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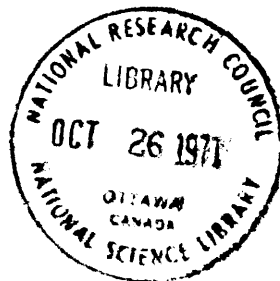
September 1971
Report No. 14

Cities for
Tomorrow

Some Applications of
Science and Technology to
Urban Development

Cities for Tomorrow

Some Applications of
Science and Technology to
Urban Development



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Catalogue No. SS22-1971 /14

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Information Canada

Ottawa, 1971

Design: Gottschalk+Ash Ltd.

September, 1971

The Right Hon. Pierre Elliott Trudeau,
P.C., M.P.
Prime Minister of Canada,
House of Commons,
Ottawa 4, Ontario.

Dear Mr. Prime Minister,

In accordance with sections eleven and thirteen of the Science Council Act, I take pleasure in forwarding to you the views and recommendations of the Council as they concern policies for the development of Canada's urban areas, in the form of a report entitled "Cities for Tomorrow: Some Applications of Science and Technology to Urban Development".

You will note that this report is prefaced by a letter addressed to me by the Chairman of the Science Council's Committee on Urban Development, in which Dr. Pierre Dansereau sets forth his personal views on the background of this report and the social environment to which it is addressed.

This report was drafted prior to the establishment of the new Ministry of State for Urban Affairs. It deals primarily with the need for long-range systematic planning to deal with Canada's urban problems, and makes a number of suggestions for development of policies and institutions to facilitate the application of new and useful analytical techniques to the problems of Canada's cities. Because of the orientation to persistent long-range problems and the role of science and technology in grappling with them, it is our belief that these recommendations should be fully compatible with both the reorganization of responsibilities in the urban area at the federal level and the most recent developments in relations among levels of government in Canada.

Yours sincerely,

O.M. Solandt,
Chairman,
Science Council of Canada.

Montréal
June 20, 1971

O.M. Solandt,
Chairman,
Science Council of Canada

Dear Dr. Solandt:

You will find herewith an account of the work accomplished by the Science Council's Committee on Urban Development. When you first proposed that I assume the chairmanship of this committee, I raised the objections that I was unsure of my competence and that I had some reservations about the Science Council's relevance to this task.

As you were able to persuade me of the appropriateness of this undertaking, I have had no thought of turning back. My misgivings, however, have stood me in good stead, as I hope I have steered a prudent course and have not engaged the Science Council in a thankless inquiry lying too far beyond its proper scope.

My reticence was due to the fact that I am not an urbanist, although, at the time, I was teaching in the Institut d'Urbanisme of the University of Montréal. (I wonder if knowledge by association is assumed as readily as guilt by association.) It was also based on the fact that the Science Council has only one social scientist in its membership.

Urban development is a process that carries a heavy scientific and technological load, but in which all the levers are of a socio-economic nature. I felt that all the scientific problems were, in a sense, interior to political and social issues. I was afraid that we might not be able to embrace the whole urban prospect, and therefore must fail to locate the points of scientific and technological impact which we are particularly competent to analyze and to forecast. I definitely could not accept the idea that we should settle for pinpointed studies in pollution, construction materials, communication techniques, or other such evidently material issues.

It was quite clear that we had to make two different, and properly complemen-

tary, contributions: a *conspectus* of the whole, and a sharply focussed *assessment* of some crucial areas. This is what you will actually find in the present report. It may be of interest to retrace the path which led us to this design and to highlight the main complexities of urban problems.

You will find that the thread of human values is woven throughout this report. Although we early gave up the attempt of a frontal attack on *quality of environment*, an ecological preoccupation pervades our whole study.

It is not likely that the values of the Canadian people will continue to be what they have been in the fifties and sixties. In fact, twenty years after the end of World War II, a rather sudden shift has occurred in Canada, as in the rest of the world. In some ways Canada may be ahead; in some ways Canada may have a better opportunity to experiment with the new values.

Release from the pressure of war resulted in a great drive for internal growth. Education, the arts and sciences, building, industrialization and urbanization, and, finally, communications were the objects of hopefully unlimited development. In the minds of many, Growth and Development became an end in itself, and many sectors of the national economy set their sights on very ambitious goals. But the brakes are on, at this time when even the Chambers of Commerce are beginning to have doubts.

We can well be appalled when we look back upon the two decades 1945-1965 and witness the compounding of professional privilege (from the surgeons to the plumbers), the overwhelming waves of compelling commercialism, the stereotyping of educational practices (from kindergarten to graduate school), the disorderly sprawl of our urban growth, the choking wastes of industrial production, the uniformity of dress, housing, and habits of our people, and the defacement of our landscapes. We must have implicitly accepted all of these disharmonies as the consequences of our unprecedented prosperity, and as a ran-

som of our pride in a high standard of living and a rapidly increasing Gross National Product.

Was it approximately 1965 when the tide was seen to turn? It was about that time that many things seemed to happen at once, or more exactly, that a certain form of global thinking and action emerged. Revolt against the dogmatism and formalism of the churches, a break with bourgeois sexual and family morality, awakening of the young to political responsibility, rejection of a consumer-oriented way of life, support for individual and collective civil rights and for social participation—all had emerged publicly very long ago. Many “causes célèbres” (Sacco-Vanzetti, Monkey Trial, “Lady Chatterley’s Lover”, the Rosenbergs) had foreshadowed the debates that were eventually to involve legislative reforms, and therefore public consent.

What seems to have emerged in the mid-sixties is a realization of the interdependence of social malfunctions. The waging of an unjust war was related to racial discrimination and to economic oppression. In turn, sexual liberation was tied to broader issues in the political context. Thus, with or without benefit of Marxian dogmatic simplifications or anti-Christian reductionisms, the whole socioeconomic model was contested, and a shattering process was spontaneously triggered in all quarters, as though in answer to Omar Khayyam’s exhortation:

Ah Love, could you and I with him conspire

To grasp this sorry Scheme of Things entire

Would not we shatter it to bits—and then
Re-mould it nearer to the Heart’s Desire!

And so it comes about that the heart’s desire is a larger component to be fed into the economist’s and the politician’s computer, a social lever strong enough to burn cities, to take revenge upon the mighty, and to turn down the benefits of technological living.

