RESEARCHING SHELTER RESEARCH:

IDENTIFYING A PROGRAM FOR THE COOPERATIVE PROGRAMS DIVISION

A Policy Paper
for

THE INTERNATIONAL DEVELOPMENT RESEARCH CENTRE
COOPERATIVE PROGRAMS DIVSION
Ottawa, Canada

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Executive Summary

The majority of the world's population live in extremely poor shelter conditions. If these conditions are to be alleviated innovative approaches will have to be found to deal with the problem. Innovation requires research: research based on a careful selection of research priorities and a clear understanding of which priorities any particular research establishment can best address given its specific objectives, interests and strengths.

The Cooperative Programs Division (CPD) of the International Development Research Centre (IDRC) wishes to start a research support program in one of the fields of shelter. This paper examines these fields, the current state of research in them done by International, Canadian, and Third World agencies, and recommends a field for CPD to support.

Given their limited resources, Third World governments can best serve as "facilitators" in the process of achieving adequate shelter by the poor. Governments can assist in the efficient functioning and coordination of the components that result in shelter, rather than sink their resources in the construction of housing units. These components are Finance, Land, Materials and Technologies (building materials, materials production, and building technologies), Infrastructure and Services, an efficient Building Industry, and a national Shelter Policy supportive of them. These components thus define the priority research fields.

Each field demands research. Selecting one among them for CPD to support is a difficult task. The criteria for selection are: (1) that it be a research priority as indicated by where the international research community place their emphases and what this reveals about areas of priority and areas of neglect; (2) CPD's support of this field will complement, not duplicate research activities of other groups; (3) in keeping with CPD's mandate, support to this field will promote collaboration between Canadian and Third World country (TWC) research institutions to strengthen the research capacity of TWCs; and (4) CPD have the interest, experience and qualifications to effectively support the program.

International agencies place the most emphasis on Materials and Technologies followed by Infrastructure and Services (Table 1,

(89% and 92% of the agencies had these fields as a research focus respectively

covering 22 agencies). In North America, however, IDRC is the only major source of funding for research in the former field. Research in Materials and Technologies, and Infrastructure and Services is also useful to the Human Settlements section of CIDA. The largest portions of CIDA's projects' expenditures are in these two fields (Table 2, 6).

IDRC's pattern of budget allocations reveals substantial support for shelter-related research (CAD$4.8 million of funds for approved projects; almost 8% of total research budget; 12% of total number of projects in 1985). Its ranking of priorities among the shelter fields as indicated by the percentage of the total research funds spent on shelter projects (1980-85) is as follows: Infrastructure and Services (41%), Materials and Technologies (35%), Shelter Policy (16%), Land (7%), the Building Industry (0.2%), Finance (0%) (Table 3, 6).

In recent years CPD has emerged ten as most active in the shelter field. In 1984-85, six of the eleven shelter projects were funded by CPD: all in Materials and Technologies. The support continues in 1985-86: six of CPD's projects (a total of CAD$1.3 million) approved or under consideration are shelter-related, again, all in Materials and Technology (Table 3, 3.2, Fig. 2).

Canadian institutions contain a strong research interest and capacity in Third World shelter fields: despite generally inadequate institutional support and coordination. Among the fields the strongest interest and capacity lies in Materials and Technologies (45 percent of the 53 institutions surveyed mentioned it as a focus), followed by Infrastructure and Services (36%), Policy (30%), and Land (28%) (Table 4, 6).

The focus of research interest and capacity in TWCs is unequivocal. By far, the largest group of Third World research institutions - close to 300 - focus on Materials and Technologies. Of the 48 international conferences on shelter and settlement in the last two years, (most of them in TWCs) Materials and Technologies was a subject in the largest number (46%), followed by Policy (42%) and Infrastructure (29%, Table 5, 6)

Drawing on the above analysis, and applying the criteria established, we investigate each Shelter field for its appropriateness as a program for CPD. Appropriateness is determined on the basis of the field that best combines all the criteria rather than excels in each (Table 7).

Research in Shelter Policy is essential. However, within IDRC it is the well-established domain of the Social Science Division, specifically its Urban Policy Program. CPD would be duplicating this program's activities if it were to embark on this field (Table 3, 3.1, Fig.1).

Finance, is both important and the most neglected of the shelter research fields. Only eight of the 22 international agencies mentioned it as a research focus. IDRC appears not to have supported any research in this field since 1980. None of the 53 Canadian institutions recorded finance as a research focus. Fewer of the international conferences in the last two years included finance as a topic of discussion than any other field (Table 6). This field needs most strengthening among both Western and Third World researchers. Nevertheless it is unsuitable as a focus for CPD. Canadian researchers have less to offer their Third World counterparts through collaboration in this field. Furthermore housing finance is traditionally a wholly social science field. If there were a program in it, the Social Science division would be the appropriate host.

After Finance, research on Land appears to most need strengthening in TWCs. Only 21% of the international conferences selected land as an issue. (Table 5, 6) TWC researchers and research institutes specialising in land are few. Canadian research interest and capacity is strong, especially in Land Information Systems. (Table 4) However, Land and the Land Information field is being supported by the Earth Sciences in CPD and the Social Sciences Division. (Fig. 1, 2) A separate CPD Program would duplicate these efforts.

Important as it is, research on the Building Industry in the Third World is weak both among Canadian researchers and in IDRC. Only one Canadian institution recorded it as a research focus (Table 4). Only one study on it has been conducted by IDRC (Table 3). The interest and capacity is too weak to warrant starting a program.

The research interest and capacity in Materials and Technologies is strong among both Canadian and TWC researchers. Among all the fields, this one (and Infrastructure) was most often recorded as a research focus by Canadian institutions. Furthermore Canada's strong research capabilities in low-cost energy for TWCs is also most pertinent, energy being a major cost factor in materials production (Table 4, 6). More often than any other field, Materials and Technologies is a major focus of TWC sponsored conferences (Table5, 6). More Third World researchers and institutes are in this shelter field than in any other. Canada has therefore much to offer the TWCs and, at the same time, there are easily identifiable and receptive counterparts in TWCs with whom to foster collaboration.

The continuing attention being paid to Materials and Technology by the international community underscores the continuing need for strengthening research in this field. Thus UNIDO and UNCHS recently embarked on a major global program to develop the building materials industry. UNCHS has declared that the major action area in <u>research</u> for the 1987 International Year of Shelter for the Homeless is "to identify and test low-cost techniques for construction and upgrading." The forthcoming 9th

session of the Commission on Human Settlements has for its theme the "Small-scale Production of Building Materials."

The complementarity of interest among Canadian and TWC researchers is perhaps further reflected in that, next to Infrastructure, IDRC support has been largest in this shelter field (Table3, 6).

In recent years CPD has become more active in Materials and Technologies than any other division. In 1984-85 the division supported six of the 11 projects in this field; the trend continues in 1985-86. The CPD staff thus have the interest and the experience to support a program in Materials and Technologies. The professional backgrounds of the CPD staff - engineering and geology (Ottawa staff), economics and science and technology policy (regional staff), indicates that CPD have both the traditional qualifications required for such a program and other qualifications that can make the program more broad based in its approach.

Finally, CPD's current programs in Earth Sciences, and Technology for Local Enterprises are both highly complementary to the field of Materials and Technologies.

Apart from Materials and Technologies, the field of Infrastructure and Services has received the most attention internationally. IDRC has funded more projects in this shelter field than in any other. Interest in TWCs and among Canadian researchers is also strong.

However, considerable duplication would arise within IDRC if CPD were to begin a program in Infrastructure and Services. Currently this field is strongly supported by the Health Science Division (60% of total expenditures in it), and the Social Science Division (24%). Such support by these divisions is likely to continue (Table 3, 3.1, Fig. 1).

Materials and Technologies, therefore, is the shelter field most appropriate for CPD to begin a program in.

However, to be effective such a program would have to be carefully designed. Research priorities within it must be precisely identified such that the program avoids duplicating research. Research methodologies must be broad based to cover engineering, economic, and social analysis. The lack of such an approach is a major weakness of research in this field. Technology policy analysis must be encouraged to address such questions as why after so much research so few innovations in low-cost materials and technologies have been widely adopted, and what changes in national policies are required to encourage such technologies. Not least, institutional mechanisms to encourage and sustain useful collaboration between Canadian and TWC reseachers must be seriously explored.

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CHAPTER ONE

THE SHELTER PROBLEM, FIELDS OF SHELTER RESEARCH, AND THE CRITERIA FOR SELECTION

The Cooperative Programs Division of the International Development Research Centre (IDRC-CPD) is considering starting a program to support research into shelter. This paper examines the current state of research in shelter, the activities of the institutions (international, Canadian and Third World) involved in shelter research including IDRC, and recommends a research field within the area of shelter for IDRC-CPD to support.

This section first discusses the need for research in shelter and the current state of thinking on shelter and settlement planning. It then defines the research fields that the area of shelter is divided into and the criteria applied to select a field among them for IDRC-CPD to support.

1. The Need for Research into Shelter

A decade ago the United Nations Conference on Human Settlements (HABITAT) highlighted the importance of shelter and settlement in the development of the individual, the family and the nation. The conference also brought to the world's attention the wretched shelter and settlement conditions in which the majority of the world's poor lived. Enlightened policies and programs to deal with the problem were identified. Some were adopted.

Today, ten years later, the majority of the world's population continues to live in shelter and settlement conditions that lack the basic amenities. The achievement of adequate shelter by the poor remains a major challenge.

In recognition of the above, the world community through the United Nations has declared 1987 the International Year of Shelter for the Homeless (IYSH).

Innovative thinking and action is required. Innovation demands research. Hence IDRC-CPD's concern for supporting research into shelter.

2. Current Thinking on Shelter and Settlement Planning

Over the last two decades two basic shifts have occurred in how the international development community views the improvement of the shelter and settlement environment. First it has been recognised that shelter and settlement improvements cannot be relegated to the category of "nonproductive investments" and

therefore be given a low priority in national development objectives.

It has been recognised that such physical improvements are essential to meet some very basic psychological, social and economic needs. The shelter and settlement conditions in which people live have a profound effect on their self-esteem and dignity, their health, and their productivity. The hope of improved shelter and settlement mobilises resources - material and financial - among a broad section of the population, even the very poor; resources that would otherwise remain dormant and unproductive. The process of shelter and settlement construction generates jobs and incomes again often amongst the poorest sections of the population. Not least, the construction of shelter and settlement is an effective vehicle of training in the technical and organisational skills that a newly developinbg country desperately needs.

The second major change has been in defining the role of governments in meeting shelter and settlement needs. It has been recognised that no government has the resources to single-handedly meet these needs. Limited government resources need to be focused on those components of shelter and settlement that households cannot provide for themselves and justifiably do not see as their responsibility to do so - components such as basic infrastructure and services. Government should act as facilitators, helping set up the conditions under which households and firms can organise the construction of housing.

The government's task as a facilitator, is to ensure that its policies and programs, promote the availability of the package of goods which together lead to adequate shelter and settlement for the poor. The components of this package consist of affordable land, finance, materials and technologies, an efficient building industry, infrastructure, community services and utilities. Thus although governments are urged not to sink their resources in constructing housing, they are not relieved of the responsibility to help make conditions such that households can employ their resources and ingenuity in meeting their shelter needs. 1/

It is this current state of thinking (and the challenges to it) that governs research into shelter today.

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1. The notion that households need no assistance beyond a serviced plot of land, (one adopted by some extreme self-help housers) has thus also been challenged.

3. Fields of Shelter Research

The components of the package that result in shelter define the fields of shelter research. These are Shelter Policy, Finance, Land, the Building Industry, Materials and Technologies, Infrastructure and Services. Clearly research in any one of these fields will impinge on one or more of the others. Indeed some of the most useful research would seek to integrate two or more of these fields. In general however, researchers and institutions tend to specialise by the fields as described.

Before we can examine which field CPD should focus on we need to clarify what these fields are and the type of research required in each. The fields are described below. The descriptions do not attempt to be exhaustive definitions of each field but simply clarify the distinctions between them.

3.1 Shelter Policy

Policy analysis which establishes the role of shelter relative to other sectors in promoting national development is an essential first step in defining a national shelter policy. Similarly important is policy analysis that sheds light on the type of shelter programs and their right mix given the specific conditions of the country. The latter is needed to establish the framework within which the different shelter fields can be coordinated and more detailed program and project design can be implemented. Such research sets the parameters for the whole shelter field.

Research in this field concerns itself with questions that extend across all shelter fields. It does not, however, substitute for policy analysis intrinsic to each field.

Research here deals with such questions as the role of shelter in the national economy, the fair and efficient allocation of resources between shelter and other development sectors, as well as within the shelter sector. Other questions include: the relative merits of encouraging public versus private investment in shelter, of constructing housing units versus sites and services versus slum upgrading, of encouraging ownership versus rental housing, of subsidy versus cost-recovery, and so forth.

3.2 Finance

Mobilising financial (and material) resources is the primary task in achieving adequate shelter. An understanding of how these resources are mobilised - at the level of the country, of specific institutions, and individuals; in the formal and informal sector; in public and private agencies, - and how these processes can be improved such that adequate resources are mobilised, is a key research task in the shelter field. It is a process that we perhaps know least about. And yet as mentioned,

it is the first problem to be faced in achieving adequate shelter.

