

**ACROSS  
DISCIPLINES  
Principles for  
Interdisciplinary  
Research**

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## **I. INTRODUCTION**

Over the past three decades, the recognition of the finite limits of our natural environment has prompted scholars and practitioners to trace connections between our personal and social choices and the environment. The need to acknowledge this interconnectedness has encouraged greater attention to research and analysis that attempt to understand reality and complexity as an integrated whole and not merely as a sum of parts studied separately.

Complexity has traditionally been studied through an analysis of its parts, and different parts tend to fall within different academic disciplines. Disciplines as systems of knowledge originated in the nineteenth century and were influenced by the evolution of the modern sciences and the industrial revolution's emphasis on separation of functions and the specialization of skills.

Interdisciplinarity can be a way of obtaining a more integrated perspective of complexity. This does not mean that monodisciplinary research is no longer desirable or useful. Indeed, good interdisciplinary or multidisciplinary research is based on disciplinary excellence. And monodisciplinary research is important where the solution of problems requires the expertise of a single disciplinary skill. But when a research problem requires input from different disciplines, the methodological approach is often multidisciplinary or interdisciplinary.

The following discussion on interdisciplinary research methods is presented within the context of environment and development research. An assumption underlying IDRC's encouragement of interdisciplinarity is that it can make a valuable contribution to sustainable development.

### **THE PURPOSE OF THIS DOCUMENT**

This document presents a set of guidelines for interdisciplinary research on environment and development issues. They are in the form of general methodological principles rather than specific actions, as interdisciplinarity is not an area of clearly-defined methodologies. There is no general prescription "which amounts to a methodology in the narrow and well-understood sense of the term... In other words, the problems of interdisciplinarity will always require increasing ingenuity and creativity" (Broido 1979). These principles can serve to support the researcher at various stages of the research process by pointing to directions that enhance teamwork and interdisciplinary input.

## DEFINITIONS

Conducting research with a number of different disciplines can entail a multidisciplinary or interdisciplinary approach. **Multidisciplinarity** involves parallel inputs from different disciplines without requiring consultation between them. **Interdisciplinarity** implies interaction between different disciplines in relation to the research problem and throughout the research process, beginning ideally with the definition of the problem.

Dirk van Dusseldorp gives a concise listing of the main components and stages of interdisciplinary research and analysis:

(1) studying the same object (2) at the same time (3) by members of different disciplines (4) in close cooperation and (5) with a continuous exchange of information, (6) resulting in an integrated analysis of the object under study. (van Dusseldorp 1992)

Going beyond disciplinary boundaries in research for development does not entail integration of the actual disciplines. Rather, it joins insights and information produced from different disciplinary backgrounds. This is an important distinction which can facilitate cooperation between individuals of different disciplinary backgrounds without challenging the value of their particular expertise.

## **II. IDRC'S COMMITMENT TO INTERDISCIPLINARITY**

At the inception of IDRC in 1970, the House of Commons debate on the Centre's structure and rationale suggested that the Centre was expected to encourage research across both social and natural sciences for the solution of development problems. In this debate, Mr Mitchell Sharp, then Secretary of State for External Affairs, observed that:

The very nature of the development process requires that the special skills and perspectives of the engineer, the physicist and the chemist be harmonized with those of the economist, the sociologist and the anthropologist.... It is expected the Centre will enlist...the talents of natural and social scientists and technologists, not only from Canada but from all over the world (House of Commons 1970, pp. 3908–3909).

Over the years, IDRC-supported research projects have drawn from a variety of disciplines when it suited the research situation. In 1992, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, the Prime Minister of Canada gave IDRC the responsibility of promoting research on Agenda 21, the UNCED Plan of Action. In 1993, the Corporate Program Framework (CPF) recognized the central importance of interdisciplinarity in tackling issues of environment and development.

The CPF developed a more integrated approach to research support by channelling half of IDRC's program resources into six themes:

- Integrating Environmental, Social, and Economic Policies
- Technology and the Environment
- Food Systems Under Stress
- Information and Communication for Environment and Development
- Health and the Environment
- Biodiversity

The other half are allocated to programs for sustainable and equitable development and innovative research in areas not covered by these six areas. The six themes employ methodologies which are often multidisciplinary or interdisciplinary, reflecting the eclectic nature of IDRC's research. The following section elaborates on the movement within IDRC towards more integrated and multi- or interdisciplinary responses to challenges of environmentally sound development.