The disorder that menaces our world at

this time is due essentially to the unshackling of the forces that had fairly kept human society in gear since the beginning of the Industrial Revolution. Because social progress has long been out of step with economic progress, because civil legislation and constitutional law have lagged too far behind esthetic and ethical breakthroughs, mechanisms inadequate to meet rising expectations have been built into our social structure, and all kinds of foreseeable accidents have cancelled out the benefits of an increasingly sophisticated technology.

The "literature" (literary, economic, social and scientific) of the modern city is varied, abundant, and revealing; the theatre, cinema, painting, sculpture, and music have celebrated and damned it—often in the same breath. Whole nations, however—in spite of the Haussmanns, the Olmstedes, the Geddeses, the Fullers, the Mumfords, the Doxiadis—have failed to curb and to direct industrialization and urbanization, and have eventually accepted ugliness, noise, waste accumulation, pollution as a sort of necessary evil.

But recently the alarm has sounded loud and clear. Spoilage of landscape, radiation fallout, pollution, were seen to lead to an eco-catastrophe potentially as ravishing as war itself. The suffocation of London, Tokyo and New York was a step towards suicide that had to be checked.

Of course, a start has been made: purification of water, abatement of noise, fume-reducing gadgets, disposal of waste at sea, storing of nuclear rubbish underground, etc. And each problem solved creates new problems, sometimes more severe than ever.

The Science Council Committee, composed as it was of experts whose centres of operation were esthetic, social, economic and political, as well as technical and scientific, was at some pains to keep this historical perspective in view and to achieve a minimum consensus on the relative weight of the issues. It was tempted to concentrate its thinking on the future and to project the whole urban

problem upon the "new city". But this prospect was abandoned for the good reason that it threatened an over-extension of the joint competence of its members and of the very mission of the Science Council itself. Although utopia is no longer a derisive term and, indeed, futurism is fashionable, we chose to adhere more closely to the realities of the day.

It was felt that the generalist's (or "totalist's") approach would be satisfied by a recommendation for a permanent study. We were able only to outline the design of this study, where "everything relates to everything" (it is tempting to say this with an Irish accent). This frustration of the engineer and of the planner should be the ecologist's challenge. And so it is. The identification of all significant parameters is the ecologist's detective job. This first step is one of great magnitude and it turned out that our Committee could not well undertake it. For this reason, the idea of "a major program" was abandoned by the Science Council Committee.

I hope we have not succumbed to the naïveté of compulsive sophistication by putting our faith in systems analysis. However, at a time when musicians and biblical scholars are learning to test their knowledge and to extend their powers of perception by seeking the help of computers, maybe scientists and technologists are not too far out in their "great expectations". There are many apprentice-sorcerers among us, and the presumptions of some of the high priests of gadgetry can still do a great deal of harm. But surely it is the scientist's mission to use more and better technology, not less.

To use it well, and place man at the centre, is also our responsibility. As scientists we bear some guilt for not having reached out to the human predicament by devising better tools for apprehending yearnings, suffering, cultural and personal imagery, and other pressures that mould society as much as thirst, hunger, and sexual drive. The urgings of Jeremy Bentham, no less than the enlightenment of Charles Darwin and his twentieth century disciples, should have led us earlier to a

better synthesis of research and development through the pursuit of a more lucid motivation and a better-controlled technological and economic instrumentation.

It should give the scientific community of Canada singular pride if it were capable of persuading the various levels of government to adopt our first two resolutions and set the co-ordinated manpower required to the business of recording, forecasting and planning the design, the re-shaping and the development of our urban environment. This is a redoubtable assignment in two ways. First: Do we have the competent staff? I think we do. Second: Can we achieve the proposed goals within the present socio-economic system as it stands? I think we cannot, but I see many signs of the coming acceptance of a more austere (less consumer-oriented) way of life. The emerging new ethic, if it has placed man in the centre, has also displaced the value of individual salvation with that of collective salvation.

This greater preoccupation with participation and with the variety inherent in human relationships offers the strongest possible bolster to the planning of the environment—to the *place* of living as well as to the *style* of living. A new balance between economic and spatial design begs to be achieved.

Thus *diversity* and *choice* become the key words in this modest contribution to urban development. *Transportation, housing, re-cycling of waste and communications between citizen and government* are tied together by these central preoccupations. Freedom to live and to work in congenial habitats with congenial people is now the lot of the "happy few". Unregulated urban transportation, poor housing opportunities, the obnoxiousness of pollution and waste disposal, as well as faulty information, are cornering the Canadian city-dweller into growing frustration at this high tide of national wealth.

We have tried to probe some of the neuralgic points of the related crises in the urban anatomy. We are bound to conclude that the best thinking of our scientists and the full knowledge and skill of

our technologists will continue to misfire if we find no better way of encompassing the urban environment as a whole, and if our national purposes cannot be more clearly geared to a goal higher than mere economic growth.

As I find myself about to express strong opinions on birth control, on reduction of private transport, on the re-orientation of research, on the appalling uniformity of housing, on the urgency of getting along with the cybernetic revolution, I fear exceeding my present mandate. I am bound however to say that my experience of the last three years in Canada especially within the mission of the Federal Task Force on Housing and Urban Development (1968-69) and as chairman of the present Committee, has led me to the conclusion that there is a very high price to pay for environmental reform. I hope the present contribution, fragmentary and modest as it is, provides some of the arguments and proposes some of the implementations that will convince Canadians that no price is too high.

I think I express the considered opinion of the members of this Committee in saying this.

I must thank each and every one of them for the hard work and solid thinking they have provided. Dr. Dirk Maasland bore the greater part of the burden, cheerfully at all times. Dr. W.L. Sauer was very helpful in the initial phase, and Dr. Saul N. Silverman steered the report to its finish.

Yours sincerely,

Pierre Dansereau,
Chairman,
Committee on Urban Development,
Science Council of Canada.

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Recommendations

The Science Council recommends that:

1. The use of sophisticated systems techniques and simulation models should be incorporated in the planning efforts of all urban regions and of all provinces in Canada. In the early stages of implementation, the costs of such programs should be borne largely by the federal government; however, provision should be made to shift to a more equitable cost-sharing arrangement, involving all levels of government, once any of these programs has been in effect for a period of time sufficient to generate demonstrable benefits in the urban policy process.