Broad questions here include the role of housing finance and finance institutions in the national economy. More specific research areas might include the efficacy of different existing sources of housing finance (formal housing banks versus informal cooperative associations), of direct and indirect mechanisms to encourage investment in housing (formal contractual savings schemes, mortgage instruments) versus providing land tenure and basic infrastructure to stimulate investment. Which finance system best suits which income group and what should be the mix of different types of finance institutions and mechanisms ? How can financing institutions and procedures be designed to make finance more accessible to semi-literate, low-income groups? etc.

3.3 Land

Land is the single commodity in demand for all human activities. Competition among alternative uses is high, especially for urban land where much of the poor's struggle for shelter takes place. Apart from a few exceptions (the houseboat, and the houses on stilts, etc.), there can be no shelter without land to place it on. The urban poor needing proximity to employment often need land that has a high market value. How to allocate land efficiently and yet fairly such that the poor can be well-located is a major research question for which ready answers have yet to be found. Answers lie in more specific research questions: what are the existing formal and informal methods of making land transactions, their relative merits and demerits? how can these be improved? how may we restrict overcentralisaion in land ownership without freezing the land market? and so on.

Classifying and recording the characteristics of land from its soil conditions to its current uses is invaluable in answering a wide range of shelter-related questions: what soils are good for which building materials, for which types of construction? what problems can we anticipate in extracting the materials and therefore how should extraction be planned? who owns which parcel, of what market value? and therefore what is a fair property tax that the municipality can collect? what are the "land information systems" (geotechnical surveys, cadastral surveys) that can help us answer such questions, what are their relative merits and demerits; how can the costs of their applications and their maintenance be reduced?

3.4 Building Industry

If the production of shelter, infrastructure and services for the poor is to be regularised, the building industry needs to organised to produce such goods efficiently, at low cost, and

with enough of a profit margin to make it worthwhile for the industry. We need efficient materials producers, producers of shelter components, transporters and suppliers of these goods; contractors who can combine these goods into affordable shelter; and information and coordination to make these different elements work together with the minimum of bottlenecks. Much of this industry will probably be in the informal, small-scale sector of the economy. Understanding how this sector functions, how it can be improved to function as much as possible as an efficient industry requires much research. Understanding how so many small-scale, informally organised, apparently disparate elements come together with few formal procedures governing their activities, requires especially sensitive research skills.

Broad research areas here would include the role of the building industry in the national economy relative to other sectors, the relative roles of infrastructure versus residential construction, the formal construction sector versus the informal construction sector, small-scale versus large-scale construction and firms, and their effect on national employment, incomes, and income distribution. Specific studies may deal with such issues as how government regulations on contracts and bidding procedures favour particular sectors of the industry at the expense of others, advantages and disadvantages in the standardisation and industrialisation of construction, increasing the efficiency of construction labour and materials supply markets, etc.

3.5 Materials and Technologies (Building Materials, Materials Production, and Building Technologies)

How to identify, design, develop, and disseminate low-cost materials and technologies to reduce the cost of adequate and acceptable shelter? Addressing this question is perhaps the most direct and easily identifiable way of making shelter more affordable. Such research is important for both buildings and infrastructure: the construction of both relies on the same pool of materials and skills. To address this question we need to conduct research on how to identify cheaper materials, reduce the cost of their extraction and production, and on the design of low-cost building technologies. Not least, we require to research how economic social, and institutional factors can help or hinder the development and spread of low-cost materials and technologies.

The wider research areas might thus include such concerns as which factors determine the choice of alternative construction and production methods and what are their relative levels of influence? the factors to research in relation to these methods may include natural and human resources available in a country, cultural preferences, climate, national policies (regarding investments, import-export, taxes and subsidies, and building regulations, for example), technology transfer ~~(internationally~~

(internationally and within the country), and institutional arrangements? How can such factors be modified to encourage the design, development, and diffusion of appropriate low-cost materials and technologies.

Research may focus on the development and diffusion of particular materials, materials extraction, and production processes; on particular construction technologies; on the relative merits (technological, economic and social) of alternative materials, materials production and construction technologies; their substitutability; on establishing construction standards, codes and regulations for innovative materials and technologies, or on modifying existing standards that are inappropriate for current conditions.

3.6 Infrastructure and Services

Infrastructure and services - roads, water and waste systems, electricity, schools and health centres etc - provide the physical and social environment in which well-housed, well-educated, healthy and productive communities can develop. Infrastructure and services is also the one shelter component that cannot be justifiably left to the community and private sector to provide. It is a responsibility of the government. No single input, apart from land tenure, more effectively stimulates the mobilisation of resources among the poor and their application in better shelter, than infrastructure and services.

The broader research areas here may include the effect of infrastructure investments on population distribution, on productivity, and on stimulating housing construction. Research may focus on the appropriate level and mix of different infrastructure and services for different settlement sizes, site locations within settlement, and for the income mix of residents; on the development and diffusion of particular low-cost infrastructure services and the technologies for them; on tradeoffs in capital and maintenance costs for alternative infrastructure systems; on pricing and cost recovery mechanisms for investments in infrastructure and services, and on the revision of planning standards to better accord with affordable infrastructure and services.

3.7 Other Research Areas

Some research areas, significant as they are, cut across two or more of the above fields and are therefore not considered here as candidates for a research focus for CPD. These areas include information systems (how to collect and make available the information on the different shelter fields), management systems (how to manage shelter finance institutions, community services, infrastructure and utilities etc.), community participation (as a means of mobilising local finance or managing community services

for example), design (of production equipment, building technologies, buildings, etc), and training.

In addition certain shelter problems and their associated solutions manifest as projects and are often the subject of research. These include slum upgrading, sites and services, resettlement schemes, and emergency housing. Each type represents a specific mix of the research fields discussed above. They may also be treated under the fields mentioned: the financing of sites and services, or the technology of disaster housing, for example.

The above additional types of research areas can be, and in some cases, are considered research fields in their own right. The reason for not considering them here is purely pragmatic: very few research institutions in Third World countries (hereafter referred to as TWCs) or elsewhere, define their focus along these research areas. Identifying counterparts for collaborative arrangements, a basic mandate of CPD, would be problematic and limited.

Thus the candidates for selection remain the traditional fields of research in shelter: shelter policy, finance, land, the building industry, materials and technologies, and infrastructure and services.

Each field as we can now see is critical to the achievement of shelter by the poor. Each field is full of interesting research questions we as yet know little about. Selecting among them is not a simple task. The criteria have to be precise, relevant, and amenable to obtaining the necessary information against which a reasonably logical and acceptable choice can be made.

4. Criteria for Selecting a Research Field for IDRC-CPD

Four criteria have been identified to help us determine which of the above research fields the CPD should develop a support program in.

(1) It must be <u>a research priority</u>. Clearly all the research fields mentioned remain fertile ground for further research. Nevertheless it would be useful to identify the relative emphases given to each field by the various research institutions. This would tell us, from the viewpoint of international research activity, how priorities are perceived, and where areas of neglect lie among the various research fields.

(2) IDRC-CPD's support to this field will <u>minimise duplication</u> of research support and preferably <u>complement research support activities of others</u>. Duplication and complementarities apply especially to agencies that potentially have the same research clientele. Foremost, they

apply to the different divisions within IDRC and to the different areas of specialisation within CPD itself.

(3) Support to the research field will serve CPD's mandate to promote collaboration between Canadian researchers and research institutions and those in TWCs. This requires that there be a strong research interest and capacity in this field in Canada. It also requires that there be easily identifiable and organised counterpart research institutions in the field in TWCs with whom Canadian researchers could be readily matched.

(4) Research support in the field can be effectively organised, administered and supervised by CPD. This requires that the staff involved have the interest, experience, and professional qualifications to ably support this field. Recent research support activities of the division would be a further indication of the existence of such interest and preparation.

In chapters 2 and 3 we assemble and analyse the information on which to make a rational choice among the research fields. We first examine the research and research-support activities of international agencies, including IDRC. We then examine the activities of research institutions in Canada and in TWCs. In chapter 4, we take each of the shelter fields and apply the foregoing criteria against the information from Chapters 2 and 3. From this analysis we can emerge with a recommendation for an area of specialization for CPD to support.

CHAPTER TWO
INTERNATIONAL AGENCIES: THEIR SHELTER RESEARCH OBJECTIVES, CAPACITY AND FOCUS

IDRC is one among many international agencies that have shelter-related research activities. We examine the activities of these agencies to clarify how the international development community perceives the need for research into shelter, the extent of support for this research, and where their emphases lie along the spectrum of shelter fields.

IDRC's activities are examined within this international context. We thus establish how IDRC's activities overlap with or extend those of the international agencies, and the extent of its influence relative to these agencies. Most relevant, we identify the research priorities as the international agencies perceive them to establish further guidelines to select a field for CPD.

The five main international agencies in North America are analysed. In Europe thirteen agencies are considered of which six are analysed in detail. In addition, the United Nations Centre for Human Settlements (UNCHS) is also considered. For each agency, the characteristics analysed are: its shelter-related research objectives, structure and capacity, research areas and focus (see Table 1 for a breakdown of the agencies, and their characteristics outlined).

The information for the above is based on personal interviews with agency officers responsible for research and development, and on publications of the agencies. The Europe office of Development Workshop was responsible for interviews with the European agencies.

1. North America

In North America, research funding for international development agencies comes from three main sources. These are: the World Bank through the contributions of its member countries; the United States government through the United States International Development Agency (USAID), and the Canadian government through the Canadian International Development Agency (CIDA). All the organisations mentioned below are funded through one or other of these three sources.

1.1 Canadian International Development Agency (CIDA)

Unlike its US equivalent, USAID, CIDA has separated research assistance from the main body of its development assistance work by the creation of IDRC. Thus CIDA cannot be said to have a

formal research function distinct from IDRC. But research related activities such as project monitoring and evaluation do take place within CIDA. These are, however, subsumed in the projects concerned, organisationally and in terms of fund allocations. A separate analysis of the research activities and their scale relative to the total of CIDA's operations is thus difficult.

Still, it is useful to analyse CIDA's activities and its emphases in development assistance to the human settlements and shelter sector. Besides the TWCs themselves, CIDA is a user of the research put out by IDRC and other Canadian institutions. IDRC's research focus should therefore, at least in part, relate to CIDA's research needs. Furthermore, as the major domestic funding source of the TWC shelter sector in Canada, CIDA's actions influence Canadian institutions' in this sector .

Objectives. CIDA's assistance program "seeks to support the efforts of TWCs in fostering economic and social programs, placing emphasis on poorer TWCs and the needy within TWCs... *Development* is defined as a process by which societies change so that they are able to meet the basic needs of their populations, in a way that is sustainable in the long term and is based largely on indigenous resources and values (CIDA Annual Report, 1984-85:6)."

Structure and Capacity. The shelter and settlement needs in TWCs is addressed through the Population and Human Settlements Sector within the Social Development Division, Professional Services Branch. One professional is in charge of the sector's human settlements work.

Of the sector's 34 ongoing projects in 1985, six fell under the jurisdiction of the Human Settlements section. The total annual value of these projects was CAD$15.07 million, of which one - Mahaweli in Sri Lanka - alone cost CAD$11.0 million (see Table 2 for a breakdown of all Human Settlements Section projects).

Focus. Of the total allocations within the Human Settlements section of the sector, by far the largest percentage went to two projects (Training at the Asian Institute of Technology, Bangkok, and Mahaweli - Building and Infrastructure construction - in Sri Lanka, totalling 77 percent). This is followed by 19 percent for housing (three projects in upgrading and housing cooperatives with a large construction component) and 4 percent for sites and services (one project).

The above allocations to Human Settlements projects amounted to approximately 0.72 percent of CIDA's total international development expenditures in 1984-85.

Limiting our analysis to the projects directly under the Human Settlements section, however, almost certainly underestimates the total value of projects that have a shelter and settlement component. A significant number of projects, which include a

shelter and settlement component, come under the jurisdiction of other sectors. Even among the projects listed under the Population and Human Settlements sector at least 13 not included in the Human Settlements section have titles - Msasani Housing project , Sulawesi Regional Planning, Reconstruction CDN BLT Facilities, Rehabilitation & Reconstruction, for example - that suggest they have significant shelter and settlement components. The head of the Human settlements section and another independent university-based consultant of CIDA projects confirmed this to be the case. The projects just mentioned had an additional value of approximately CAD$7 million.

A rough estimate of the average distribution of expenditures per project broken down by shelter field was as follows: Policy (assistance in policy studies, making shelter policy changes, etc., 0 percent), Finance (helping set up shelter finance systems, institutions etc., 10 percent), Land (policies and projects to make land available for shelter, surveys, etc., 0 percent), Building Industry (assistance to strengthen local contracting capacity, 10 percent), Materials and Technologies (setting up small materials production plants, training in materials and technologies, building construction, 30 percent), and Infrastructure and Services (Sites and Services projects, constructing roads, water and waste systems, 50 percent).

