Deciphering Interdisciplinary and Transdisciplinary Contributions

Roderick J. Lawrence, *Human Ecology Group Institute for Environmental Sciences, University of Geneva, Switzerland, Email: Roderick.Lawrence@unige.ch*

doi: 10.22545/2010/0003

The incapacity of many human societies to deal with contemporary environmental questions (such as climate change, health epidemics, land-use, forestry management, renewable and non-renewable resources, housing, poverty, and urban planning) can be contrasted with the viewpoint of many professionals and politicians who are convinced that they have the "right answers." However, the lack of consensus about climate change, the stock of renewable and non-renewable resources, and the failure of so-called "model" housing estates and urban planning projects constructed since the 1950s in countries with socialist or freemarket economies clearly show that new ideas, working methods, objectives, and criteria are needed in both scientific research and professional practice. The challenges related to dealing with the above-mentioned problems concern their complexity, the compartmentalization of scientific and professional knowledge, the sector-based division of responsibilities in contemporary society, and the increasingly diverse nature of the societal contexts in which people live. In addition, the lack of effective collaboration between scientists, professionals, and policy decision-makers has led to the "applicability gap" in sectors that deal with both the natural and human-made environment. This article discusses the added value of interdisciplinary and transdisciplinary contributions as well as the challenges that are commonly confronted by those who wish to implement them to deal with complex real-world issues.

Keywords*:* interdisciplinary and transdisciplinary contributions, environment, collaboration.

1 Introduction

Today there is no consensual definition of interdisciplinary and transdisciplinary contributions. Current confusion and misunderstandings about multidisciplinary, interdisciplinary, and transdisciplinary contributions to scientific research, formal education programmes, and professional practice have a history that can be traced back at least to the seminar organized by the Organization for Economic Cooperation and Development (OECD) in 1970. In some of the papers presented at that seminar, a distinction was made between interdisciplinary and transdisciplinary contributions [1]. Both Erich Jantsch, the Austrian physicist, and Jean Piaget, the Swiss psychologist, adopted an interpretation that refers to systems theories and a multi-level or hierarchical model that positions multidisciplinary contributions below interdisciplinary ones, which, in turn, are below transdisciplinary contributions. Jantsch and Piaget agree that multidisciplinary approaches merely juxtapose different disciplinary contributions whereas interdisciplinary approaches are coordinated and integrated. Accordingly, transdisciplinary approaches combine more disciplinary contributions in order to generate a more comprehensive level of understanding by

applying an enlarged systemic framework of several disciplinary and interdisciplinary contributions.

Thirty years after the international seminar organized by the OECD, a consortium of Swiss academic and professional institutions organized an international conference in Zurich in 2000. About 800 participants from 50 countries attended, and they were presented with different interpretations of interdisciplinary and transdisciplinary approaches compared to those of the 1970s [2]. In particular, transdisciplinary approaches were considered new forms of learning and problem solving that involve actors from both the scientific community and other sectors of civil society (non-governmental organizations, community associations, and the private sector) in order to tackle real-world problems. This interpretation is not the same as the enlarged application of disciplinary approaches that was proposed in the 1970s.

Some reasons for the shift in the interpretation of interdisciplinary and transdiciplinary approaches between 1970 and 2000 are grounded in the ability of scientific research to deal with tangible research questions that societies need to tackle. These include public health challenges, such as the obesity epidemic; impacts of global change, including the effects of desertification on natural and human-made ecosystems; and the consequences of the uses of different kinds of energy resources on local and global economies. Another concern has been related to the complexity of these real-world issues and the incapacity of any one discipline or profession to deal with them effectively. Gibbons et al. argued that the conventional modes of doing scientific research are insufficient and that joint problem solving among science, technology, and representatives of civic society are essential [3]. Hence, in contrast to other interpretations, the International Conference in Zurich provided an innovative framework for participatory research on a wide range of real-world problems rather than focusing only on academic research and the curricula of higher education programmes.

Today there is no shared definition of interdisciplinary and transdisciplinary contributions. Nonetheless, it is more widely accepted that transdisciplinary approaches are not synonymous with interdisciplinary ones. However, there is still no consensus concerning the differences between interdisciplinary and transdisciplinary contributions [4].