2. A National Institute for Urban Analysis be established, involving all levels of government as well as groups outside the public sector.

3. A program emphasizing public transportation be initiated, with the aim of:

- a) increasing the efficiency of existing transportation facilities;
- b) developing and applying advanced urban planning techniques to ensure transportation-land use compatibility;
- c) developing new transportation technology.

4. The federal and provincial governments embark upon a co-operative program to fund experimental programs and demonstration projects in urban transportation.

5. A program of widespread experimentation be encouraged to make our communities more livable, and that experimentation set in motion be monitored.

6. The governments concerned make greater use of public ownership of urban and expansion-area land in order to counter the harmful effects of speculation and to ensure the freedom of planning necessary for the orderly development of new cities.

7. Governments give urgent attention to the construction industry's fragmentation, under-capitalization, inadequate economies of scale, seasonality, hazardous work conditions, and lack of effective utilization of highly qualified manpower in adequate

numbers. Construction is virtually a non-industry, characterized by a tendency to emphasize high-unit-profit production rather than volume production; in part this stems from a desire to offset the high degree of financial risk arising from the unevenness of financial flows in the housing and other construction areas. The use of housing as an economic regulator, in accordance with the dictates of counter-cyclical monetary and fiscal policy, tends to be a major factor that exacerbates these unwanted tendencies in the construction industry. Other factors are the multiplicity of local codes and local enforcement, inadequate criteria and strategies for land deployment, and the fragmentation of labour into craft-oriented unions. If governments desire a significant improvement in housing, policies that reinforce the non-industrial nature of activity in this field should be dropped or modified, and other policies to encourage industrialization should be promoted. Only in this way will existing science and technology be given a chance to have an impact on the housing field.

8. A detailed study of waste recycling and disposal be given the highest possible priority, either in the program of the proposed National Institute for Urban Analysis or on the part of such new urban and environmental agencies as are being created by the federal and provincial governments.

9. The different levels of government initiate the funding of an independent network of information bureaus. The functions of the bureaus will be to provide the citizen with access to required government programs, and to provide governments with feed-back on the adequacy of government programs. The immediate objective is to establish a number of pilot projects in the five major regions of Canada, and the ultimate goal, a national network of information bureaus.

Introduction

The history of mankind is, to a considerable extent, the history of how man came to live in cities and of his subsequent activities within an urban environment. Yet the city has always posed a difficult problem to those whose concern it is to assess the human experience. Our bias toward rating the urban experience rather highly is reflected in our vocabulary: "politics", "urbanity", and "civilization" itself, are words that stem from man's self-esteem as a creature who came to dwell in cities. Throughout history, however, there have been those who have questioned the quality of life that is possible in the urban context. "Cities are the abyss of the human species", wrote Rousseau, in 1762. "At the end of a few generations in them races perish or degenerate, and it is necessary to renew them". Today, there are not a few people who would agree with Rousseau, and many more who, while disagreeing with the depths of his pessimism, see the urgent need for renewal in more than the bricks-and-mortars-and-Civic-Centres sense. Yet the path which Rousseau prescribed for periodic renewal ("the renewal always comes from the countryside") is no longer open as an option. Rural depopulation over the past number of generations—the flight from the land to the city—is itself symptomatic of urban formation and growth, the indicators of which have been the attracting inwards of population to major centres at the same time as has occurred an outward-reaching territorial imperialism of the city against the surrounding hinterland.

Statistics¹ indicating the trends in Canadian urban development have become part of the common coin of social and political dialogue in the last few years. In this century—and particularly in the last 25 years—Canada has been one of the most rapidly urbanizing countries among those in the "highly developed" category. We are now one of the most highly urbanized countries in the world. Though our land mass of 3.5 million square miles (3.8 million

square miles counting fresh water area) ranks next to that of the Union of Soviet Socialist Republics as the most extensive of any country in the world, almost 75 per cent of Canada's population now lives and works in urban areas that occupy less than 1 per cent of our total land area. The rate of growth of urban population is expected to fall somewhat during the next decade, but the major trend will continue to be significant. According to projections of the Economic Council of Canada, by 1980 over 80 per cent of our anticipated population of 25 million will be urban. In the two decades, 1961-1980, approximately 11 more cities will have become "large cities" of 100 000 people or more. Thus it is anticipated that, by 1980, some 60 per cent of the total population of Canada will be concentrated in approximately 29 urban complexes, each with a population of 100 000 or over.

It is obvious that ours is an urban-centred economy. Just how great this shift has been since the enactment of the British North America Act, which still provides the basic framework into which the cities fit, is indicated by the following data: in 1870, about one-half of Canada's economic output (on the basis of esti-

¹A number of problems arise when dealing with statistics having to do with urban and metropolitan areas. It should be noted that *the statistics given here are for illustrative purposes only*; they are indicative of the kind of data that tend to be used in the current urban debate, and are not in themselves a basis for the Science Council's deliberations and recommendations. Accordingly, these statistics have not been reduced to a common base, but are presented as derived from the original sources (principally, various publications of the Dominion Bureau of Statistics, the Fifth and Sixth Annual Reviews of the Economic Council of Canada, and the Report of the Manitoba Commission on Targets for Economic Development—which includes material on Canada as a whole, as well as on Manitoba). Agreement on a standard base and terminology for development of urban statistics would certainly simplify discussion of this problem.

Another point which has been raised in discussion of data on urban problems has to do with the degree to which our thinking on urban policy is in itself bound within the limits of statistical extrapolation. Extrapolations tend to imply a deterministic course of urban development, relatively unaffected by changes in policy. This question of developmental determinism is touched upon in part of Chapter I of this report.

mates of final demand) was in the primary sector of the economy; by the late 1960s, over 85 per cent of a vastly expanded output was in the industrial and service sectors. While the division of the economy into sectors is not fully compatible with the geographic breakdown into urban-rural, these data do indicate the dimensions of the shift to an urban-centred economy.