If the materials and technology components of both building and infrastructure were combined, this field would account for at least 70 percent of total expenditures (estimates by the head of the section).

1.2 International Development Research Centre (IDRC)

Objectives. IDRC sets out to "stimulate and support scientific and technical research by developing countries for their own benefit (IDRC Annual Report 1984-85:1)."

Structure and Capacity. IDRC is funded through CIDA's ODA's international assistance program budget. In 1984-85 it received CAD$76.3 million or 4 percent of total development assistance expenditures.

IDRC does not conduct research but it funds, supervises and administers research on development problems in the Third World undertaken primarily by developing-country researchers and also from Canada. The Centre also promotes cooperation between developing-country researchers and their counterparts in Canada.

Focus. The Centre's priority ares of research and the relative importance accorded them is reflected in the seven organisational divisions and their share of the total research budget (for the period 1980-85). In order of importance, these are:

Canada's Overseas Development Assistance Program Budget.

	Budget (millionC$)	%
Agriculture, Food & Nutrition	$22.0	36.8
Social Science	$12.4	20.7
Information Science	$ 7.8	13.1
Health Science	$ 7.5	12.6
Cooperative Programs	$ 6.3 1/	10.5
Fellowships and Awards	$ 2.6	4.3
Communications	$ 1.1	1.8

Support for research in shelter and settlement is not the exclusive responsibility of any one part of IDRC; it is distributed among its seven divisions. The fact that shelter and settlement is not included as a distinct research area suggests a lower priority attached to it by the Centre relative to the above mentioned areas. This lower priority is consistent with shelter's ranking in development priorities of Canadian development assistance in general, as was clear from our discussion on CIDA above.

However, a detailed analysis of IDRC's projects and their budget allocations reveals a greater emphasis on this field than is otherwise apparent or may be generally realised. In 1984-85, CAD$4.8 million or almost eight percent of the total research budget was spent on shelter-related research. Such research accounted for 12 percent of the total number of projects in that year (see Table 3: cell O49,R49).

Over the period 1980-85, the biggest spenders in shelter-related research by division (as indicated by the percentage of the total budget allocated to shelter projects) were as follows: Social Sciences (26 percent), Health Sciences (25 percent), Agri-Food and Nutrition Sciences (20 percent), Cooperative Programs (17 percent), Others (3 percent) [see Table 3: cells P50 to P60]).

These figures, however, underestimate CPD's involvement because for the first three years of the period (which were also CPD's first years) CPD had no projects in shelter. In 1983-84 it ranked third among the divisions in percent of total budget allocated to shelter research (Table 3: cells P29 to P38). In 1984-85, CPD spent the most on shelter (34 percent of the total shelter budget), followed by Social Sciences (25 percent) (Table 3: cells P40 to P48).

The percentage of the total shelter budget allocated to the different fields of shelter reflects the priorities IDRC assigns to each field. Over the period 1980-85, a total of CAD$13.3 was

1. Includes only that portion for projects directed by CPD itself. Part of the CPD budget (c$7.3 million, 1984-85) is administered by other divisions.

allocated to shelter projects (see Table 3: cell 062), the breakdown by different fields was as follows: Infrastructure and Services (41 percent), Materials and Technologies (36 percent), Shelter Policy (15 percent), Land (7 percent), Building Industry (0.2percent). See Table 3 for a complete breakdown of shelter research projects by Division, 1980-85.

The specific types of shelter-related projects supported by each of IDRC's divisions over the period 1980-85 provide further insights on the how the research priorities for shelter research are perceived by each division. The types of projects vary widely across all the divisions, but each division tends to concentrate on particular shelter fields. Each division's focus is largely a function of its broader fields of investigation.

The shelter-related research projects in the Agriculture Division were all in the field of Materials and Technology. With a few exceptions, all projects were on the development of organic building materials (bamboo and timber). These are generally of three types: (1) bamboo production and preservation; (2) small-scale timber production to supply wood for construction and fuel;2/ (3) timber grading, i.e., establishing strength characteristics and development of grading systems for local lumber.

Shelter projects in CPD were largely in the Materials and Technology field and a smaller number, on Land. Most projects in Materials and Technology focused on research on lower cost cement or cement substitutes, including the use of recycled industrial or agricultural waste materials in building materials. A second focus was research on the metal industry.

Land research focused on land information (urban soil engineering and urban geology). The projects included the production of maps for use by planners and developers and collection and evaluation of geotechnical information.

In the Health Sciences Division, all shelter-related projects were in the Infrastructure and Services field, specifically water supply and sanitation.

The earlier water supply projects focused on increasing access to water supply especially in rural areas. These included studies on water consumption and demand; development, testing and promotion of water supply technologies (majority of the projects were on handpumps); the development of design criteria for water supply systems, and studies on the operation and maintenance of water supply systems. In the latter part of the five-year period projects on water supply focused more on water quality (e.g., rapid, low-cost methods of classifying drinking water sources).

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2. Forestation projects not specifically designated for construction have been excluded.

Research in sanitation include: studies on sanitation practices in specific communities; evaluation of sanitation technologies (technical feasibility, testing, acceptability, utilisation, and environmental effects), and health education projects (construction, demonstration and training in improved systems).

Shelter-related projects of the Information Sciences Division were on information networks, documentation centres, and other information dissemination activities in two fields: Materials and Technology (bamboo, ferrocement, and geotechnical information), and Infrastructure and Services (appropriate technologies in water supply, sanitation).

All but two of the shelter-related projects funded by the Social Science Division during the 1980-85 period were in two research fields: Shelter Policy and Infrastructure and Services.3/ Research on shelter policy made up the largest group of projects, most of which were urban in focus. The projects include evaluations of specific government interventions or programs in urban housing (e.g., sites, and services, urban renewal, slum upgrading) or evaluations of the housing policy package in a particular urban area; national assessments of urban development policy (of which housing policy forms a part) or on the evaluation of the housing policy packages in a particular urban area.

Clearly shelter as a research area is a *de facto* reality in IDRC, even if it does not have official prominence. Infrastructure and Services, and Materials and Technologies, are the fields in the shelter research area that claimed the most attention in terms of dollars spent. This ranking of priorities is consistent with CIDA's own research needs in shelter and settlement planning given the distribution of its project expenditures by shelter field (Table 2). In IDRC, CPD, at least in the recent past appears most active in the shelter field.

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3. The two other studies - one on electricians and plumbers and the other on technology assimilation in the steel and aluminium industry - fall in the Building Industry and the Materials, Production Techniques and in the Building Technologies categories, respectively. Other projects that are not specifically on shelter but may be partly relevant to this sector were also supported by the Division. These include studies on: local labour markets (usually urban informal sector); international migration, and technology adoption in small- and medium-scale enterprises. Construction labour forms a substantial portion of both the urban informal sector labour and the international migrant (contract) labour. However, the lack of detailed project information to determine which of these touch on construction labour and enterprises has precluded their inclusion in this inventory of shelter-related projects.

Canadian research expertise is brought to bear on Third World problems in collaboration with researchers from TWCs through the CPD. The division's objective is "to promote collaboration between Canadian research institutions and those in developing countries for projects concerned with various development issues" (IDRC Annual Report, 1984-85:15). For this purpose, the division's CAD$6.3 million budget (in 1984-85) is augmented by another CAD$7.3 million, administered by the other divisions. The Cooperative Program budget which can draw in the research expertise of Canadians in the service of developing country problems is therefore a significant 20 percent of the total budget.

The further significance of the above findings within the context of the activities of the international community will be pursued at the end of this chapter.

1.3 The World Bank

Most departments of the World Bank have a research unit in which some shelter-related research takes place from time to time. Thus research into school facilities planning occurs in the Education Department. The Agricultural Department occasionally supports research into agricultural storage and farm buildings.

The shelter research is, however, concentrated in the Water Supply and Urban Development Department. A Policy and Research Division has been established in this department and concerns itself with research largely in support of the department's urban projects. In addition, two units - Applied Research and Technology, and Water and Sanitation - have also been established and do research largely on rural water supply and sanitation.

(a) Policy and Research Division

Objectives. The division concerns itself with urban research for practical policy and investment planning requirements in a variety of ways. Among these are: (1) developing policies, guidelines, standards, and analytical tools relevant to urban operations; (2) providing specialised support for Bank operational activities; and (3) maintaining contact and collaboration with other organisations in conducting, disseminating, and applying research.

Structure and Capacity. Research is funded from three sources. First, from the Water Supply and Urban Development Division's internal administration budget which covers the regular salaries and overheads of the researchers. There are 8 professionals who spend approximately 35 percent of their time on research (the rest is spent on policy papers and background studies directly in support of ongoing Bank operations). Second, the funds from the Bank's central Research Committee which all divisions of the Bank

have access to on the basis of a successful proposal. Third, from short-term, out of division consultants' budget which pays for short research papers contracted to consultants. A ballpark estimate of the total value of research undertaken annually is US$900,000 (CAD$1.08 million).

In addition, external funding is occasionally available through other agencies. For example collaborative research on sites and services projects brought in IDRC funds in 1975.

Research Focus. Six research areas are the current focus. These are in Housing Policy, Finance, Land Markets and Land Information Systems, Infrastructure Productivity/Criteria for Investment, Water and Sanitation Demand, and Municipal Finance. Some research topics cut across these areas and are therefore not defined as separate research areas. These topics include urban management, evaluations of sites and services, and slum upgrading projects. In addition, there is a special focus on Africa.

(b) Applied Research and Technology, and Water and Sanitation Units

These units conduct research related to the Water Supply aspects of the division. They have two regular, full-time professionals on the staff.

The two major projects of the technology and water and sanitation units are funded by the United Nations Development Program (UNDP). The first is on the field testing and technological development of rural water supply handpumps (US$10.2 million over six years or US$1.7 million per year or CAD$2.2 million). The second is on the development and implementation of low-cost sanitation investment projects (US$6.6 million over six years or US$1.1 million per year or CAD$1.4 million). The first is staffed by three project officers and an economist at the Bank and four regional project officers. The second is staffed by a larger number of multidisciplinary professionals - sanitary engineers, public health specialists, health educators and institutional specialists - based both at the headquarters and at the four regional offices. Resident staff in nine other field offices also participate by implementing "spin-off" projects in their countries. There is some overlap in the staff involved in the two projects.

Both projects, especially the latter combine technological, economic, institutional and policy concerns in their research. The projects also integrate the development of technological solutions with their widespread implementation in the field.

(c) Other

In addition to the above activities, the research of the Construction Industry Unit of the Transportation Department also deserves mention. Although their focus has been on intersettlement, largely rural roads, the unit has come out with some very useful studies on the construction industry as a whole, and on alternative construction technologies.

The conceptual and methodological framework of these studies as well as some of their findings are also relevant to construction and alternative technology choice as these relate to shelter. Some examples are the questions pertaining to the informal versus the formal construction sectors, capital- versus labour-intensive techniques, the importance of developing a strong foundation of small contractors, and not least, the importance of pursuing research beyond its technological boundaries to its interrelations with the economic, managerial, institutional, and policy spheres.

1.2 The Office of Housing and Urban Programs; US Agency for International Development.

Housing and urban programs account for a substantial body of activity and development assistance expenditures in USAID. By 1984-85 for example there were 137 projects underway. In that year US$150 (CAD$180) million was authorised for new projects. The projects included broad urban development programs, settlement upgrading, sites and services, core housing, and community facilities and urban services.

Objectives. The responsibility for defining and implementing the urban (including shelter) policy of the USAID rests with the Office of Housing and Urban Programs. This responsibility sets the research agenda of the office.

The research activities of the Office of Housing and Urban Programs sets out to "develop innovative approaches to urban related and shelter sector programs." Like the World Bank, research is meant to be in support of field operations, but unlike the Bank's research units, the Research and Development, and Training Unit of the Office of Housing,does not conduct research itself but funds, supervises, and administers it.

Structure and Capacity. The unit has five professional staff who concern themselves with the writing of ideas, concepts and strategic planning papers. Research activity is subsumed in the capital lending programs as part of the projects being implemented, or contracted out to private research institutes, consulting firms, and universities. Approxiamtely US$800,000 (CAD$960,000) per year is spent on research.

Research Focus. Recent studies include: a series on urbanisation and regional analyses (with an emphasis on Africa), methodologies for conducting urban development assessments and housing needs assessments, municipal finance and management, and urban land issues. Other studies have had a narrower scope, focusing on infrastructure, housing designs and technologies, and disaster housing. The emphasis, however, has been on the former set of studies.

The Office of Housing emphasizes dissemination of its research findings and of its views, in general, through their application in field projects; through conferences, workshops and seminars in TWCs; through training workshops, and through study scholarships for the nationals of TWCs to attend American universities. For every US$800 thousand spent on research, approximately US$300 (CAD$360) thousand is spent on training and study activities.

1.3 Appropriate Technology International (ATI)

Objectives. Appropriate Technology International (ATI), based in Washington D.C., is a private, nonprofit, development asistance corporation. ATI works with local enterprises and organisations in TWCs to identify, adapt, and disseminate technologies appropriate to the needs and resources of the rural and semi-urban poor. ATI's major objective is to get productive technologies into the hands of the rural poor in order to increase their incomes and improve their quality of life.