The relationship between researchers in different disciplines, especially in the human/social and the basic/natural sciences, is often considered to be a source of conflict. Yet, this need not be the case as Boyden and his colleagues showed more than 20 years ago in their applied human ecology research about Hong Kong [5]. Innovative contributions of this kind can lead to the development of new terminology, innovative concepts, and new knowledge. This is an important challenge for those who wish to apply interdisciplinary or transdisciplinary approaches to deal with complex environmental questions.

When dealing with complex subjects, such as core environmental questions, it is necessary to shift from mono-disciplinary to interdisciplinary and transdisciplinary concepts and methods. In order to be effective, this shift should be founded on a clarification of definitions, goals, and methods. In this paper, disciplinarity refers to the specialization and fragmentation of academic disciplines especially since the 19th century. Each discipline has its own concepts, definitions, and methodological protocols for the study of its precisely defined domain of competence. Multi-disciplinary refers to an additive research agenda in which each researcher remains within his or her discipline and applies its concepts and methods without necessarily sharing a common goal with other researchers. Interdisciplinary studies are those in which concerted action and integration are accepted by researchers in different disciplines as a means to achieve a shared goal that usually is a common subject of study. In contrast, transdisciplinary contributions incorporate a combination of concepts and knowledge not only used by academics and researchers but also other actors in civic society, including representatives of the private sector, public administrators, and the public. These contributions enable the cross-fertilisation of knowledge and experiences from diverse groups of people that can promote an enlarged vision of a subject, as well as new explanatory theories. Rather than being an end in itself, this kind of research is a way of achieving innovative goals, enriched understanding, and a synergy of new methods.

Multidisciplinarity, interdisciplinarity, and transdisciplinarity are complementary rather than being mutually exclusive. Both interdisciplinary and transdisciplinary research and practice require a common conceptual framework and analytical methods based on shared terminology, mental images, and common goals. Without specialised disciplinary studies, there

would be no in-depth knowledge and data. This paper will summarize the mainstream interpretations of interdisciplinary and transdisciplinary contributions and illustrate them with respect to recent publications in the field of environmental studies.

What is interdisciplinarity?
It is generally accepted that interdisciplinary contributions involve the collaboration and cooperation of scientists from at least two disciplines who apply their disciplinary competence to work on common questions and the achievement of shared results. The core characteristic of interdisciplinary approaches is their goal to integrate concepts, methods, and principles from different disciplines [6].

What is transdisciplinarity?
Transdisciplinarity is an ambiguous term that has been interpreted in various ways. Balsiger noted that there is no complete history of this term or concept [7]. Like interdisciplinarity, there seems to be no consensus about its meaning. This being said, several shared aims of transdisciplinarity can be identified by an analysis of recent publications.

First, transdisciplinarity admits and confronts complexity in science and it challenges knowledge fragmentation [8]. It deals with research problems and organizations that are defined from complex and heterogeneous domains such as global environmental change or public health challenges [9]. As well as complexity and heterogeneity, this mode of knowledge production is also characterized by its hybrid nature, non-linearity, and reflexivity, transcending any academic disciplinary structure [10]. Second, transdisciplinary research accepts local contexts and uncertainty. It is a context-specific negotiation of knowledge [11]. Third, transdisciplinarity implies intercommunicative action. Transdisciplinary knowledge is the result of inter-subjectivity [12]. It is a research process that includes the practical reasoning of individuals with the constraining and complex nature of social, organizational, and material contexts. For this reason, transdisciplinary research and practice require close and continuous collaboration during all phases of a research project or the implementation of a project. Fourth, transdisciplinary research is often action-oriented. It entails making linkages not only across disciplinary boundaries but also between theoretical development and professional practice [13]. Transdisciplinary contributions frequently deal with real-world topics and generate knowledge that not only address societal problems but also contribute to their solution [14]. One of its aims is to understand the actual world and to bridge the gap between knowledge derived from research and decision-making processes in democratic societies. However, transdisciplinary research should not be restricted to applied knowledge [15]. This common interpretation is too restrictive because there is no inherent reason why theoretical development – especially the analytical description and interpretation of complex environmental questions – cannot be achieved by transdisciplinarity. This is a basic necessity if advances are to be made in research and practice about real-world issues.