Almost every aspect of our urban study raised questions of jurisdictions and of the underlying socio-economic, political and cultural aspects of contemporary life. One may start with the desire to examine the ways in which science and technology may contribute to the development of a better way of life in our cities. But one soon discovers that, for science and technology to relate meaningfully to urban policy, one must move beyond consideration of their possible role to discussion of a variety of impediments to their utilization. One of these is the constitution itself. Can a jurisdictional system based on the perceived realities of the 1860s provide the framework for dealing with the problems of the 1970s? With greater jurisdictional flexibility, the policy mechanisms at the municipal and regional levels could be allowed more adequate communication with the provincial and federal institutions that are evolving to cope with urban problems. There are some signs that these institutional problems are being faced. Establishment of a Ministry of State for Urban Affairs is a promising step forward at the federal government level. Urban affairs are being discussed in the context of the multi-faceted review of the Constitution. But we should take care that whatever new arrangements may be evolved will not be so rigorous in their definition and application as to create new kinds of problems for the Canadian cities of the 1980s, 1990s, and beyond.

Because of the relatively less significant role of the cities a hundred years ago, it seemed natural that, together with their constitutional status as creatures of the provinces, their administrative and fiscal capabilities would also be restricted. To-

day, the Canadian Federation of Mayors and Municipalities states that "the municipalities continue to be charged with the responsibility for achieving a variety of goals in our society, but they are given neither the institutional ability, nor the legislative means, nor the policy directives, nor the taxing authority, nor the revenue needs to satisfactorily discharge these responsibilities".²

The main *direct* source of taxation for municipalities is the tax on real property. It is not our purpose to comment in detail on taxation. However, the inelasticity of the property tax base constrains urban policy, in its relation to science and technology, in a number of ways. The general case for tax reform in this regard was well articulated by the Honourable Mitchell Sharp, in an address of April 24, 1967, while he was still Minister of Finance:

"I am told that in Canada real property taxes are probably higher in proportion to income than in any other advanced country. The needs of municipalities—and school authorities—have caused this tax to be used to collect a total revenue nearly as much as that yielded by the corporate income tax—or about one-half as much as that yielded by the personal income tax. Yet the Carter Commission confirms what we have previously believed, that this tax is regressive, leaning heavily upon the poor....

"Efforts are being made to finance from other sources, chiefly provincial revenues, some public expenditures such as education which would otherwise be met from real property revenues. I have no doubt this trend will continue, bringing a more equitable distribution of the total tax burden. But it would take a strong optimist to believe that this shift will be rapid enough to reduce substantially the general scale of the property tax....

"...Our property taxes in Canada fall to a large extent upon the improvements put on the land rather than on the value

²Canadian Federation of Mayors and Municipalities, Submission to the Government of Canada, April 21, 1969, p. 2.

of the land itself. Along with other influences, they make houses and apartments cost too much. I believe we cannot fully solve our housing problems, which are serious, until we can improve the financing of municipalities as well as the effective control and planning of land use.”

These remarks have not diminished in significance in the intervening four years. The general structure of municipal taxation, and its place within the context of the demand on sources of revenue at all levels of government, is a question that is beyond the scope of this report—though obviously, like the general jurisdictional question, it constitutes a basic constraint on the ability to carry out urban development along lines determined by analyses of the conditions of the cities per se. The Science Council can only hope that constitutional and other discussions having to do with the interplay among levels of government will have the effect, in good time, of reducing fiscal and jurisdictional impediments to innovation aimed at improving the quality of urban life.

However, we would be remiss if we did not at least point out some ways in which the inadequacies of municipal taxation as it now exists *directly* affect, in a negative fashion, the application of science and technology to urban development. First, there are instances, such as in land utilization policy, in which the tax system is a link in a chain of decisions that leads to adopting policies that work against the effective use of technologically-based efficiencies—for example, those that could help in keeping down the cost of housing. Another way in which the taxation base plays a role is in considering whether to apply technology-intensive urban policies (e.g. in mass transportation) which would require that public authorities raise considerable investment money. Finally, given the inelasticity of the urban tax base, few governments are likely to undertake the development—out of their own funds—of sophisticated research and analysis services aimed at the long-run improvement of municipal public policy.

Having recognized that the urban arena is and will be a central focus of national activity, including scientific and technological activity, how do we begin to make meaningful assessments of needs and priorities, particularly when the complexities of the urban situation are as broad as those of the whole society? At one level of analysis, we are dealing with philosophical and psychological questions intrinsic to the human condition: the search for greater “quality of life”, both as an objective reality and as a concept perceived and sensed by highly subjective human beings. We must recognize as a datum the pressure and strains of urban life, and the phenomenon of alienation—particularly among the poor and the young, but also, increasingly, among some sections of the middle-class tax-paying population—even if these phenomena are hard to grapple with according to relatively objective conventional analytical techniques. Perceptions and expectations are quite important. They must be given considerable weight in the policy process. It may be that certain results cannot be fully achieved by tangible policies because such perceptions are distorted or because expectations are pitched too high, on the part of the population as a whole or of significant sectors thereof. Improved communication between decision-makers and the population (two-way communication) may help to adjust the balance between objective reality and subjective perceptions. But, in the end, it may be necessary to accept that certain dimensions of a human problem are associated with the nature of the human being himself and cannot be fully resolved by recourse to public policy.

Other dimensions of the problem are more tangible. If our cities continue to grow, are we going to have to accept an intensification of present urban transportation difficulties, or can we do something about them? Can better housing be provided for Canadians within the urban context? What about the social-economic and cultural quality of Canadian urban life? What about the special ecological

eatures of the city—something that many of us have lost sight of in our legitimate ecological concern for the future of our fields and forests and streams? How do these and other features come together to produce the complex whole that we call urbanism? How can we comprehend this whole? Do new analytical tools exist that can help us understand the complex social system that is the city? If so, how can such tools be brought to bear in such a way as to assist the urban policy-maker? Going beyond the present urban situation, how can possibilities for new experimental modes of “urban” living be explored?

Naturally, the central concern and mandate of the Science Council is for the role of science and technology in the urban process. The report will indicate certain areas in which “science and technology”, even in the more precise sense, can be applied to certain problems. However, we also have to consider science and technology in a broader sense: *as an arsenal of analytical methods and approaches*, including those of the behavioural and social sciences, which are part of a multidisciplinary effort to encompass and understand complex problems of social reality, as an aid to decision-makers.