ATI does not do primary research. Instead it selects technologies on which research has already been done, (that is, technologies past the laboratory, "developmental shelf," and sometimes even beyond the pilot project stage), tests them for their technological soundness, potential commercial viability, economic sustainability and widespread use beyond the project area. The emphasis is on helping make such technologies viable in the hands of the private sector.

Shelter and settlement planning are not considered part of ATI's objectives although, as described below ATI does have projects in this area.

In its program ATI stresses the following: (1) building technical capacity among the poor, (2) promoting private sector strategies for development, (3) strengthening local institutions, and (4) building a body of knowledge about Appropriate Technology.

Structure and Capacity. ATI is funded through the USAID. Its revenues in 1984 were US$5.8 (CAD$6.9)million. It undertakes programs in cooperation with the Employment and Small Enterprise Division of the Office of Rural and Institutional Development, wihtin the Bureau of Science and Technology of USAID.

Its field operations are staffed by 24 professionals, nine of whom are in its Development and Evaluations Group, the closest research-oriented function that ATI performs. One engineer has a specialisation in building construction.

Focus. ATI fields of focus as indicated by the types and numbers of projects it has implemented are on: Food Processing (6), Power Production (animal-driven pumps, turbines, 3, projects), Building Materials Industries (Brick and Lime Kilns, mini-cement plants etc., 3 projects), small-scale manufacturing (rural potteries, wool spinning, 3 projects), and institutional mechanisms for small industries development (venture capital companies, 3 projects). These projects were for 1984-85.

Thus three out of fifteen projects in that year were in the shelter area, all in the Materials and Technologies field.

2. IN EUROPE

In Europe, the international agencies involved in shelter research have two major sources of funding: the aid agencies of the respective governments, such as the Ministere de l' Cooperation et du Developpement in France, and the Overseas Development Ministry in U.K.; second, the United Nations through its specialised bodies such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO), and the United Nations Industrial Development Organisation (UNIDO).

Of the countries in which agencies were studied (Austria, France, Netherlands, and the U.K.) the Government of France appears to put the most emphasis on aid for shelter and settlement including research in this area. The aid and research agencies are most numerous. The aid and researh effort seems also the best coordinated. A clear hierarchy in research funding, its distribution and implementation is also apparent. Three ministries disburse funds to six organisations which initiate, administer, and conduct research as well as sub-contract it to a larger number of smaller research groups. (See Table 1 for the breakdown of funding and research organisations in the different countries). The following six agencies were analysed in detail.

2.1 REXCOOP: TWC Research part of Plan, Construction et Habitat (PCH) of Government of France (France)

Objectives: Rexcoop is the French Government's interministerial program with the mandate to undertake research and experimentation in the field of French cooperation in the construction, housing and urban development sector. The Rexcoop program actually represents the "developing countries" component of "Plan Construction et Habitat" (PCH), the inter-ministerial organisation charged with the development of research and

innovation in the field of human settlements, including action both in France and abroad.

Structure and Capacity. Rexcoop projects are funded on the French side by various sources, of which the principal ones are credits from: (1) the Ministere de la Recherche et de la Technologie for research studies; (2) the Ministere de l'Urbanisme du Logement et des Transports for preliminary studies; (3) the Ministere des Relations Exterieures for technical assistance, documentation and small equipment.

Cooperation projects with mixed French and foreign funding are set up on the basis that Rexcoop is responsible for the outlay related to the experimental aspects of a project (research, additional costs due to preliminary studies, evaluation and training), while the foreign partner is responsible for the ordinary investment costs of the project, such as site preparation, labour etc. Research is carried out for Rexcoop by various French or foreign organisations, (including research departments within the funding ministries already mentioned, Plan Construction et Habitat, and institutional research organisations such as Groupe de Recherche et d'Echanges Technologiques (GRET), Centre Scientifique et Technique du Batiment (CSTB), and the Agence Cooperation et Amenegement (ACA).

Rexcoop's budget in 1985 was French Francs (FF) 20 million (or CAD$4 million), and the average allocation to a project is FF 300,000 (CAD$60,000).

Focus. REXCOOP supports research and experiments (Laboratory) testing in construction, housing and urban development. Research ranges from the theoretical to applied, action based research. Rexcoop's policy is that projects should be replicable and adapted to local conditions. It emphasizes reducing investment and operation costs, adapting housing to the environment, using local material and human resources. Local participation and careful consideration with local partners of the economic, human and technical conditions are regarded as necessary in ensuring this policy. Rexcoop research has six main themes:

(1) Production channels and building materials (development of local resources and rationalization of traditional materials, improvement of building site equipment and facilities; low-cost building systems, earthquake and hurricane resistant measures; and setting up production networks.

(2) Energy, housing and urban development (energy conservation; production and use of materials; urban transport, and urban planning and building design.

(3) Financing of housing and construction promotion (local institutional mechanisms to encourage savings and provide low-income populations with loan systems).

(4) Land management and operational urban planning (achieving minimal tenure; matching local finance and facilities).

(5) Urban facilities (infrastructure improvement; urban facilities planning and management).

(6) Support to local town management structures in town management.

2.2 'Cellule Habitat' in Groupe de Recherche et d'Echanges Technologiques (GRET - France)

Objectives. GRET, a nonprofit organisation based in Paris, has a central objective of providing an information network for people involved in Development. It is the French counterpart of Volunteers In Technical Assistance (VITA) in the USA or Intermediate Technology Development Group (ITDG) in U.K.

GRET has a 'Cellule Habitat' concerned with shelter and construction in the Third World. Its mandate is to identify and promote alternative technologies and support development projects which give value to local skills and materials.

Structure and Capacity. The 'cellule' deals with research, training, project organisation, and dissemination of information.

The 'Cellule Habitat' has three permanent staff (plus access to other facilities in GRET) and is supported by a network of part-time contract workers, who do much of the research. Currently there are 31 people employed, including 16 architects, 5 engineers, 5 economists, 5 sociologists and 2 artisans.

Half of its funding comes from the French Government, through the Ministere des Relations Exterieurs and through Plan Construction et Habitat; the remainder, from foreign bilateral aid, other nongovernment organisations, and multilateral organisations.

The 'Cellule habitat' had a 1985 budget of FF900,000 (CAD$180,000), spread over 25 programs, of which 11 began in 1983 or 1984. The average value of a program is FF200,000 (CAD$ 40,000). Research is undertaken on demand (for example, GRET does research for REXCOOP and Plan Construction et Habitat).

Focus. Research has three themes: the production and use of local materials (including plaster, gypsum, stone, ceramics) and techniques (such as detailed work on different roofing systems); improvement in living conditions and popular housing; housing as a process/housing as a product.

Recently an earlier focus on building materials has been complemented by work on systems of housing finance in the Third World and evaluations of urban policy in Third World socialist countries. GRET has also been examining international aid for

"habitat," and a country-by-country evaluation of the role of NGOs in the field of "habitat."

2.3 United Nations Educational, Scientific and Cultural Organisation (UNESCO - France)

UNESCO's mandate is to encourage intellectual cooperation internationally and to speed development through operational assistance to Member States.

UNESCO has several divisions responsible for sponsoring and promoting research related to shelter and construction, but recent budgetary cutbacks have reduced UNESCO's sponsorship of research.

(a) Division of Technological Research and Higher Education

Objectives. The Division of Technological Research and Higher Education now has the main program of research into shelter problems in TWCs. This Division stimulates research through the allocation of travel grants and publication of scientific bulletins and newspapers. It provides assistance for improving educational and training methods, for producing manuals and curricula related to shelter and construction, and also supports seminars and meetings concerned with engineering and socio-economic problems of low-cost housing and local building materials.

The Division feels that it has an important role in the exchange of information on research, and that it can also beneficially lend the support of its name to validate worthwhile initiatives.

Structure and Capacity. The Division works primarily in collaboration with other organisations, such as Centre Experimental de Recherches et d' Etudes du Batiment et des Travaux Publics (CEBTP), the International Centre for Technical Research, and the World Association of Earthquake Engineering.

The Division had a budget of US$400,000 (CAD$520) in 1985, with a program specialist in charge of the programs indicated below.

Focus. The focus of research support is on:(1) local building materials (e.g., soft limestone blocks; earth stabilisation; production and use of gypsum plaster; solar energy for calcination; improved grass roofs; optimising use of sand aggregates in concrete, all in conjunction with CEBTP); (2) technology for local building construction; (3) earthquake engineering.

The Division also sponsors a UNESCO Working Group on Low-Cost Housing in Africa. The Working Group issues bulletins on research by various African national institutions, reviews of seminars,

and the implementation of appropriate findings in building and materials production practice. The aim of the group is to encourage collaboration among African research institutions concerned with local building materials and construction.

(b) Other Divisions

The Division of Human Settlements and Socio-Cultural Environment also sponsors research, particularly through the publication of reports and studies on the traditional built environment. They have five publications coming out in 1986, covering work in Senegal, Mozambique, Peru, Iran and Lebanon.

The Division of Educational Policy and Planning, Educational Facilities Section, has sponsored research into low-cost building technologies and materials in the past. No information about their present activities was provided.

2.4 International Council for Building research Studies and Documentation (CIB - Netherlands)

Objectives. The CIB is the principal coordinating agency in for building research. Its objective is to encourage, facilitate and develop international coooperation in building, housing, and planning research studies and documentation. CIB concerns itself with the technical, economic and social aspects of the built environment.

Structure and Capacity. CIB promotes research by facilitating information exchange among its members. Its membership includes 300 institutes worldwide as well as individual members representing 70 countries. Research is coordinated through 45 working commissions on topics covering major aspects of building and planning. Its activities are financed by the subscriptions of its members.

Focus. The members of the 40 Working Commissions meet and exchange information on a wide range of research subjects which their members are carrying out or are reviewing. A number of Working Commissions have a focus which relates to shelter in TWCs. The working commissions cover such areas as urban planning, organisation and management, housing sociology, building economics, low-cost housing, water supply and drainage, energy conservation, waste utilisation, and long-term forecasting.

Working Commission W63 on Low-Cost Housing, and Working Commission W76 on Utilisation of Wastes and Local Materials in the Building Industry have a list of activities which include producing state-of- the- art papers and carrying out research on the following: Improved Mud Housing Technology; Economical Use of Timber; Bamboo as a Building Material; Appropriate Materials for

Roofing; Housing Affordability; Incremental Housing Concept; Self Built Housing; Housing Standards; Choice of Local Materials.

2.5 United Nations Industrial Development Organisation (UNIDO) Austria

Objectives. The Building Materials and Construction Unit of UNIDO coordinates research into the development and use of low-cost building materials, production techniques, and building technologies.

Structure and Capacity. The normal procedure is for a government to request assistance in a particular field. This is followed by a joint UNIDO/Host Government request for funding, which is usually supplied through UNDP. Budgets vary according to project.

Three current programs serve as examples of UNIDO activity. In Indonesia UNIDO is coordinating a 4-5 year large-scale program of research assistance in the field of building material production and supply industries for low-cost housing, with a total budget of US$2.5 (CAD$3.25) million. In Thailand there is a program for developing low-cost building materials and production techniques, and construction technologies for producing houses, with a budget of US$ 80,000 (CAD$104,000). Projects are carried out by a mixed team of national and international experts.

In addition, UNIDO is collaborating with UNCHS on a major "Global Consultation on the Building Materials Industry of TWCs". The research agenda of this program covers (a) the development of the building materials industry, (b) strengthening indigenous technological capabilities, and (c) development of building materials production in the informal economy.

Focus. UNIDO appears to be most active in Asia and the Pacific, in part because the potential for industrial development is greater than in Africa. In addition to a research focus on building materials, the Building Materials and Construction Unit also works on methods for improving earthquake resistance.

2.6 Building Research Establishment (BRE - United Kingdom)

Objectives. The mandate of the Overseas Division of BRE is to help the construction activities of TWCs by carrying out research and by providing information and advice.

Structure and Capacity. The Division is largely funded by the Overseas Development Administratiom (ODA), and is thus linked through British aid to some 120 countries. Funding also comes from commissions undertaken directly for organisations in overseas countries, and other agencies sponsoring work in TWCs. Research is done mainly by the Division staff who can also call

upon the resources of other BRE Divisions as necessary, thus providing the Division a strong research capacity. Some subcontracting of research takes place. Research funding for 1984-85 was UKPounds 203,700 (CAD$400,000).

Focus. Research is strongly linked to project implementation and is supported by the publication of "Overseas Building Notes," prepared by both U.K. and foreign institutions, and the sponsorship of seminars. Research has recently focused on the following fields: (1) low-income housing (especially earthquake and hurricane resistance); (2) environmental conditions (thermal response of various materials and designs); (3) sanitation (development of latrines); (4) rural housing; (5) local building materials (improving fired-brick production, the stabilisation of soils and the production of an improved block making press); and (5) roofing (improved roof frame structures, using timber, and roof covering systems).

The Overseas Division research activities are complemented by a wider range of subjects covered through the publication of the Overseas Building Notes.

