described earlier in this paper. As adopted by the First World Congress of Transdisciplinarity in Portugal in 1944, the postmodern view of transdisciplinarity which serves as its philosophical framework is a rigorous rationality that must also be receptive to the "unknown, the unexpected and the unforeseeable," including "myth and religions," while shunning bigotry, ideology and prejudice. The values espoused by the transdisciplinary vision are sharing, respect, resolve and a zeal for justice, equality, inclusion and democratic decision-making. It pleads for a new ethos, a different way of living, a personal ethical commitment, and a new way of being. This distinctly postmodern viewpoint calls on transdisciplinary-minded persons of all nations to join and bring this vision into reality and into daily living.

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