The literature of urban development is far-ranging, and reflects a variety of both professional and value orientations. In the last decade or so, many of the existing orientations reflected in urban policy have come to be questioned. Emphasis has been shifting from concern with the external environment, which is properly the focal point for an architectural and engineering approach, to inclusion of these approaches within what might be called an “organic” or “internal” approach to urban problems. Life-styles and social and psychological aspects of living within a city are factors increasingly reflected in the literature; these, however, are less easy to study from the point of view of public policy. Conflicts arise as to how to bring such considerations within the framework of decision-making, and such conflicts almost inevitably reflect the normative values of those engaged in the

dialogue on urban policy. Implicit in discussions as to what is feasible are value-decisions, whether explicit or hidden, as to what is *desirable*. We must recognize, accordingly, that future-oriented approaches to the city combine relatively objective projections of trends and analysis of policy-options with normative—and somewhat subjective—postulating of objectives.

It is impossible to summarize even the range of leading ideas on our urban future. The dean of contemporary students of the problem, Lewis Mumford, has clearly indicated his own preferences. As early as 1940, in *Faith for Living*, he stressed that, in his view, “man’s chief purpose...is the creation and preservation of values; that is what gives meaning to our civilization....” Accordingly, his approach has been less to the city *per se* than to the city as a setting for the value-oriented human community. “The fundamental values of a community”, he wrote, “are...in the pursuit of non-utilitarian activities”, and he pleaded for an end to “the segregation of the spiritual life from the practical life...a curse that falls impartially upon both sides of our existence”. Even those who agree with Mumford’s values—which seem, to some, to slight the work-a-day existence of most of the world’s inhabitants—have, at times, questioned their relationship to his more specifically urban-oriented writings. Thus, in *The City in History* (1961), Mumford elaborated his thesis on the obsolescence of the contemporary city as a setting within which such values could be attained; he argued for a process of planned decentralization whereby a substitute for today’s city might eventually be found.

In the same year, Jane Jacobs launched a powerful counter-argument: in her view, emphasis on decentralization, and on the notion of the good life within small specially-planned communities, contributed to an oversimplified approach to, or a neglect of, the problems and the possibilities of the central city. Those who were most in need of intelligently-applied public policy for urban development were,

precisely, the dwellers in the central city, who had little possibility of moving out to garden suburbs and whose immediate needs were inextricably connected with the economic life of the large urban area. In her view, the vitality—however unplanned or even disorderly it might appear to be—that was inherent in the central city should be capitalized upon, rather than planned away. Neighbourhoods on a human scale should be encouraged within this central core, and (to borrow from the words of another student of the problem, Martin Anderson), the bulldozer should not be considered the main weapon at the disposal of those concerned with urban renewal.

The work of Jay Forrester, who has come to urban studies via his work on computers, systems analysis, and industrial methods engineering, takes a somewhat different tack. Forrester's studies (reflected in Chapter I of this report) stress the need to use systems analysis to get some analytical control over the variety of inputs, outputs, and unforeseen consequences of the dynamics, planned and otherwise, of the urban development process. Dr. Forrester's contribution to our study was a significant one; however, there has been some debate as to whether he might not represent the more mechanistic end of the continuum of approaches to urban policy. His general approach to analysis was in fact accepted, although some of the more specific proposals contained in his analysis have been treated with some reservations. Yet the conclusions stemming from Forrester's analysis seemed to converge with the findings—from another analytical approach—of one of our other consultants, Mr. Neal A. Irwin. In a somewhat more normative, future-oriented precis of what the Canadian city of the late 20th century might look like (prepared as a basis for his recommendations on transportation), Mr. Irwin suggested that our cities would be diverse, and would move away from the pattern of rather uniform development along arterial roads. "Rather", he wrote, cities would come to "be made up of mo-

saics of smaller residential communities and nuclei of employment, commerce, education and recreational 'activity centres'..."

How do we get to the stage where we can begin to choose meaningfully among options, or at least to consciously affect the direction taken by the urban system, rather than follow in the wake of the in-built dynamics of the present system? A miniscule sampling of some of the orientations that it is possible to follow has already been given. The greater the variety of approaches, the more interesting is the debate, and debate is certainly *part* of the process of formulating policy. But debate is *not* in itself policy-formulation. At some stage, people have to choose among options, and among values, synthesizing some and casting aside others. How? It will be noted that this report, in its first chapter, suggests considerable exploration of the use of systems analysis and related techniques as part of the urban policy process at all levels. At this point we would simply suggest that systems analysis is not a magic wand which, waved over a problem, automatically produces a solution. **What systems analysis, properly utilized, can do** is to clarify the options available, simulate the outcomes of optional policies applied under a variety of conditions, and clarify the value choices that still have to be made. Systems analysis is not a substitute for the decision-maker in the urban field or in any other field. Rather, it is an aid to the decision-maker and enables him to focus more consciously on a prime aspect of his job: to act as the lens through which the values of society are focussed on a problem, and to choose among values, and among means by which values can be operationally applied.

In considering its approach to urban development, the Science Council bore in mind the orientation outlined in its own Report No. 4 (*Towards a National Science Policy for Canada*, October, 1968):

"The greatest concern of the Science Council is to see that the growth of science

and technology in Canada is channelled in appropriate degree towards specific broad objectives as they are defined. To permit this channelling it is proposed that most new undertakings in Canadian science be organized as large, multidisciplinary, mission-oriented projects having as a goal the solution of some important economic or social problem and in which all sectors of the scientific community must participate on an equal footing. This report refers to these initiatives as major programs."

In these words the Science Council of Canada introduced the concept of Major Programs in October 1968. Since that time the concept has been refined. The Science Council believes now that the objective of any Major Program must satisfy the following criteria:

1. The objective must present a real challenge to the technology. It must be so far out that it cannot be attained by simple extrapolations or empirical improvements in the state-of-the-art; yet it must not be so far out that there is no hope of measurably approaching the objective in one man's lifetime.

2. The challenge presented must involve technology over a broad front. This is so that the probabilities will be high that the new ideas and expertise stimulated by the challenge will find useful application for other purposes also; in other words, the technological establishment that is built up will be adaptable to many tasks, and a generation of new commercial products will be one of them.

3. The program must be large—large enough that, over the broad technological front, the groups formed to attack the special problems will generally be of above-critical or viable size.