## **THE DEVELOPMENT OF INTERDISCIPLINARY METHODOLOGIES**

During the 1970s, IDRC encouraged economists and agronomists to work together, building upon positive experiences between animal experts and farming projects in Central America. By the early 1980s, social scientists like anthropologists and sociologists were essential participants in farming, fisheries, and food research. In recent years, development researchers have encouraged greater participation from the ultimate beneficiaries in the research process.

### **Systems Research Methodologies**

The systems approach to research is an extension of the physical and biological sciences, and attempts to understand complex problems and interactions between various components of a system (Li-Pun and Seré 1993). Principles and tools from the systems approach have been gradually absorbed by agricultural and fishing research methodologies. Three methodologies that are briefly outlined here are:

- Farming Systems Research (FSR)
- Production to Consumption Systems Research (PCSR)
- Integrated Coastal Development (ICD)

All three methodologies stem from a systems perspective and are now being applied in IDRC-supported research projects in Africa, Asia and Latin America.

### **Farming Systems Research and Production to Consumption Systems Research**

Farming Systems Research (FSR) situates the problems facing the farmer and the farmer's operations in the larger socioeconomic and biophysical context of the farming activities. Production-to-Consumption Systems Research (PCSR) builds on this by linking these activities with non-farm aspects, notably by tracing what happens to the farm output once it leaves the farm environment.

### ***FARMING SYSTEMS RESEARCH (FSR)***

#### ***Andean Farming Systems and Sustainable Highland Agriculture (Peru)***

*IDRC has promoted Farming Systems Research actively since the mid-1970s. This has produced important benefits in the fragile highlands environments in the Andean region of Peru. In the earlier stages of the research, impact on improving conditions for local farms and farmers was limited. The complexity of the farming environment and the limited confines of the approach were partly to blame for this shortcoming (the research focused on the development of improved yields or specific technological improvements for farm application). In the mid- to late-1980s, the project adopted an FSR approach, which broadened the analysis and concentrated, in an integrated manner on crop, animal and socioeconomic research and postproduction aspects. The researchers included agricultural economists, rural sociologists, agronomists, nutritionists, and animal production specialists. The project then moved beyond component technology development and dissemination to a more complex but integrated goal of improving specific farming systems.*

*Research approaches, methodologies, and technologies adopted during this project have been incorporated into projects in other Andean countries (Colombia, Ecuador and Bolivia) through the Centre-supported Consortium for Sustainable Andean Development (CONDESAN) a multi-donor, multi-institutional initiative coordinated by the International Potato Centre.*

FSR involves many players and attempts to consider a variety of factors affecting the farming activity. Whereas FSR focuses upon farm activities as an interrelated whole, PCSR widens the field of inquiry to include vertical linkages (ie. between consumers and other stakeholders and the researchers) from the pre-production stage to the final consumption of that product.

IDRC-supported projects have applied the PCSR approach to the oil crops subsector in Asia and Africa. The research has achieved important results, including improvements in genetic and agronomic research. The PCSR approach has also studied closely the requirements for creating a supportive environment for improved sustainable production of oilseeds.

**PRODUCTION-TO-CONSUMPTION SYSTEMS RESEARCH (PCSR)***The Vegetable Oil/Protein Systems (VOPS)*

*This Kenyan initiative attempts to view the oilseed subsector holistically. The objective of the project is to "characterize the oil-protein system in Kenya with the purpose of identifying key research interventions that can lead to the removal of constraints to local oilseed production, processing and utilization of edible oils and protein cake" (Thomas 1993, p.2). Achieving this objective requires systematic coordination of various scientists from both the natural and social sciences as well as a variety of social and institutional actors (government departments, research institutions, private firms, farmers, etc.).*

*Stemming from the application of PCSR in Kenya, IDRC is supporting efforts to restructure existing oilseed networks in Africa and Asia along PCSR methods.*