3. United Nations Centre for Human Settlements (UNCHS)

Objectives. The main tasks of UNCHS are to harmonize human settlements activities in the United Nations system; to keep them under review and assess their effectiveness; to execute human settlements projects; to promote global exchange of information and collaboration with the world scientific community and NGO's in human settlement development efforts.

The work program covers eight subject areas: settlement policies and strategies, settlements planning, shelter and community services, development of the indigenous construction sector, low-cost infrastructure, land, mobilisation of finance, and human settlements institutions and management.

The work program reflects the priority fields in shelter and settlement planning as defined by the UNCHS. Since UNCHS is noted to be highly sensitive to the majority voice in the UN system, which are the TWCs, this selection of priority fields is a good indicator of the priorities of TWCs themselves. The work program, as we shall see below sets the research agenda of the agency.

Structure and Capacity. An indicator of the importance given to research in UNCHS is that Research and Development is the largest of the three divisions which in total are staffed by 95 professionals. The other two divisions are Technical Cooperation, and Information, Audio-Visual and Documentation. This indicator, however, is not entirely satisfactory without information on the relative budget allocations of the three divisions and an assessment of the quality of research emanating from UNCHS.

The R and D division is divided into four sections whose definitions help to further identify the research areas that UNCHS is active in, namely (1) Policy and Planning (covering policies and strategies; global analysis and reports; urban and regional planning; rural planning; environmental aspects; institutions and management), (2) Shelter and Community Services (covering shelter, slums and squatters; community participation; community services; financing for human settlements; land), (3) Building and Infrastructure (covering the indigenous construction sector; building technologies; building materials and equipment; low-cost infrastructure; energy; transportation), (4) Training (covering policies and priorities; training programs and courses; Training centres).

Research Focus. At least three indicators suggest that building materials (materials and technology in our classification), and the building industry are the main research focus of UNCHS. The first is the more detailed mention made of this field and of research activities within it in UNCHS documents describing the work of the R and D division. Thus building materials and the role of the construction industry is noted to be of particular relevance to TWCs. As mentioned UNCHS is collaborating with UNIDO in planning global consultations on the building materials industry. It has also conducted and published research in areas such as earth construction, the use of fibre-cement, and undertaken a comprehensive review of technologies for basic infrastructure in low-income settlements.

A second indicator is that out of a total of 30 publications listed in the 1985 UNCHS publications catalogue, the largest number, ten, are on building materials. The breakdown of publications by shelter research field may be taken as a rough indicator of the ranking of research priorities. This breakdown by field and number of publications ranked to indicate priority is as follows: on Materials and Technologies (10), on Policy (4), on Infrastructure and Services including Infrastructure Technology (4), on the Building Industry (3), on Finance (2), on Land (2), on other shelter fields (environment, energy etc., 11).

4. Lessons for IDRC.

From the above analysis several points emerge about shelter research among the international (largely western) agencies and about IDRCs emphases relative to these agencies.

First, the ranking of research priorities of international agencies and IDRC by shelter field are broadly similar. This ranking as indicated by the number of agencies including each field as a research area, was as follows (18 out of 22 agencies surveyed had information on research priorities): Materials and Technologies (16), Infrastructure and Services (14), Building Industry (11), Policy (9), Land (8), Finance (8) (Table 1). As we have seen, Infrastructure and Services, and Materials and

Technologies were also IDRCs major shelter research fields, followed by Shelter Policy. As we have also seen, research in the field of Materials and Technologies is emphasized among the European (and UN) agencies. This emphasis is in marked contrast to that of the World Bank and USAID, which tend to downplay the value of research in this field. This is especially true for the Urban Policy and Research Division of the World Bank.

Thus IDRC is the only source of any significant amount of research funds in this field in North America. This fact is not widely appreciated; perhaps even within IDRC.

Closer examination ruled out an earlier expected duplication of effort in Materials and Technologies, between IDRC and ATI. Shelter projects are not considered an area of concentration by ATI. Furthermore, ATI concentrates on dissemination of research results rather than primary research: picking up the research of others (such as those funded by IDRC) when it is "past the bench stage and often even past the pilot project stage,"as its Executive Director noted. IDRC research is thus viewed as complementary by the agency.

Finance, Land and the Building Industry, however, are important areas of concern among the international agencies to which IDRC has given little attention, at least in the last five years. As we shall see in the following chapters, this distribution of research priorities in IDRC reflects, at least in part, the relative research interests, strengths and weaknesses of Third World and Canadian institutions. We have already noted how the project emphases of CIDAs' Human Settlements section also lie in the two fields of Infrastructure and Services, and Materials and Technologies.

Perhaps most significant, is the substantial support, in terms of research funds, that IDRC gives to the shelter area. The albeit incomplete budget figures obtained for the international agencies suggests that IDRCs support compares very favourably (Table 1). Given this, it is striking that IDRCs (and Canada's) influence on shelter research is not more widely acknowledged. Contrast, for example, IDRCs expenditures of CAD$4.8 million on shelter-related research in 1985 to the annual expenditures of approximately US$0.9 million (CAD$1.2) of the World Bank's highly influential Urban Policy and Research Division.

No doubt part of the answer lies in that the Urban Policy and Research Division maintains good researchers on its regular payroll. Furthermore, its research influence rests on the clout that the World Bank wields in the shelter area in general through its project expenditures. This is reinforced by USAID's heavy investments in this field. Given IDRC's primary mandate to assist TWCs in improving their research capacity - a far more valuable objective than simply producing the best research, and CIDAs low level of support to the shelter field relative to USAID and the

Bank, there is little that IDRC can do with regard to these two factors.

However, much of the Urban Research Division's impact stems from its well-coordinated, highly visible, and almost aggressively projected research efforts. It is along these lines that applicable lessons may lie for IDRC to improve both the quality of its research and the recognition and impact due to it in the international sphere. At very least some of these lessons can be applied to the particular program on shelter research that is to be identified in this paper. What these lessons are and how they can be applied must be pursued in more detail within the context of the program once a decision to proceed with it has been made.

CHAPTER THREE
CANADIAN AND THIRD WORLD INSTITUTIONS: THEIR SHELTER RESEARCH INTERESTS, CAPACITIES, AND POTENTIALS FOR COLLABORATION

In this chapter we survey the shelter-related research activities of research institutions in Canada and those in the TWCs. In the first section, we identify specific fields of research in shelter that the Canadian institutions have a demonstrated interest and capacity in. The factors affecting Canadian interest and activity in shelter research relevant to TWCs are also investigated.

In the second section we examine Third World institutions. Such an examination reveals which fields the TWCs themselves identify as priorities (a viewpoint which international agencies must take into account). It also helps identify what types of research skills and resources are readily available for collaborative research with Canadian institutions.

In the final section, the interests and capacities of Canadian research institutions are matched with those of institutions in the TWCs. Fields of collaborative research between the two and the types of potential counterpart institutions are then defined. Finally, ways through which collaborative research can be encouraged are outlined.

1. Shelter Research in Canada

The following discussion is based on a survey of a representative range of Canadian institutions (Total = 53) doing TWC shelter-related research or having the interest and capacity to do so. The information sources for the survey include interviews, published materials from the research institutions, and directories of research centres and programs such as that published by the Association of Universities and Colleges of Canada (AUCC).

The survey focuses on universities and colleges (although a few federal research institutions and private nonprofit organisations are included). 1/ Within this group, a broad spectrum of institutions are covered: academic departments and programs, research centres, and institutes. Institutions based in the physical and social science disciplines are roughly equally represented in the survey.

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1. Because the CPD's principal objective is to promote collaboration between Canadian research institutions and those in the TWCs, and because of the sheer numbers involved, the survey does not focus on private organisations. Similarly, few federal research institutions are included because in many of these institutions research activities are restricted to domestic (Canadian) concerns by their mandates.

1.1 Shelter-related Research Activities and Interests Relevant to TWCs

Research on Third World development, particularly on shelter issues, is much less in Canada relative to, for example, the US. Nonetheless, a closer examination of Canadian institutions' research activities in the area of shelter for TWCs reveals a substantial research capacity, experience, and interest - much more than what is generally acknowledged by the international community and even by some Canadian researchers themselves. Table 4 summarises the survey results. It shows the following information for each institution:

(1) areas of specialisation related to shelter;

(2) specific research centres, institutes, groups or individual members' interests that are relevant to shelter in TWCs;

(3) activities in the different fields of shelter research that are relevant to TWCs (these include those done specifically on shelter problems of TWCs as well as others not specifically on shelter in TWCs but may have applications in these areas;

(4) examples of actual projects or individual members' experience in shelter research specifically for TWCs.

Gauging from the research activities and staff interests of the institutions surveyed, the research capacity of Canadian institutions are strongest in two fields: Materials and Technology, and Infrastructure and Services. The percentage of institutions recording these fields are their areas of research activity are 45 percent and 37 percent respectively. These are followed by Shelter Policy (30 percent) and Land (28 percent). Research on Urban and Building Design for TWCs (e.g.,form studies, climactic design, site planning) forms a fifth area, but research activity in this field is considerably less compared to the first four areas. Interestingly, none of the institutions surveyed recorded Finance as an area of research activity. 2/

An independent summary list of strengths in urban development research, presented at a conference on "Research for Third World Development: Ontario Perspectives" in 1985, although restricted to institutions in the Ontario province, corroborates the above findings. The research strengths relevant to shelter that are included in the list are:

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2. None of the institutions surveyed indicated involvement in this area. It may be that research in this field comes out of academic programs in Economics. A review of the international development experience of these departments (listed in the directory, Canadian University Resources for International Development) however, did not indicate this to be the case.

(1) "the Technology of City Building and Construction (vernacular architecture, rehabilitation, sub-division norms energy conservation);

(2) distribution Systems and Service Networks (health service delivery, social service systems):

(3) urban settlement systems and settlement policies (University of Waterloo and IDRC, 1985:32-33)."

Research is also distinguished by the type of sponsoring institution. Research activities of most institutions based in the physical sciences - architecture, engineering, and environmental science - deal largely with technological design and development aspects of the different shelter fields. In contrast, research by institutions based in the social sciences - administration, geography, urban and regional planning - are largely policy oriented. Institutions that work on both technology and policy aspects in the different fields (e.g., Centre for Minimum Cost Housing, McGill University and Institute for Environmental Studies, University of Toronto) tend to be fewer. Similarly. interdisciplinary research projects involving independent units within an institution or different institutions are few.

Materials and Technology. Research activities mostly emphasise studies on the fundamental behaviour of structural materials, such as masonry and timber (along with the more traditional structural materials like reinforced concrete and structural steel). Several institutions 3/ are active in research on cementitious materials, specifically to develop cement subsitutes or supplementary cementing materials. The use of industrial or agricultural waste materials as partial replacements to Portland cement forms an important part of this research effort. Another important area of materials research, although fewer institutions are currently involved, is research on alternative building materials used exclusively in TWCs - bamboo, sulphur concrete mix, fibre-reinforced concrete for example - such as that done by the Centre for Minimum Cost Housing.

A second line of research is earthquake engineering, including the design of seismic-resistant structures.

In addition to these research areas, individual staff in several institutions have a research interest in appropriate building technologies for Third World housing.

Infrastructure and Services. Research concentrates on water supply, waste management, and energy. Research on transport,

3. These include the Canadian Center for Mineral and Energy Technology and the Civil Engineering departments in the the following universities: British Columbia, Calgary, Mc Gill, and Ottawa .

although an area of specialisation in many of the institutions, is mainly on large-scale infrastructure (port, airport terminals, highways) that are less directly targeted to the poor (exceptions are the Project Ecoville studies of the Institute of Environmental Studies, University of Toronto). There are, however, studies in the Materials and Technology field (e.g., research on fly-ash in road construction done at the University of Clagary) that could possibly have applications in the design of small-scale, low-cost infrastructure.

Research (and training) experience in water resource development (both urban and rural) and waste management (largely urban) for TWCs is considerable. In addition, many of the faculty in academic programs serve as consultants, in an individual capacity, to various international agencies. Most research deals with the design of low-cost water supply and waste disposal systems and studies on water quality, but a growing number of studies are looking at the broader question of access to and the management of water supply and other basic services (health, education, transport, etc.)in urban areas.

Research in energy comprises a roughly even mix of studies on energy policy and planning (energy audits, supply and demand forecasting, environmental impact studies) and those oriented to particular technological areas (wind, solar and biomass). The design of small-scale renewable energy systems and specific applications in buildings (e.g., solar heating) is a major part of the technological research.

In addition, Canadian institutions have established an international reputation for energy research. The Brace Research Institute, for example, is recognised as one of the leading international centres for solar and wind utilisation. Others with well established programs in energy research focused on TWCs include the Faculty of Environmental Studies at York University and the Ryerson Energy Centre.

Shelter Policy. Research is strongly urban in focus and is done almost exclusively by the institutions based in the social sciences (Mc Gill's Centre for Minimum Cost Housing is one of the few exceptions). Research on unplanned, squatter, or informal sector housing is the most common type. A second line of research is the evaluation of national housing policies or of specific government interventions in housing (e.g.,sites and services, resettlement). Finally, a third area is research on settlement issues in rapidly urbanising TWCs (e.g.,those done by the Centre for Human Settlements, University of British Columbia and by the Institute of Environmental Studies, University of Toronto).