2 Understanding Multidisciplinary, Interdisciplinary, and Transdisciplinary Contributions

Although interdisciplinarity and transdisciplinarity have been used interchangeably by some authors, the difference between multidisciplinary, interdisciplinary, and transdisciplinary contributions will now be summarized.

Bruce et al. stated that in multidisciplinary research, each discipline works in a self-contained manner and that in interdisciplinary research, an issue is approached from a range of disciplinary perspectives integrated to provide a systemic outcome [16]. In transdisciplinary research, however, they affirm that the focus is on the organization of knowledge around complex heterogeneous domains rather than the disciplines and subjects into which knowledge is commonly organized.

Some authors remind us that the word interdisciplinary has been used consistently to denote scientific research that involves a number of disciplines [17]. In contrast, the word transdisciplinary has not been restricted to scientific research. It has been used since the 1970s in debates about teaching that were launched by the famous Swiss psychologist Jean Piaget, as well as in the practice of architecture, urban design, and land-use planning that involves stakeholders in decision-making processes.

Ramadier argued that transdisciplinarity should not simplify reality by only dealing with parts of it that are compatible at the crossing of multiple disciplinary perspectives, as is often the case with interdisciplinary research [18]. He introduced the

argument that transdisciplinarity is at once between disciplines, across disciplines, and beyond any discipline, thus combining and going beyond all the processes of multidisciplinarity and interdisciplinarity. He stressed that transdisciplinary approaches can only be effective if there is a significant shift in disciplinary thinking. He argued this would involve a shift from disciplinary divisions (which search for the unity of knowledge) to collaborative deconstruction (which seeks coherence).

Ramadier illustrates these approaches by the study of people-environment relations in urban areas. He considers the contributions of scholars in anthropology, architecture, history, human geography, urban sociology, and psychology. Each of these disciplinary contributions includes concepts and methods that are applied to study people in precise situations, usually only at one point in time. He then discusses how disciplinary interpretations of the legibility of urban space have not provided innovative knowledge. In contrast, he notes that transdisciplinary contributions by some environmental psychologists have led to the formulation and validation of innovative concepts, such as place identity. Since the 1970s, the concept of place-identity has provided important contributions to the field of architecture, human geography, psychology, and sociology by showing the influence of the physical environment on identity and self-perception.

Després, Brais, and Avellan describe the context, theoretical framework, methodology, and results of a collaborative urban planning project to redefine the future of suburban neighborhoods built between 1950 and 1975 on the outskirts of Quebec City in Canada [19]. The authors stress that transdisciplinarity and intersubjectivity explicitly form the theoretical and methodological foundations of their work. They adopt a framework stemming from the theory of communicative action by the German philosopher Jürgen Habermas. The authors share Habermas conviction that scientific knowledge is not the only type of rational knowledge and that instrumental, ethical, and aesthetic knowledge should be integrated to form a holistic science [20]. They endorse Habermas position that rational knowledge is not only defined by what is known but also by how it is communicated. Dialogue processes, mediation, negotiation, and consensus building are means for the development of mutual understanding and intersubjectivity that, in turn, produce a fifth type of hybrid knowledge.

Desprs and her colleagues applied this theoretical framework and developed a methodology that combines scientific analysis, action research, and participatory design processes. The successive phases of their work involve a diagnostic of the demographic, environmental, physical, and social characteristics of suburban environments; the definition of objectives and criteria for the revitalization of specific suburbs; and the development of an architectural and urban design project for the redevelopment of these suburbs using an 18-month participatory process with stakeholders and representatives of the local population.

Transdisciplinary contributions of this kind enable the cross-fertilisation of ideas and knowledge from different contributors that promotes an enlarged vision of a subject, as well as new explanatory theories. Innovative contributions require not only logical reasoning but also imaginative thinking [21]. Transdisciplinarity is a way of achieving innovative goals, enriched understanding, and a synergy of new methods.