4. The objective must be made understandable to the public at large. Unless the objective is basically sound enough, sufficiently exciting to the public mind, and in the public interest, it will not continue to receive support over the long term; it will be subject to political ups and downs which will demoralize the personnel and destroy the efficiency of the

organization, and consequently the project will peter out in ineffectual misery.

The Major Program may be thought of as a four-stage process:

1. The initial identification of a subject area for further study.

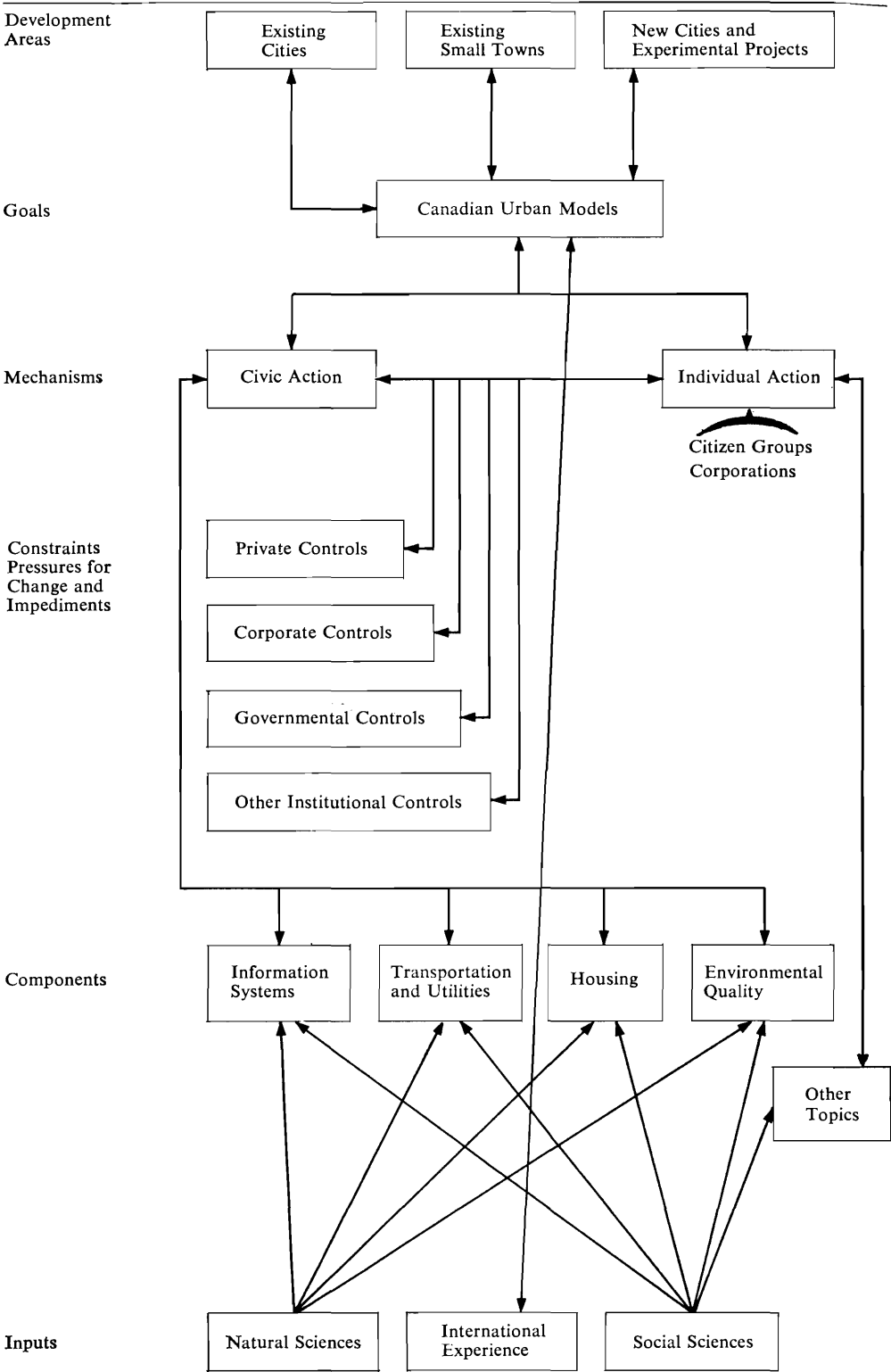
2. Further study by a group or task force with the aim of confirming or rejecting the subject area as suitable for designation as a Major Program.

3. Study of the subject area in considerably more detail, with the aim of identifying more precisely the projects which make up the total program, estimating the cost and time to completion of each project, and planning their implementation.

4. The implementation of the program.

From the beginning of its inquiry, the Science Council found that the magnitude and complexity of the urban development question posed particular difficulties of conceptualizing and operationalizing the "Major Program" concept outlined in Report No. 4. Some of the complexities of the urban development process, elaborated in the chapters that follow, are presented diagrammatically in Figure 1. In the light of these complexities, two approaches to a Science Council report on Urban Development ran through our deliberations. There were those who wished to centre the report on the systematic aspects of the city, together with such macro-problems as the total ecology of urban areas. It was felt that unless this "totalistic" approach were reflected in the report, we would continue to tackle urban problems piecemeal without affording full scope for the capabilities of science and technology, broadly conceived, to analyze, systematize, and synthesize in relation to the total policy process. At the same time, it was recognized that the danger in this approach was that it could lead to a report that would be too diffuse and that would delay action on immediate problem areas while a strategic plan for a long-range program was gestating. The merits of more specific approaches to a variety of programs in which science and technology could be applied—e.g. urban transportation, housing, information ser-

Figure 1-A Conceptual Diagram of the Urban Development Process



vices, and waste disposal and re-cycling—were recognized. Such programs would be “faster off the ground” than a broad attack on urban development. At the same time, their advantage also entailed a defect: they could result in a too narrow focus on the *components* of urban policy and an unfortunate delay in systematically approaching urban policy as a whole.

In the end, as will be evident to the readers of this report, the Science Council decided to bring together various aspects of urban policy, both those that reflect the total systems approach and those that stem from concern with specific areas of policy.