Research on settlement issues and policies in rural areas is not an area of activity for majority of the institutions. The School of Rural Planning and Development at the University of Guelph is one of the few institutions working in this area.

Land. Research focuses on two areas: land policy and development of land information systems. The former, which largely comes out of academic and research programs in geography and planning, includes studies on land ownership, tenure, and other related issues. Research on land information systems includes: cadastral studies, management of land information systems, computer cartography, and development of efficient in-situ geotechnical testing techniques. Quite a few institutions have strong programs in geotechnical engineering and extensive facilities for mapping and remote sensing (e.g., Carlton University, University of New Brunswick, and University of Waterloo).

Building Industry. Very few institutions deal with this subject. Most of the research is on industrialised and prefabricated construction (University of Montreal, School of Architecture, McGill University, Civil Engineering Department). The Rural Planning School, Guelph University has done some work on small-scale construction enterprises which may have application to the TWCs.

1.2 Factors Affecting the Level of Interest and Activity in Shelter-related Research for TWCs

Part of CPD's objectives is to encourage Canadian research groups to take a tangible interest in a wider and more varied range of Third World concerns. It is thus important to examine the factors that affect the level of interest and activity in shelter-related research for TWCs.

A quick look at Canadian institutions active in the field of shelter does not give the impression of strength in research on shelter problems in Third World countries: few academic programs or courses on shelter in TWCs, few institutions have a decidedly Third World focus in shelter research, few overseas activities at the level of the institutions. A closer examination, however, reveals the much stronger interest and capacity in these institutions to assist TWCs in shelter-related research. Why then are these interests and capacities - with a few exceptions - not readily apparent?

Several factors constrain a greater amount of interest and involvement in shelter-related research for TWCs among Canadian research institutions. These are:

Sponsorship. A major factor explaining the seemingly "low visibility" of Canadian institutions in the field of shelter research is the lack of sponsorship: funds for research on shelter needs of TWCs are limited.

Grants and external contracts (largely on a project-by-project basis) are the primary sources of funds for research institutions. The largest proportion of these funds are provided by the federal government (largely through grants from the

Natural Sciences and Engineering Council and the Social Sciences and Humanities Research Council). Other sources are provincial government agencies, private industry, and charitable foundations. On the whole, these funding agencies have research interests related to selected areas of national, regional or corporate importance not necessarily relevant to research needs in TWCs.

Research funds specifically for shelter in TWCs come largely from the IDRC. Funds from other international agencies such as the UNDP, although increasing in recent years, tend to be captured by the few more visible and internationally established institutions with a decidedly Third World focus or a long experience in development work.

Closely linked to the issue of sponsorship is Canada's foreign aid policy, which puts little emphasis on shelter and settlement planning. As we discussed in the preceding chapter, the CIDA, unlike the USAID, allocates a very small percentage of its budget to shelter and settlement planning (CIDA's CAD$15 million versus USAID's CAD$195 million - 1984-85). The demand for research that would have otherwise been generated by specific needs of foreign-assisted projects (a large part of university research in the United States, for example) is again lacking.

Foreign Student Enrolment. Research interests represented by a sizeable foreign student enrolment, particularly from TWCs, provides an impetus to develop and further research programs and activities relevant to the Third World. Foreign student enrolment in Canadian universities and colleges, although much lower than that in other countries, has been increasing for a number of years (about 5 percent of total enrolment in 1983-84 compared to 13 percent in France, 20 percent in Switzerland for 82-83). However, since 1984-85 when all but three of the provinces in Canada started charging foreign students higher "differential" fees , statistics on foreign student enrolment indicate a marked decline (AUCC, 1985:x-xii). Most of the institutions included in the survey pointed out that their Third World-related research programs and activities decreased with the decline in foreign student enrolment.

Interinstitutional Linkages. Although institutions and research programs with a Third World concentration are fewer, there are a good number of research groups within these institutions that have interests relevant to TWCs (see Table 4). In addition, individual faculty experience and interests related to shelter in the Third World are also substantial. Yet, as we earlier noted, these interests and capacity are not immediately apparent. The reasons are partly institutional.

Several institutions have established mechanisms to facilitate and coordinate international activities among the different units of the institution. The examples include the Ryerson International Development Centre, Waterloo Research Institute,

and Carleton University's Paterson Centre for International Programs: each draws on the expertise derived from their respective institution's full range of units and departments to meet needs of specific projects. In addition, Institutional exchanges or joint programs (e.g., Ottawa-Carlton Institute of Graduate Studies and Research in Engineering, University of Waterloo and University of Toronto Information Technology Cooperative) have been established between several universities. On the whole, however, indications of an ongoing, regular exchange among the different institutions (and individual researchers) in the area of shelter-related research are few.

The indicators of weak interinstitutional linkages are several. Apart from a general awareness of research in the more internationally established institutions (such as those based at Mc Gill University), few of the institutions surveyed were familiar with the interests and activities of other institutions. In one case the director of an institution appeared unaware of the fairly substantial research interest and activity within his own institution as reported by some of his faculty. The geographical spread of the institutions adds to the difficulties of communication, especially between institutions in the eastern and Atlantic provinces and those in the central and Pacific provinces.

As earlier noted, instances of collaborative interdisciplinary research among several institutions are rare. At best there is interdisciplinary research involving independent units within the same institution. Channels that could help encourage such interdisciplinary collaboration among institutions or individual researchers are few. Unlike the Canadian Society for Civil Engineering, the Canadian Institute of Planners, an organisation that draws its membership from a variety of disciplines does not have a program or a research focus on shelter in TWCs (its US counterpart, the American Institute of Planners has, for example, an International Division that brings together members with specific interests in international development).

The negative forces notwithstanding, several factors are supportive of promoting greater interest and activity in shelter-related research. These are:

Institutional Commitment. Observing the current state of Canadian universities in international development, the Director of the International Development Office/AUCC states, "Canadian universities and colleges believe that they have a key role to play in human resource development in the Third World (AUCC, 1985:vi)." In general, Canadian institutions encourage international development cooperation; some have formulated a formal policy on international activities.

The increasing number of universities and colleges that have designated officials to coordinate international activities among different faculties and units indicates the commitment to

international activities. Further evidence of this growing involvement is the number of institutions - international programs, research institutes, international development centres - that have been established to administer and coordinate institutewide international activities. Thus the basic ingredient of institutional commitment clearly exists: the task is to combine this institutional commitment with the strengths of the researchers in the shelter field.

Research Infrastructure. Research requires a substantial investment in supporting infrastructure - testing laboratories, research stations, equipment, computer facilities, library and documentation resources - facilities that are scarce in Third World institutions. This infrastructure is already in place in Canadian institutions. Furthermore, in some of these institutions the standard of the research infrastructure is among the best internationally.

Experience and Interest. As discussed in the preceding section, individual interest and experience in shelter-related research oriented towards TWCs is substantial. Many of the staff in these institutions have worked, in an individual capacity, on development projects abroad and serve as consultants to the CIDA, IDRC, and other international agencies. In addition, quite a few staff members are immigrants from the Third World and have an interest in development work in their countries of origin.

Another encouraging sign is that, despite the absence of formal institutional exchanges with research institutes in the Third World, many of the individual staff have maintained informal links with their counterparts in the TWCs.

In sum, despite factors that negatively affect the Canadian institutions' interest and involvement in shelter-related research for TWCs, there are also a number of encouraging, supportive factors that can be marshalled to further promote the interest and strengthen capacity in Third World-oriented shelter research. Some measures to implement these objectives are outlined in the last section of this chapter. In the following section we examine the activities of research institutions in TWCs.

2. Shelter Research in TWCs

The information on research institutions in the TWCs is drawn largely from secondary sources and complemented by the authors' personal experience. To get an indication of what TWCs perceive as their research priorities, we need to look at what TWCs consider as their basic shelter and settlement problems and the research interests and capacity of institutions in these countries. We thus examine several indicators:

(1) objectives and themes of international conferences, meetings, and workshops held over the last two years;

(2) statements of Third World professional associations and expert groups, and organisations representing Third World countries;

(3) available directories of Third World research institutions.

2.1 Shelter and Settlement Problems in TWCs

Meetings, conferences, seminars and workshops on shelter in TWCs and attended by representatives from the Third World indirectly reflect the shelter problems, the research interests, and, to a lesser extent, the research capacity in the TWCs.

A content analysis of titles and themes of shelter conferences in the last two years (total = 48, see Table 5) reveals two recurrent, interrelated shelter concerns. First, is a concern for shelter, i.e., housing and services that are low-cost (low-cost through the "cost-effective use of resources," use of "appropriate building materials," "low-energy ecotechniques," "low-cost technologies, "appropriate strategies and approaches," "cooperative systems"). Second, is a concern for meeting the needs of the poor (the "low-income," "urban poor," "informal" sector).

Put another way, from the viewpoint of TWCs, the major problem they face in this area is that of utilising resources effectively to make adequate and acceptable shelter affordable to the poor who make up the majority of the population. For example, the 5th Housing and Planning Convention of the Association of Southeast Asian Nations held in January this year had as its overriding objective to "highlight significant issues, experiences, and innovations through which key production resources such as finance, land market, settlement planning and construction technologies can be made more accessible and more cost-effective (HABITAT News, December, 1985:23).

2.2 Research Interests and Capacity

Research Interests. Gleaned from the fields that were the main topics of discussion in the shelter conferences, the research interests of institutions in TWCs are strongest in the fields of Materials and Technologies (48 percent of the conferences) and Shelter Policy (42 percent). Infrastructure and Services comes as

a relatively distant third (29 percent). 4/ Within Materials and Technologies, there is considerable interest in local, small-scale building materials production and indigenous technologies.

Research Capacity. Research mainly comes out of two types of public institutions: government agencies, and universities or technical institutes. Nongovernmental organisations (NGOs) - trade and professional associations, private research institutes - also do some work in this field. Their contribution, however, is a small, if at times significant, proportion of the total in most countries. 5/

The government agencies include the line ministries or departments such as Housing, Planning, Building, Public Works, Construction, Forestry, Industry, and Mines, and the independent research councils (e.g., the Pakistan Council for Scientific and Industrial Research) or institutes. Research in the line agencies are done by research units within the ministries or by semi-autonomous building research centres, institutes or testing laboratories. In some countries (e.g., India, Pakistan) there is one centre for each major province or state.

Research in government agencies generally focus on the development of building materials and technologies and the formulation of standards. The latter range from broad standards on zoning and land use to the more technological standards such as building codes and construction specifications.

In addition, policy oriented-research is also undertaken in housing agencies, particularly in countries with sizeable foreign-assisted shelter projects; such research is often initiated by foreign donors such as the World Bank or USAID, to meet the research needs of the programs or projects they finance. Typical of these studies are the following undertaken by the Research and Analysis Division of the National Housing Authority in the Philippines: longitudinal studies of turnover of households in project areas; income and expenditure studies of project area residents; an evaluation of the physical environmental impacts of upgrading projects (World Bank, 1979: 25).

Like at Canadian universities, research activities of technical institutes and universities in TWCs are distinguished by the particular discipline focused on by the institutions. Research by

4. The relevant percentages for the remaining fields are: Land, Land Information Systems (21 percent), Housing Finance (18 percent), Building Industry (15 percent), and Other fields (8 percent).
5. An assessment of the research contribution of NGO's must await adequate documentation of their activities. Documentation on NGO contributions in general is only beginning to get the attention it deserves.

universities are generally of two types. The first is on building materials and technology done by civil engineering, architecture, and forestry departments or by affiliated building research institutes; the second, on policy-oriented studies such as housing finance studies (usually done by economic research institutes), socio-economic surveys and evaluation of specific government interventions in housing. In recent years, policy-oriented research has included urban management studies that cut through the different shelter fields as we have defined them in this report. These studies examine the administration, financing, and access to basic urban services such as water supply, waste management, public transport, etc. including housing. The socio-economic studies, housing programs/project evaluations, and urban management studies are usually done by sociology, geography, urban and regional planning, and public administration programs or by housing research institutes.

The institutions doing research on building materials and construction probably constitute the largest and most active group. In the six-volume series of directories on institutions in the field of human settlements published by the UNCHS, the only directory of research institutions included in the series are national research organisations in construction materials and technologies. 6/ The UNCHS directory lists close to 300 such institutions in TWCs. Nine out of the 24 institutions based in TWCs that sponsored conferences listed in Table 5 are institutions doing research on building materials and construction.

Clearly then, the strongest research interest and capacity of institutions in TWCs lies in the Materials and Technology field. With notable exceptions, however, such institutions have little influence in government and impact in their societies: much of the research is duplicative, limited to the engineering aspects of the research, with little attention paid to issues of policy, dissemination, economic and social sustainability. Thus despite the research interest and capacity in this field, there are critical aspects of it that need strengthening.

2.3 Research Priorities of TWCs

Given the great diversity of TWCs, it is difficult to define research priorities in the shelter field. Research priorities, afterall, depend on the particular shelter problems to be addressed and the research skills and resources existing in each

6. The other directories in the series are on the following: information and documentation centres; ministries and governmental institutions; firms and institutions providing consultant services; training institutions, and finance institutions.

country. The precise definition of priorities will have to be done on a country-by-country basis.