Several recent contributions propose that the difference between interdisciplinary and transdisciplinary contributions stems from the latin prefix "trans," which denotes transgressing the boundaries defined by traditional disciplinary modes of inquiry. They make a distinction between the research group, which will always remain interdisciplinary by the very nature of disciplinary education and inquiry in general, which, if transdisciplinary, implies that the final knowledge is more than the sum of its disciplinary components. Lawrence compares interdisciplinary approaches to a mixing of disciplines while transdisciplinary ones would have more to do with a fusion of disciplinary and other kinds of knowledge [22]. This interpretation means that transdisciplinarity is not an automated process that stems from the bringing together of people from different disciplines or professions. In addition, it requires an ingredient that some have called transcendence [23]. This implies the giving up of sovereignty over knowledge, the generation of new insight and knowledge by collaboration, and the capacity to consider the know-how of professionals and lay-people.

Wiesmann and his colleagues summarize the dominant interpretation of transdisciplinarity in German-speaking countries of Europe as "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" [24].

This paper shows that the debate about the "correct" definition of interdisciplinary and transdisciplinary research has been a continuous one since the 1970s. Here it is important to emphasize that multidisciplinarity, interdisciplinarity, and transdisciplinarity approaches are better treated as complementary rather than being mutually exclusive. It is important to stress this complementarity because the interrelations between these approaches ought to be more systematic than they have been in recent years.

3 Conclusion

There is an urgent need for innovative approaches in many situations, such as the blatant failure of the wealthiest countries of the world to deal with a wide range of challenges. For example, the necessity of addressing environmental concerns has not been recognized by all actors and institutions in developed and so-called developing countries as being essential for sustaining human living conditions on earth. Many governments in these countries have not realized the urgency of mitigating the consequences of their ways of life by the implementation of innovative policies. This inertia has some of its origins in the lack of interdisciplinary and transdisciplinary contributions. Most scientific contributions on this subject are completed by the bio-physical environmental sciences in order to understand the changes and impacts in the bio-physical environment. Nevertheless, analyses of the behaviour and organization of human societies are also needed to address the situation with political tools. Therefore, at the very least, multidisciplinarity is required to address this complex issue in its globality. However, the different epistemologies of each discipline and science (in both the natural and human sciences) raise difficulties for collaboration, preventing strong interdisciplinarity, especially when treated within traditional disciplinary scientific methodological frameworks. The practical solution will lie in the capacity of teams of researchers and representatives of civil society to join their research objectives by building dialogue. However, even as many researchers and practitioners no longer question the need for interdisciplinary contributions, transdisciplinary approaches are still not yet commonly applied in order to address core environmental questions.

References

[1] Organization for Economic Co-operation and Development (OECD), Interdisciplinarity : Problems of teaching and research in universities.1972. Paris, OECD.

[2] Thompson Klein, J., Grossenbacher-Mansuy, W., Häberli, R., Bill, A., Scholz, R., and M. Welti (eds.), 2001. Transdisciplinarity: Joint Problem Solving among Science Technology and Society, an Effective Way of Managing Complexity. Basel, Birkhäuser.

[3] Gibbons, M. et al., 1994. The New Production of Knowledge : The Dynamics of Science and Research in Contemporary Societies. London, Sage.

[4] Pohl, C. & Hirsch Hadorn, G., 2007. Principles for Designing Transdisciplinary Research–Proposed by the Swiss Academies of Arts and Sciences. Munich, oekom Verlag.

[5] Boyden, S., Millar, S., Newcombe, K. & ONeill, B. 1981. The Ecology of a City and it People: The Case of Hong Kong. Canberra: Australian National University Press.

[6] Frodeman, R., Thompson Klein, J. & Mitcham C. (Eds.), 2010. The Oxford Handbook of Interdisciplinarity. New York, Oxford University Press.

[7] Balsiger, P. 2004. Supradisciplinary Research Practices: History, Objectives and Rationale. Futures, 36(4), pp.407-421.

[8] Sommerville, M. & Rapport, D. (eds.), 2000. Transdisciplinarity: Recreating Integrated Knowledge. Oxford, EOLSS Publishers.