**Integrated Coastal Development and Integrated Coastal Zone Management**

Integrated coastal management approaches the question of resource depletion, economic growth, and unemployment near coastal zones in a holistic and integrative manner. It brings three major elements together and requires research expertise from a variety of disciplines (some key ones are noted below in parentheses):

- The community, with people as the central theme (social scientists)
- Natural resources and the environment, with maintenance and recovery of the fisheries resources as the goal (biologists, ecologists, oceanographers)
- Technology and its appropriate applications (technologists and engineers)

All three areas are woven into a common fabric. There are horizontal and vertical linkages and local fishers and business people are involved in various stages of research. As in other system approaches, Integrated Coastal Management seeks to harness the suitability of indigenous technologies for solving local problems.



**INTEGRATED COASTAL DEVELOPMENT NETWORK**

*IDRC has supported the development of the Integrated Coastal Development (ICD) model and its research applications at the coastal community level in Uruguay, Peru, Columbia, Chile and Brazil and linked the researchers under a regional network. One specific initiative has seen IDRC support the training of local personnel to understand the ICD model, and to familiarize them with applied technology and the use of modern communication methods to transfer this technology. Such training includes attention to the interdisciplinary skills for problem solving in coastal development research (resource management, technology transfer, aquaculture).*

All three of these alternative research methodologies are driven by a problem-solving agenda. They have created a basis for the methodological development of interdisciplinary research tools. Also, the adoption and refinement of these integrated approaches have provided valuable lessons and training in managing systems-based projects.

### **III. GUIDING PRINCIPLES FOR INTERDISCIPLINARY RESEARCH**

#### **GENERAL**

The following are some general observations about the interdisciplinary approach:

- A grounding in disciplines is a prerequisite to interdisciplinarity.
- Continuous recognition of a common goal, regular communication, consultation, exchange of data, and provisional conclusions between the team members and a strong commitment to teamwork are central to the interdisciplinary process.
- The quality of interdisciplinary research depends on attention to preparation, quality of disciplinary inputs, process of interaction, and quality of the synthesis. The core principles of interdisciplinarity can be called the three "C's": Collaboration, Cooperation and Communication among disciplines in addressing a particular issue (Klein, 1993).
- It can be easier to encourage multidisciplinary rather than interdisciplinary cooperation in institutions or regions where monodisciplinary research is the norm. The main distinction between multi- and interdisciplinarity relates to the intensity of the contact and communication between the disciplines, ranging from minimal consultation in the former to repeated interaction throughout the research process, in the latter.
- Preparation for interdisciplinary research can be promoted by encouraging regular networking between academics and researchers from different disciplines, policy makers, and the broader community. Openness to connections beyond specialized domains can provide the foundation upon which interdisciplinarity is developed.
- Costs related to interdisciplinary research (ie. time, people, money) are generally higher than those for monodisciplinary research. This is especially pronounced at the beginning of a project when teams are identified, leaders chosen, and channels of communication developed among team members.
- The interdisciplinary process requires use of electronic and/or social networks for input and dissemination of knowledge and information.

## **STAGES IN THE RESEARCH PROCESS**

The following pages present some principles for managing or participating in interdisciplinary research. They relate to the following stages of the research process:

- Problem Identification
- Team Management
- Data Collection and Analysis
- Synthesis and Presentation of Findings
- Capacity Building

### **Problem Identification**

1. The interdisciplinary approach to problem-solving is characterized by a research design and a research team that reflects as far as possible the key facets of the issues' complexity and the concerns of those who are affected by it.
2. The first step is to get the research question(s) right. For this, the focus needs to be on the problem and the issues it generates and not on disciplinary perspectives or the methodology – these come after a clear definition of the problem. Clarity is enhanced to the extent that all involved in the research process make explicit the assumptions that they bring to the project about the problem, the research goal, and the key terms.
3. While outlining the problem that requires research, a core question is "whose problem is it; who identifies the problem?" Various constituencies and stakeholders (such as the community and policymakers) and the researchers should, wherever possible, define the problem jointly. The consultation process can involve the users of the research through community meetings, roundtables, and preliminary interviews with researchers.
4. Cross-cultural sensitivity, in terms of respect for local customs, needs and practices, is essential in defining the problem. Involving local groups and individuals at the very outset of the project promotes some degree of sensitivity to a community's values, beliefs, customs, traditions and meanings. This sensitivity is an important consideration for effective research in interdisciplinary or other initiatives.
5. Once the problem has been jointly defined, it is essential to have clearly articulated objectives that have been agreed to by all of the key stakeholders involved in the process.