Nonetheless, some general conclusions may be drawn from the preceding analyses.

(1) The research priorities of TWCs are on finding ways through which resources can be effectively utilised to make shelter (housing and services) affordable to the majority of the poor population.

(2) A key element in attaining affordability is the implementation of appropriate strategies, among them the use of appropriate building materials and construction technologies, particularly those used in the small-scale, informal building sector and indigenous technologies.

(3) Research interest among institutions in the Third World is strongest in the Materials and Technology field.

(4) The institutions doing research on building materials and construction probably constitute the largest and most active group; therefore, research capacity is strongest in Materials and Terchnologies.

(5) Research in Materials and Technology clearly ranks high in the research priorities of TWCs.

(6) The engineering research in this field must however be extended to incorporate policy, economic and social analysis. The research institutions themselves need to be strengthened in the hierarchy of government institutions.

3. Research Collaboration between Institutions in Canada and TWCs

Before we identify the possible fields of research collaboration between Canadian institutions and those in TWCs that CPD may consider supporting, we need to recall the relevant criteria earlier outlined in Chapter 1. First, the field must be a research priority. Second, research in the field identified should facilitiate CPD's mandate to promote collaboration between Canadian researchers and institutions and those in TWCs. Research collaboration makes sense in the fields where the institutions involved have a mutual interest and, especially for the Canadian institutions, in fields where the current research capacity is strong; that is, in fields where Canadian institutions have something to offer to develop the scientific and technological capacity of participating institutions in TWCs.

Moreover, collaboration is easier in a field where counterpart researchers in participating TWCs are easily identified and organised under some institutional framework.

Matching the research interests and capacities of Canadian institutions with those in TWCs, we find that the fields common to both are Materials and Technology, Shelter Policy, and Infrastructure and Services. Of these three, interest and capacity is strongest for both Canadian and Third World institutions in the field of Materials and Technology. Moreover, this field also meets the criteria of being a research priority from the viewpoint of TWCs.

Among Canadian institutions, a wide range and number of institutions based in both the physical and social sciences, including some that are well-known internationally, are available to engage in collaborative research. In TWCs the range of institutions that are potentially available as counterparts in participating countries is not as wide, but their numbers are probably sufficient. The potential counterparts in TWCs consist mainly of institutions focusing on the engineering aspects of building research.

Meeting these criteria, however, are not sufficient conditions to promote collaboration between Canadian and Third World institutions. As we have seen, several factors affect the level of interest and activity of Canadian institutions in shelter-related research relevant to TWCs. A number of institutional measures would be necessary to promote interest and to develop research capacity in Third World-related shelter research among Canadian institutions. Measures will also be necessary to develop channels of communication between Canadian researchers and their counterparts in TWCs. Some of these measures are briefly outlined here.

First, is the strengthening of interinstitutional linkages among Canadian institutions involved in shelter-related research. Corollary to this is the development of linkages between Canadian institutions and those in the TWCs.

An essential first step in the development of such linkages is information: a resource list or inventory of the Canadian expertise (institutions, individual researchers,) and research facilities in the area of shelter that could be drawn upon to assist TWCs is needed. 7/ Such a resource list would be a valuable reference for both Canadian institutions and those in participating TWCs.

Second, is an organisational framework which would provide for ongoing interinstitutional exchange at two levels: (1) among Canadian institutions; (2) between Canadian institutions and collaborating institutions in TWCs. Such linkages could have several benefits. At the minimum, it could provide a forum for

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7. An ongoing research project at the School of Architecture, Carlton University is the documentation of the Canadian nongogernmental organisations' involvement in development work.

exchanging information and ideas and help in building upon previous research results. It could help to encourage joint research among institutions and thus better exploit their individual areas of research strength. Most important, it could help promote collaborative interdisciplinary research which is what is increasingly called for in efforts to alleviate shelter problems in the Third World. For the Canadian institutions, it could could provide the linkage among what are now disparate elements of a potentially strong body of expertise in shelter-related research and thus further build up research capacity.

Several forms of existing linkages between Canadian institutions and those in the TWCs, although not focused specifically on shelter research, provides some models for the development of an organisational framework that would promote interinstitutional exchange among Canadian institutions involved in shelter research, as well as between Canadian institutions and those in the TWCs. Several of these organisations have received IDRC support.

One model is the linkage based on a geographic focus such as the Canadian Area-specific Learned Societies based at Carlton University. These associations promote exchange between Canadian scholars and those from their regions of focus: Carribean and Latin America, Asia, Africa.

Another is the network of Project Ecoville, of which the secretariat is the Institute of Environmental Studies, University of Toronto. Consisting of some 25 institutions, majority of whom are in the TWCs, the network is organised around Project Ecoville's research agenda: "long-term transdisciplinary research on environmental implications of rapid urbanisation." Another facilitating network organised in a similar manner is the Integrated Rural Energy Systems Association, consisting of groups and individuals working on integrated renewable energy systems in village projects in 12 countries. The Brace Research Institute serves as the Secretariat for INRESA.

Apart from these models it would be useful to examine the communication and liaison work done by the International Development Office (IDO) of the Association of Universities and Colleges in Canada. The objectives of IDO include the extension of the role of Canadian institutions in international development. All these examples merit careful consideration. Lessons can be drawn from them to be applied to the design of an interinstitutional support system that enhances the capacity of Canadian researchers and research institutions to collaborate with their counterparts in the Third World and strengthen the research effort in those countries.

CHAPTER FOUR
MEETING RESEARCH NEEDS: SELECTING A SHELTER FIELD FOR THE COOPERATIVE PROGRAMS DIVISION

In chapter 1 we identified six shelter research fields among which one was to be selected as the program focus for CPD. In that chapter we had also identified four criteria to guide us in our selection. In the last two chapters we assembled and analysed the information required to make a selection. When we matched the research strengths and interests of Canadian researchers and research institutes with those from the TWCs, materials and technologies emerged as the most appropriate field for CPD to support. This was based solely on the criteria of promoting research collaboration.

In this last chapter we shall address more fully the question of which is the most appropriate field for CPD. We shall examine each field against each of the four criteria we had established. Before doing so, let us recall the criteria we are applying to make a selection. The criteria as presented in the first chapter are as follows:

1. Criteria for Selecting a Research Field for IDRC-CPD

(1) It must be a research priority. Clearly all the research fields mentioned remain fertile ground for further research. The emphases given to each field, however vary by research institution, between Europe and North America, and between Canada and the TWCs. How are priorities perceived, and where do areas of neglect lie along the various research fields?

(2) CPD's support to this field will minimise duplication of research support and will preferably complement research support activities of others. Duplication and complementarities strongly apply to agencies with potentially the same research clientele. They apply, foremost, to the different divisions within IDRC and within CPD itself.

(3) Support to the research field will serve CPD's mandate to promote collaboration between Canadian researchers and research institutions and those in TWCS. This requires a strong Canadian research interest and capacity in the field selected. It also requires easily identifiable and organised counterpart research institutions in TWCs with whom Canadian researchers could be readily matched.

(4) Research support in the field can be effectively organised, administered and supervised by CPD. The staff involved must have the interest, experience, and professional qualifications to ably support this field. Recent research

support activities of the division would be a further indication of whether such interest and preparation exists.

No single research field can claim to best meet each of these criteria. What the criteria offer is a checklist against which we can systematically examine each field using the information from the previous chapters. We can then identify which of the fields appears most reasonably and logically to meet the combination of criteria involved.

Let us now consider each field and see what choice emerges. We preface our examination of each field with a reminder of the substance of that field. (See Table 7 for a summary breakdown of the shelter fields, how they compare against each criteria, and the selection this analysis leads us to.)

1. Shelter Policy

Policy analysis to establish the role of shelter relative to other sectors in promoting national development is an essential first step in defining a national shelter policy. Similarly policy analysis on the type of shelter programs and their right mix given the specific conditions of the country is essential to establish the framework within which the different shelter fields can be coordinated and detailed programs and projects for each field can be implemented. Such research sets the parameters for the whole shelter field.

Almost every major international shelter research and research support agency emphasizes the significance of such policy research. The World Bank and USAID, followed by UNCHS, place the most emphasis on this field (Table 1). Even those agencies inactive in policy research, accept its significance, while pleading they lack the research capacity or political clout to engage in such research and effectively influence national goverments.

The Urban Policy Program of IDRC supports such research activities. Of the 25 shelter policy studies supported by IDRC between 1980-85, 23 were supported by the Urban Policy Program (Table 2). Indeed the Urban Policy Program, to a great extent, serves as a Shelter Policy Program. Thus this research priority is currently being met within IDRC and within one identifiable part of it.

Canadian research interest and capacity is strong in this field (Table 4). Although it ranked third in terms of the number of Canadian institutions engaged in this field, the quality of research is high. Such policy research is relatively new in TWCs. Researchers are distributed in various universities and a few development (largely economic) research centres. Thus, although, collaboration between Canadian and Third World researchers is highly desirable to strengthen this field in TWCs, it is

difficult to mount. With fewer readily identifiable research centres focusing on this field, establishing counterparts relies heavily on the private networks of individual researchers.

CPD staff have an interest in policy research but less so in research to do with national shelter policy issues per se. Their experience and qualifications also do not concide directly with this field. Clearly promoting collaboration between Canadian and TWC researchers would be valuable, if problematic. But this is a problem for the Urban Policy Program to address. For CPD to do so would be inappropriate and a duplication of the Urban Program's activities.

2. Finance

Mobilising financial (and material) resources for adequate shelter is the primary task in achieving such shelter. Research on how these resources are mobilised at the level of the country, of specific institutions, and individuals; in the formal and informal sector, in public and private agencies, and how these processes can be improved to increase the resources mobilised, is an essential research task in the shelter field. It is a process that we perhaps know least about. And yet as mentioned it is perhaps the first task in the process of achieving adequate shelter.

Here, again, there is a consensus among most international agencies on the importance of research in shelter finance. Despite this consensus, there is perhaps less research in finance than in any other field in shelter. The World Bank and USAID define it as a major research focus. UNCHS considers it an important research area but has produced fewer publications in this field than in any of the others. Seven of the 12 major European agencies studied did not mention housing finance among the shelter fields they researched (Table 1). Apart from the building industry, finance was the focus of fewer international conferences than any other shelter field (Table 5).

None of the 53 Canadian organisations studied recorded housing finance as a focus of their research. It is likewise missing in the research supported by IDRC, at least in the last five years.

Here is a research field that appears to need strengthening among TWC researchers and among those in the West, including Canada. Thus while a program that attempts to do so is worthwhile, it could not be justified on the basis that it would provide useful Canadian research expertise in the service of strengthening that of TWCs.

Furthermore, housing finance is conventionally a wholly social science field. If there were a program in it, the appropriate division would be the Social Science Divison, probably as part of

the Urban Policy Program. Finally it appears neither an interest nor a strength of the CPD staff.

3. Land

Land is the single commodity in demand for all human activities. Competition among alternative uses is high, especially for urban land where the struggle for shelter by the poor is perhaps most intense. The urban poor needing proximity to employment often need land that has a high market value. How to allocate land efficiently and yet fairly such that the poor can be well-located is a major research question for which ready answers have yet to be found.

Classifying and recording the characteristics of land from its soil conditions to its current uses is invaluable for answering a wide range of shelter related questions: what soils are good for which building materials? who owns which parcel, of what market value? what is a fair property tax that the municipality can collect?

Research on land and land information issues is another recognised priority area. Once again the World Bank and USAID consider it a primary research focus. But for the international agencies in general it appears to have the same low priority as finance does despite its acknowledged importance (Table 1). Research and interest among TWCs appears equally lacking. Among the 48 international conferences on shelter and settlement held in the last two years, the majority in developing countries, only 21 percent focused on land (Table 5).

The need for strengthening this research area is apparent. Canada has a strong research capacity in this field especially on land information systems. Relative to the other fields however it ranks fourth in terms of the number of Canadian institutions with identified interest in it (Table 5). IDRC does have a modest activity in this field (six research projects, three by CPD, 7.1 percent of total shelter allocations, between 1980-85, Table 3 cell Q64). Although the Shelter and Settlements Section of CIDA spends no money on this activity, TWC governments' inability to obtain land was considered a major bottleneck inn projects.

If adequate interest could be generated, a program in this field may be justified. Such a program, however, would probably have to follow the current division of labour: Social Science supporting studies on land markets, taxation etc, and CPD focusing on the technical information studies and systems. The activities and interest as they are at present however, do not warrant a separately defined program.

4. Building Industry

If the production of shelter, infrastructure and services for the poor is to be regularised, the building industry needs to be organised to produce such goods efficiently, at low cost, and with enough profit margins to make it worthwhile for the industry. To define policies and programs for the coordinated and efficient functioning of the many actors in the industry: materials producers, producers of shelter components, suppliers and contractors, requires much research. This is especially so since many of these actors are in the informal, small-scale sector, a sector on which there is little information and for which especially sensitive research skills are required.