The Science Council has **concluded** that, in view of its magnitude and its multi-faceted nature, urban development does not lend itself at the present time to the kind of unified major program defined in Report No. 4. Rather, we may speak of **urban development as an area within which a number of programs are appropriate, some of which might become, in their own right, major programs** within the terms of the Science Council’s definition. At the same time, it is our hope that work along the lines indicated may contribute to the *ultimate* task of co-ordinating and rationalizing the way in which we deal with the urban milieu. The effort along these lines will have repercussions in many areas of policy and endeavour, some of which are not dealt with directly in this report. One such area, which should be singled out in view of our current concern with highly trained manpower, is that of education. If some of the proposals suggested in this report are, in fact, to be translated into policy over the next decade, it is clear that demands will be placed on our educational system to supply us with the men and women who are prepared to do the job that is required—often, with combinations of skills not presently available. A whole series of repercussions then follows, in terms of the way in which the governments, the public, and those within the educational institutions approach their responsibilities. The Science Council cannot, itself, follow up

these repercussions within the scope of its present study. It is with an awareness of the magnitude of the task that confronts the nation that it now presents its findings on some aspects of urban development in the 1970s, and the potential role of science and technology, broadly defined, in contributing to our response to the urban challenge.

Chapter I

The City as a System

The city is a total system. "Urban planners have been tormented by the realization that everything relates to everything." In this statement, Daniel P. Moynahan articulates the frustration felt by those engaged in governing, administering, or living in cities, when the systemic nature of the city—the relationship, for example, between work patterns, traffic, wastes, and urban sanitation—impinges on their everyday concerns.

Laws, regulations and beliefs combine to produce the pattern of a social system. The characteristics of the present system were formed through a process of responding sequentially to pressures as they arose. The tendency is to gravitate toward the most stable modes of behaviour, which tend to be the ones with a short time horizon, and policies aimed at short-term goals. The nature of the process must be understood; otherwise, a non-reversible sequence results which produces growing stress, conflict and futility. We must adopt more rational design procedures, procedures that take account of the interactions, and are geared toward the longer term.

But our present way of dealing with urban and other social systems is historically conditioned. Some have characterized this historical evolution as moving from an authoritarian structure, through a democratic-capitalist system, toward what might be called an administrative-socialist system. As part of this evolution, particularly in its most recent phases, a shift has occurred from emphasis on the individual as the mainspring of economic and social action to acceptance of rather considerable intervention by governments. Numerous, in part unexpected, by-products result from this process of intervention.

The first by-product is that the concept of "efficiency" is diluted because it is difficult, if not impossible, to make comparisons with competing organizations. While it is possible to compare, say, urban policies in State A with those of State B, too many cultural variables exist for one to have complete confidence that one has really assessed the comparative efficiencies

of one policy as opposed to another.

A second by-product may be restriction of choice on the part of the individual and limitation of the degree to which he can set his own priorities. The individual, provided with a range of government services, naturally attempts to maximize his benefits under the system. Claims which he supports in the area of public expenditure (e.g., for better schools, improved transportation, modernized police services, etc.) compete, via taxes and fiscal policies, with his own ability to maximize his consumption of those goods and services which remain in the private sector of the economy.

A third by-product, in this case more specifically related to growing complexity, is that quite often the consequences of new laws, policies, and programs will be quite different from what had been anticipated. "Better" highways are built to reduce travel time between two points. But "better" highways invite more intensive use. Travel time on clogged superhighways is not always reduced—at least not during rush hours. High land prices are used as an excuse for allowing higher buildings; competition for suitable sites for such buildings accelerates the rise in land prices. Welfare programs often do not alleviate the plight of the poor, but rather exacerbate, in both economic and human-relations terms, the problems of providing an environment in which all our citizens can live in human dignity.

A fourth characteristic—part by-product, part intermediate cause—is an emphasis on short-run considerations. Policies beneficial in the short run are often counter-productive in the long run. Extended periods during which short-term policies are strung together produce a burden of long-term impediments which is built into the system, and which no longer can be countered by short-term manipulation of policy.

In suggesting that there have been some undesirable and unintended by-products of the interventionist state, the Science Council does not advocate a return to a previous, more simple society that is be-

yond recall and that had its own very obvious disadvantages. Instead, we start from a clear recognition of the need to obtain a better understanding of our social system, an understanding that will allow us to *predict* more precisely the consequences and spill-overs of both public and private policies and actions.

Methodologies of systems analysis and design that will do just that are now becoming available. Elsewhere, the Science Council hopes to play its part in the exploration of the general utility to Canada of a variety of methods—systems analysis, social indicators, and others. In connection with its Urban Development Report, the Science Council commissioned two expert studies on the potential of systems analysis for urban policy. One was by Professors Holling and Goldberg of the University of British Columbia; the other by Professor Jay Forrester of Massachusetts Institute of Technology. From different points of departure, the two papers arrive at essentially similar findings.

Holling and Goldberg, in their report to the Science Council, approached the urban system in terms of four properties. First, urban systems not only respond to present events, but also show a historical quality. Secondly, they show a spatial interlocking property. Thirdly, by encompassing many components with complex feed-back interactions between them, they show a systems property. And finally, through the common appearance of lags, thresholds, and limits, they present distinctive structural properties. Therefore, the complexity of urban systems is characterized by the interactions among components and the historical, spatial and structural features of those interactions. The computer seems remarkably well suited to cope with the magnitude and complexity inherent in urban systems.

Forrester argues that "...in the past urban design has stressed architectural and geometric factors. It has not adequately dealt with the interacting dynamics of people, industry, housing, the aging of buildings, and the pressures for expansion. In short, our cities have not

been designed by city planners. What planner would lay claim to having designed the depressed areas now visible in many North American cities? At best, urban planners launch only the initial phase in a cascade of changes through which an urban area thereafter relentlessly falls."

Human psychology and the nature of our society have set in motion a self-directing system. We try to respond sequentially to short-term social pressures that develop. *But these are merely the symptoms of difficulty, and not levers through which the fundamental difficulty can be corrected.*

Seldom do we approach the true causes of difficulty; most programs, even our most "successful" ones, produce changes which generate new pressures. This merely shifts the symptoms of trouble to another point. The pattern of public reaction to one pressure after another is itself a social-system-design process. Cities that react in this manner are not working toward desirable goals. Unless the characteristics of complex systems become understood and recognized in city planning, cities will continue to fail to fulfill their potential.