### **INTERDISCIPLINARY AND PARTICIPATORY PROBLEM DEFINITION**

#### ***Community Participation in Health Promotion at the District Level***

*In this Egyptian project, the local community, government agencies and a university came together in an effort to promote community level participation in health promotion. Included on the project team were ten physicians, two social scientists (who designed the interview methodology and measurements of community participation), an anthropologist, a teacher, an agronomist and an engineer. All parties agreed to work together as equal partners from the outset. Both informal and formal community leaders held several meetings with the local population (the ultimate beneficiaries) and drew up a list of their main concerns. Problem definition was outlined by the local population and reviewed by researchers from the University. Finally, priority areas for research were agreed upon with the local community.*

#### **Team Management**

6. A good leader is essential to the effective management of interdisciplinary projects. The leader should have the ability to negotiate with a wide variety of stakeholders and to work across the boundaries of disciplines, sectors, and issues. He or she should also have a demonstrated capacity to mobilize a group.
7. The quality of the leader will facilitate the building of a team identity so that researchers work together as a team and not as a collection of individuals.
8. Intellectual leadership and administrative responsibilities can either be carried out by the leader or they can be split between the project leader (as intellectual leader) and a coordinator of project administration. A possible advantage of combining the two roles is that the leader's control over the disbursement of funds can provide leverage in ensuring individual performance.
9. The role of various disciplines will vary according to the research problem. Sometimes there might be a "lead" discipline, and at other times there might be shared responsibility among the co-researchers.
10. The selection of disciplines for the research team responds to the problem or research question in hand. It is also influenced by analysis of the interests involved in the research process.

11. Modes of teamwork are dependent to some extent on the location of the research project and the availability of infrastructure for pulling together and maintaining a team. Transport, electronic communication mechanisms, and telephones that work are all important tools for conducting interdisciplinary teamwork.
12. The ideal setting is one where all members of the team are in close proximity, although electronic communication can surmount some of the disadvantages of distance.

### ***TEAM COORDINATION: USE OF A COORDINATOR***

#### ***Seaweeds and Invertebrates***

*The Seaweeds and Invertebrates project involves research that spans both the social and natural sciences. The overall objective of the project is to develop sustainable harvesting and management programs for seaweed and invertebrates in the Philippines and surrounding region. Two institutes involved in the research are the College of Social Work and Community Development (the social science institute) and the Marine Science Institute (the natural science input). In the early stages of the project, these often worked in a parallel manner. Then, a coordinator was hired to organize the interaction between the two institutes. This move has been quite successful in establishing essential linkages. The main reason for the improved coordination and cooperation has been attributed largely to the personality and skills of the coordinator. The individual in question was energetic, open-minded and experienced in working with numerous disciplines.*

13. The representative(s) of the disciplines involved in the research should convey to others in the team how his or her discipline's perspective on a problem relates to those of the others. This requires an iterative process of exchange and feedback between the different actors involved in the research.
14. Disagreements among team members should be discussed openly when they first arise. Disregarding differences may accelerate consensus in the short run but create more fundamental conflict in the long run.
15. When delegating authority and responsibility, the team leader should clearly allocate tasks and hold individuals accountable for them.

### **INTERDISCIPLINARY TEAMS**

*The two examples below illustrate how the selection of team members follows from the initial diagnosis on the dimensions and research components of the problem.*

#### ***Towards a Sustainable Development Strategy (Mexico)***

*The first phase of this project gathered information on a sensitive eco-region. This included data on the socioeconomic and biophysical factors. Based on the information produced, a sustainable development plan was generated. Phase II of this project draws from a diverse number of disciplines including anthropology, geography, law, political science, and agronomy to implement the plan.*