A fair number of international agencies, 11 out of the 18 studied, addressed these questions. The construction industry unit of the World Bank has produced a number of valuable studies, as have some universities, notably the Technology Adaption Program at the Massachusettes Institute of Technology. The complexity of the industry is such that research continues to be a priority. Third World countries acknowledge this need but tend to deal with these research questions as part of their much stronger interest in Building Materials and Technologies. Thus only 15 percent of the international shelter-related conferences held over the last two years focused on the construction industry, although the industry is a subject discussed in many of the conferences focusing on Materials and Technologies (Table 5).

Interest in IDRC on this subject appears to be weaker than in any of the other shelter research fields. Although some of the labour market and informal sector studies supported by the Social Science Division, may have touched on aspects of the building industry, only one research project focused on this field was supported over the last five years (Table 1). Canadian institutions do a fair amount of research on the building industry, but it is on the Canadian industry, the characteristics of which are very different from that in TWCs. Only one of the 53 institutions studied recorded an interest on the building industry in TWCs.

CPD staff with an engineering background have some preparation in this field, and some experience through their involvement in projects dealing with building materials and technologies. However, the interest is too indirect to mount a seperate program. Building industry issues may, and indeed should be addressed at least in part, through a program on Materials and Technologies, if such a program is adopted. Perhaps more problematic would be to identify appropriate Canadian research skills to strengthen Third World research capacity in the Building Industry field.

5. Materials and Technologies

How to identify, design, develop, and disseminate low-cost materials and technologies to reduce the cost of adequate and acceptable shelter? Addressing this question is perhaps the most direct and easily identifiable way of making shelter more affordable. It is important for all aspects of shelter: buildings as well as infrastructure and services, the construction of all of which rely on the same pool of materials and skills. And as one authority puts it:

> "Apart from land and basic services nothing could more rapidly and effectively improve living conditions than, steady, readily available supplies of cheap building materials". (Hardoy and Satterthwaite, 1981:258)

To address this question we need to conduct detailed research on how to identify cheaper materials, reduce the cost of materials extraction, and production, and design low-cost building technologies. Not least, it requires research on how economic, social and institutional factors can help or hinder the development and adoption of low-cost materials and technologies.

In part because of its obviously central role in achieving affordable shelter, and in part because it is among the more "doable" of the research fields, this subject has been given most importance relative to other fields. Materials and Technologies relative to other fields, was most often one of the focuses of the research groups in all the categories studied.

Sixteen of the 18 international agencies included it as a focus (Table 1). More Canadian institutions cited Materials and Technologies as a research area than any other field. (45 percent, Table 4). Canada's capacity to assist TWCs in this field is probably higher than this expressed interest. In addition to the direct research capacity in this field, Canada's excellent energy-research institutions could also contribute significantly through for example, helping develop low-energy alternatives to materials production. Energy is a major cost factor in materials production and supply.

Perhaps most significant it is by far the field with the greatest research interest and capacity among TWCs. The indicators are numerous.

More research centres in shelter and settlement planning in TWCs focus on Materials and Technologies than on any other aspect. Many TWCs have at least one such centre. Some have one for each province. Of the six directories of institutions in the area of human settlements, produced by UNCHS, the only research institutions included in the series were national organisations in construction materials and technologies in TWCs. (UNCHS, 1980). Close to 300 such institutions in TWCs are listed in the directory.

Despite all this attention and effort, few would claim that the research problem in this field has been satisfactorily addressed: that we now have developed materials and technologies that are adequate and affordable for the poor; and that the research problems now lie elsewhere.1/ This field remains a research priority. Again the indicators are numerous.

Over the last year UNCHS and UNIDO have collaborated on a major "Global Consultation on the Building Materials Industry" whose research agenda are: (1) development of the building materials industry, (2) strengthening indigenous technological capabilities, and (3) development of building materials production in the informal economy. The major action area in research selected for the 1987 International Year of Shelter for the Homeless is to "identify and test low-cost techniques for construction and upgrading of community services." Fifty-one percent of the papers to be presented in the shelter section of the forthcoming International Congress of the International Council for Building Research Studies, is on materials and technologies (the next most frequent field is housing policy with 30 percent of the papers).

In addition to the need for more research, is the need as mentioned, for a broader based research methodology; one that encompasses engineering, economic and social analysis. Such a methodology critically needs strengthening among TWC reseachers.

IDRC seems to have responded to the research interest and capacity among both Canadian and TWC researchers. Although Materials and Technologies has not been recognised as a distinct research field with a separate program in IDRC, over the last five years almost 36 percent of the total shelter-related research budget was allocated to this field (Infrastructure and Service was the only field which claimed a higher - 41 - percent. Table 3).

In recent years CPD has become more active in this field than any other division. In 1984-85, six of the eleven projects in this field were supported by CPD. CPD also spent a larger proportion of its total budget on this field than any other division (34.5 percent, see Table 3). In 1985-86 there are again six projects in this field supported by CPD.

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1 Although the Urban Projects Policy and Research Division do not include Materials and Technologies among their research fields, the field is included in the research agenda of other areas of the Bank: the Construction Industry Unit, for example. The importance of research into low-cost Materials and Technologies is also given prominence in the "Urban Edge", the Bank's widely read publication which reflects that institutions interests and activities.

The above suggests that the CPD staff have the interest and the experience to support such a field. The professional backgrounds - engineering and geology (Ottawa staff), economics and science and technology policy (regional staff) - also suggests that CPD staff have the traditional qualifications required for such a program (engineering and geology) ~~among the Ottawa staff),~~ and other qualifications to help make it more broad based in its approach (economics, and science and technology policy). ~~specialisations among its regional staff).~~

The two programs in CPD, Earth Sciences, and Technologies for Local Enterprises (TLEP), are complementary to the field of building materials and technologies. A knowledge in earth sciences is highly valuable to technological research on building materials based on inorganic matter. The activities of the TLEP program are highly complementary to research into the design of production technologies for low-cost materials. A program to support research into low-cost building materials and technologies could thus complement both the professional backgrounds of the CPD staff and the programs currently within it: more so than any of the other shelter research fields considered here.

However, given that these other sections of CPD and other divisions within IDRC also support materials and technology related projects (Agriculture, Food and Nutrition Science, for example) and presumably will continue to do so in aspects where their expertise clearly lie, the exact nature of the program in CPD will have to be carefully defined to avoid duplication and enhance complementarities. This and other issues that will need to be more carefully considered if CPD were to develop a program in this field, will be discussed in the last section.

5. Infrastructure and Services

Infrastructure and services - roads, water and waste systems, electricity, schools and health centres, etc. - provide the physical and social framework around and on which well-housed, well-educated, healthy and productive communities can develop. Infrastructure and services is also the one shelter component that cannot justifiably be left to the community and private sector to provide; its is a responsibility of the government. No single input, apart from land tenure more effectively stimulates the mobilisation of resources among the poor and their application in better shelter, than infrastructure and services.

The importance of infrastructure and services in stimulating and sustaining good shelter conditions, the scale of the task, and that it must, at least in the first instance, be borne by the government alone, makes this field an extremely significant one. Research into how government can meet this task, in an affordable fashion, raises questions of low-cost infrastructure materials and technologies, the most efficient mix and phasing of the

implementation of infrastruture and services, and not least, methods for cost-recovery acceptable and affordable to the low-income beneficiaries. Research to address such questions remains a major priority.

After Materials and Technologies, it was the field most frequently cited as a research interest by Canadian institutions (36 percent of them, Table 4). Fourteen of the 18 international agencies studied included it among their research focus.

Over the last five years, IDRC has funded more projects in this field than in any other shelter-related one (41 percent). The interest and research capacity of Canadian institutions is highest in this field (along with Materials and Technologies - Table 4). The interest in TWCs is also strong. Thirty percent of the international conferences on shelter and settlement in the last two years were on this field (third most important after Materials and technologies and Housing Policy, Table 5).

Considerable duplication with the existing research support activities of other divisions would result however, if CPD were to start a program in this field. By division, by far the greatest support now comes from the Health Sciences in the area of low-cost water and waste systems, (56 percent of the total number of projects in this field, claiming 60 percent of the total allocations to this field). Next is support from the Social Sciences Division, specifically the Urban Policy Program, largely through its support of research into the management of urban services and energy supply systems (33 percent of the projects, 24 percent of the budget of the funds, Table 3).

A small, yet significant area of research within this field remains neglected, that of access and drainage infrastructure - roads, pedestrian paths, drains, culverts, etc. Although the CPD staffs' engineering background would qualify them for supporting such research, it is too small an area to justify a program. It however remains an important neglect that perhaps could be rectified within the existing program structure; perhaps with the low-cost infrastructure materials and technologies, subsumed under a Materials and Technologies field.

6. Conclusion

Given the criteria for selecting a field for CPD to focus on and the information at hand on each of the shelter fields, Materials and Technologies emerges as the most appropriate candidate for consideration. It best combines the criteria such a field had to meet: a research priority; complementarities and minimum duplication with existing research support activities; the promotion of useful collaboration between Canadian and TWC researchers; and the interest, experience, and qualifications of CPD staff.

program should be. The program should be carefully designed around an appreciation of the question why with so much ongoing interest and attention in this field, the problem of affordable materials and technologies remain so intractable. Other issues, such as the clear division of responsibilities within this field to reduce duplication among the divisions currently active in the field, needs to also be built into the design of the program. Such considerations will be discussed in a preliminary fashion in the last section. A more thorough examination should follow a decision to implement a program in Building Materials, Materials Production and Building Technologies within the Cooperative Programs Division.

7. Researching Materials and Technologies: the Need for Careful Program Design

The effectiveness of a program to support research into Building Materials, Materials Production, and Building Technologies will depend heavily on how well the program has been designed. It will require a more precise definition of the research field, a judicious selection of the research priorities within this field, and the most effective research methodologies to address them. Not least, the success of the program will require the early identification of some of the problems and potentials that the program must from the outset, be prepared to confront, resolve, and build upon.

Some of the issues related to the above are discussed briefly here.

First, despite a large amount of research on construction materials and technologies, few innovations have emerged that have been widely applied to significantly reduce construction costs. The research program will have to define priority areas within the research field much more carefully than is typically done by many research institutes. Areas of research that most promise to lead to innovative, applicable results will have to be distinguished from others that amount to reinventing the wheel or have already led to fruitless cul de sacs.

Second, a more comprehensive research methodology should be encouraged: one that subjects the technology being considered not only to engineering analysis but also to economic (cost-benefit) evaluations while also confronting the issues of wider application and replicability by examining such factors as information dissemination, training, marketing, cultural and social acceptability, etc.

Not least researchers should be encouraged to consider how the wider policy framework will effect the adoption and spread of their innovations and what modifications are necessary and possible both in the technologies and in the policy framework if their proposed technologies are to succeed.

possible both in the technologies and in the policy framework if their proposed technologies are to succeed.

In sum, given the multifaceted nature of this field, effective research requires an interdisciplinary approach.

The engineering backgrounds of the program officers are complemented by their awareness of some of the above issues. This awareness and the ability to respond adequately seems evident from how they have shaped some of the more recent research projects to address wider issues. In addition, the economics and science and technology policy backgrounds of CPDs regional staff should be applied in guiding the selection and shaping of research projects. The precedent of closely involving regional staff in such a manner is well established. Much of the timber research undertaken by AFNS for example, in part drew on the expertise of their regional officers.

Careful attention needs to be paid to the issue of avoiding duplication and enhancing complementarities. Currently several divisions of IDRC are involved in supporting research related to building materials and technologies (see Table 3 for the shelter research fields that IDRC divisions are involved in). The Agriculture, Food and Nutrition Science Division, for example, is nearing completion of a long successful research program in timber technology. Even within CPD, the Earth Sciences section is supporting research into developing stone as a building material. The relationship between the Materials and Technologies program within CPD and such activities in other sections needs to be clarified. The program needs to be designed to build on the complementarities and reduce duplication, confusion and conflicts.

Certain promising areas of research within the field that are often overlooked and neglected may be identified and encouraged. For example, much less research appears to have been done on materials production and appropriate building technologies in small towns and rural areas than in the large cities. This is so despite the fact that many leading authorities argue that housing conditions in rural areas are worse than in urban areas. This is so despite the fact that the raw material and materials production sources of many low-cost construction technologies are in the rural areas. A rural emphasis in the program may not only help correct this imbalance in research but also align the program more closely to IDRC's overall mandate to assist the rural population.

Finally, and perhaps most important, if useful research collaboration between Canadians and their Third World counterparts, is to be sustained, careful thought must be given to the institutional mechanisms necessary to encourage and maintain such collaboration. In chapter three we suggested how the current lack of such mechanisms dilutes the not inconsiderable research strengths that Canada has. The sum of the

research strengths now appear weaker than their parts. IDRC without appearing to do so, is investing quite substantially in shelter research. To make this investment more effective, it should examine ways and means of strengthening the research infrastructure and interinstitutional linkages such that each researchers' capacity is enhanced, and such that each Canadian researcher is better able to help strengthen the indigenous research capacity of the Third World.

Clearly, this is an issue that spans all the shelter research fields and indeed, all research in Canada and in the Third World. But here again a modest start can be made by first thinking such questions through in designing the program for CPD.

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TABLES AND FIGURES