[9] Lawrence, R., 2004. Housing and Health: From Interdisciplinary Principles to Transdisciplinary Research and Practice. Futures, 36(4), pp.487-502.

[10] Thompson Klein, J., Grossenbacher-Mansuy, W., Häberli, R., Bill, A., Scholz, R., and M. Welti (eds.), 2001. Transdisciplinarity: Joint Problem Solving among Science Technology and Society, an Effective Way of Managing Complexity. Basel, Birkhäuser.

[11] Thompson Klein, J., 2004. Prospects for Transdisciplinarity. Futures, 36(4), pp.515-526.

[12] Despres, C., Brais, N. & Avellan, S., 2004. Collaborative Planning for Retrofitting Suburbs: Transdisciplinarity and Intersubjectivity in Action. Futures, 36(4), pp.471-486.

[13] Lawrence, R., 2006. Housing and Health: Beyond Disciplinary Confinement. Journal of Urban Health,. 83(3), pp.540-549.

[14] Hirsch Hadorn, G., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., Wiesmann, U. & Zemp, E. (eds.), 2008. Handbook of Transdisciplinary Research. Dordrecht, Springer.

[15] Bruce; A., Lyall, C., Tait, J. & Williams, R., 2004. Interdisciplinary Integration in Europe: The Case of the Fifth Framework Programme, Futures, 36(4), pp.457-470.

[16] Easton, D. & Schelling, C., 1991. Divided Knowledge : Across Disciplines, Across Cultures. Newbury CA, Sage, Publications.

[17] Ramadier, T., 2004. Transdisciplinarity and its Challenges: The Case of Urban Studies. Futures, 36(4), pp. 423-439.

[18] Despres, C., Brais, N. & Avellan, S., 2004. Collaborative Planning for Retrofitting Suburbs: Transdisciplinarity and Intersubjectivity in Action. Futures, 36(4), pp.471-486.

[19] Habermas, J., 1985. The Theory of Communicative Action Volume 1: Reason and Rationalization of Society. New York, Beacon Press.

[20] Brown, V., Harris, J. & Russell, J. (eds.), 2010. Tackling Wicked Problems through Transdisciplinary Imagination. London, Earthscan.

[21] Lawrence, R.,2010. Beyond Disciplinary Confinement to Imaginative Transdisciplinarity. In Brown, V., Harris, J. & Russell, J. (eds.) Tackling Wicked Problems through Transdisciplinary Imagination, pp. 16-30. London, Earthscan.

[22] Thompson Klein, J., 2004. Prospects for Transdisciplinarity. Futures, 36(4), pp.515-526.

[23] Wiesmann, U., Biber-Klemm, S., Grossenbacher, W., Hirsch Hadorn, G., Hoffmann-Riem, H., Joye, D., Pohl, C. & Zemp, E., 2008. Enhancing Transdisciplinary Research: A Synthesis in Fifteen Propositions. In G. Hirsch Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, D. Joye, C. Pohl, U. Wiesmann & E. Zemp (eds.). Handbook of Transdisciplinary Research. pp. 433-441, Dordrecht: Springer

Dr. Roderick J. Lawrence has a Masters Degree from the University of Cambridge (England) and a Doctorate of Science from the Ecole Polytechnique F*é*d*é*rale, Lausanne, Switzerland. Since 1984 he has been a Consultant to the Committee for Housing, Building and Planning of the Economic Commission for Europe (ECE) in Geneva, and the Urban Affairs Division of the Organization for Economic Co-operation and Development (OECD) in Paris. In 1999 he was appointed chairperson of the Evaluation Advisory Committee of the Healthy Cities Project in the WHO-European Region. In January 1997 he was nominated to the New York Academy of Science. His research fields include projects funded by the European Commission and the World Health Organization on urban health from a human ecology perspective; anthropological and ecological perspectives and policies for housing, building and urban planning; citizen empowerment and participation; and public and private responsibilities of actors in environmental management and sustainable development. His biography has been included in Marquis Who's Who in the World and Who's Who in Science and Engineering.