#### ***Highland Farming Systems (Bolivia)***

*Adopting lessons from the Andean Farming Systems project in Peru, the project in Bolivia uses participatory and interdisciplinary methods to address critical needs of peasants in a holistic manner. Results from surveys are combined with the use of computer simulation models and Geographic Information Systems (GIS) to assess potential impact of technologies in crops and animal production. The impact of other farmer activities is also analyzed. The project team includes a systems specialist, agronomists, economists, animal scientists and information specialists.*

### **Data Collection and Analysis**

16. This stage is defined by the problem identification stage and the research objectives derived from it. Data collection should flow directly from clearly stated objectives.
17. Data collection needs to be organized according to target dates so that data from all disciplines and participants is tabled at key decision-making meetings throughout the life of the project and not just at the end of the project.
18. Analysis is conducted with the recognition of the interdependence between different aspects of the problem.

**COMMUNICATION DURING DATA COLLECTION*****Chagas Disease Control through Improved Housing***

*In the Chagas project, team members included representatives from biology, sociology, rural architecture, material sciences and clinical medicine. The team met once a week to ensure regular information sharing. Such sessions allowed the different participants in the project team to know where the others were in terms of timing and progress with research. Since each set of data had a specific information niche to fill in the overall project design, regular interaction was essential.*

19. The interdisciplinary research process aims at integrating the findings of the various disciplinary components of the development problem.

**Synthesis and Presentation of Findings**

20. Synthesis and learning should take place throughout the research process. Repeated interaction among those involved can build up common language and sensitivity to one another's disciplinary assumptions.
21. A fundamental prerequisite for successful synthesis is openness and respect for one another's discipline and the continuous recognition of a common goal.
22. There also needs to be ongoing synthesis and integration of the different perspectives of both the researchers and the stakeholders. Communication, regular consultation and exchange of data and tentative conclusions between the team members and the end-users of research are ways of ensuring this.
23. The report-writing stage of the interdisciplinary process integrates the findings of the various research components. This means that findings should not be presented as a collection of disciplinary inputs or in the form of separate papers. Rather, each chapter should attempt to integrate inputs from the various disciplines on each of the issues.

#### **CAPACITY BUILDING**

- Capacity has to be developed in institutions of learning and research for both disciplinary expertise and skills in interdisciplinarity. Training for both needs to be recognized and rewarded in institutions of learning, the donor community, and the marketplace.
- Institutions that encourage interaction and linkages between various disciplines should be established. Training and research facilities that actively cultivate mutual appreciation and awareness of different disciplines need to be encouraged.
- Outlets for the dissemination of the products of interdisciplinary research need to be supported.
- Institutions need to recognize and build capacity for leadership in integrated research. In institutions, there should be senior personnel with adequate knowledge of networks and expertise in various areas for them to be able to pull in the right people from different disciplines and institutions for various projects.
- Networks can serve to re-orient members away from strictly disciplinary approaches and towards interdisciplinary problem solving techniques through information dissemination and examples.
- The development of appropriate leadership for interdisciplinary teams can be supported through the documentation of elements that make for good interdisciplinary project leadership. Regional or institutional lists on effective team leaders could also be compiled and shared amongst research institutions and donors.
- Capacity building in local and national governments can be realized by encouraging their participation in early stages of the research process. Involvement in interdisciplinary research may encourage closer links between research and policy processes and greater integration in the public policy.



#### IV. CONCLUSION

This document presents some suggestions on how interdisciplinarity might be achieved in the research process. It remains to be re-emphasized that the integrative process is communication-intensive and that different degrees of integration will correspond to different situations, resources and skills available.

Working beyond the borders of one's own discipline raises questions to which there are currently no clear answers at present but to which responses will develop with practice. Some of these are: What standards of intellectual or theoretical rigour can be applied to such research? Is there need for a theoretical base to interdisciplinarity? Or, is interdisciplinarity to be seen as a new "empirical discipline"? How do we measure the effects of interdisciplinarity? How do we know whether the extra costs have been worth the results, or is it that sometimes this is the only way to go, regardless of the extra expense and effort?

For interdisciplinarity to be encouraged, research institutions have to acknowledge that it needs to be supported through sustained capacity building, training and a reward system distinct from the one that exists for disciplinary excellence. This creates the challenge of channelling some of the resources from the more conventional disciplinary groupings and departments. It also means sensitizing policymakers and resource allocators to the need for the interdisciplinary approach.

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