Many cities have been developing master plans in volumes that describe goals for city X. In substance, these plans promise everyone more of everything, and better. Such goals are impossible. By attempting to do the impossible, by adopting policies that have the reverse of the intended effect, by seeking utopia with means that can produce disaster, frustration within urban systems is intensified as the urban environment worsens.

Current plans depend on huge infusions of money, beyond what is likely to be available, and thus they are not implemented, at least not without significant curtailment. But it is Forrester's contention (by no means universally accepted) that even *when* the current type of plans are implemented, they tend to be, intrinsically, dynamically unsound. Necessary negative counter-balances are not built into such plans to compensate for

side effects of proposed improvements. He argues that unless counter-balances are incorporated in systemic design from the start, implementation of a plan (the intent of which is to improve the urban system) can generate unwanted effects in a variety of unanticipated ways.

In our older cities, the consequences are evident of past generations of urban planners and decision-makers not having had the tools at their disposal to more fully understand the dynamics of complex social systems. Only recently have methods become available to aid in the understanding of social systems. It is time to enter a new phase in urban planning. Rather than deal with incremental changes and improvements, it is necessary to think of the urban system in its entirety and interrelate the major forces at work. This is within the range of present systems-modelling techniques.

City planning might well shift its emphasis to questions of equilibrium and continuous self-renewal, rather than stressing continuous growth. An urban area is a combination of physical design, legal and tax structures, and social forces; it is characterized by a delicate balance between pressures for growth and the forces that check the growth rate and density of both population and economic activity. Such an equilibrium is precarious. It can easily degenerate into systemic decay. The kind of equilibrium aimed at for a particular city should not only represent that which appears attractive to the particular mix of people for whom the city is designed, but must also include corresponding counter-balances. Only in this way will equilibrium be reasonably stable over time.

Different cities can have different styles and characteristics. These should emerge out of the needs and subjective perceptions of the people living within the city at a given point in time. An overly mechanistic view of urban development, which seems to imply that the people exist for the sake of the functioning of the system, is of course to be rejected. However, *systems analysis*, correctly applied, *can*

help those whose responsibility it is to make the decisions and clarify the human factors that bear on urban objectives.

Objectives for a particular city probably cannot be optimized for every kind of person within that city. Both retirement areas and areas with employment opportunities for the young are needed; but how are both of these priorities to be accommodated within a general plan?

It may be difficult to achieve this; indeed, it may be impossible in the present context of urban life, with its emphasis on the multi-purpose community. An array of cities, each of which more specifically reflects certain tastes, styles, and ways of living might come closer to meeting the preferences of most individuals in the society. This is one of the possibilities that might be tested, through systemic simulation, as part of the process of clarifying urban policy objectives.

The strategy of system development needs to be considered. Not only should we adopt long-term objectives for an area, but it is important that these be sustained. The dynamics of any intended goal shift need to be carefully explored. An area which gives up one set of goals and attempts to move to another can easily be trapped in some intervening mode from which it may not have the resources, the wisdom, or the political unity to escape.

A further point related to the strategy of system development is that incentives must encourage individual action that is consistent with the common welfare. By incentives, we do not mean merely financial payments by tax concessions or other means. The incentive can be in the form of increased freedom to take desirable actions. Incentives can take the form of reducing the restraints standing in the way of desirable action. Conversely, legal and tax structures could be altered to reduce the incentive for undesirable action.

Finally, an experimental attitude should be adopted. Variations might be subject to both simulation and practical test. Diversity in local laws and tax regulations could be examined in these ways in order to explore which mix of urban

policies might be more productive of a satisfying way of life.

After consideration of its consultant studies and other available material, the Science Council has concluded that the techniques of systems analysis offer considerable promise, when used in conjunction with other methodologies, for arriving at more soundly based urban policies.

Our social systems are so complex and are of such a nature that traditional political processes of argument, judgment and compromise *must* be supplemented by new techniques of analysis and decision. Here it must be said that even a person well trained in social system dynamics does not correctly anticipate the behaviour of a laboratory model system, although he may have complete knowledge of the structure and policies implicit in the model. Only by going through extensive computer simulations (i.e., an examination of the system in the laboratory under a variety of circumstances) does he develop insights about how the particular system behaves. Such simulation is increasingly being recognized as an aid to decision, a supplement to existing techniques. Where more disagreement exists is how to go about the harnessing of systems analysis and other techniques to the resolution of the real problems of Canadian society, including the problems of the cities, where the preponderant majority of Canadians live.

The question of how to begin to bring systems analysis into the arsenal of urban policy-making led to many discussions at various levels of the Science Council. A variety of proposals were presented and evaluated. Finally, the Science Council decided that a twofold proposal seemed to offer the most reasonable prospect for progress in this field:

1. to recommend that the governments and planning agencies of urban regions and metropolitan areas within Canada be given all possible assistance to enable them to integrate these techniques in their planning efforts, and
2. to urge strongly the formation of a National Institute for Urban Analysis as

a body distinct from the regular institutions of government, capable of attracting both public and private support at various levels, and authorized to engage in an integrated program of studies that would be necessary to support the work of the separate planning agencies at the municipal and provincial levels.

Though this point will be elaborated in due course, it should be stressed now that the proposed National Institute would *not* be an arm of the federal government per se.

The emphasis placed on attempting to encourage greater use of systems analysis and related techniques at the level of the existing planning mechanisms (including not only metropolitan planning agencies, but also the provincial municipal planning boards where they exist) stems from a recognition that some of these bodies are already attempting, often without sufficient funding or qualified staff, to come to grips with the systems approach to the city, while others would be likely to add capabilities of this sort, were additional outside support and encouragement available. It seems inevitable that, as with other innovative programs, some sort of co-operative financing will be required. Part of the phenomenon of short-term reactive policy is that the resources of Canada's urban governments are already so attenuated in the effort to cope with day-to-day problems that a major commitment to upgrade the sophistication of the planning process is unlikely to be made if the cost of the exercise falls predominantly on local bodies. Therefore, it is necessary that senior levels of government make funds directly available for the introduction of systems techniques into municipal planning efforts.

What could be done by systems analysis as a major constituent of the urban planning and policy process? What could urban regional planners do with such a capability as they developed it? Even the most dedicated exponents of systems analysis recognize that both the methodology and the proposed area of investigation (urban systems) are present problems of definition and application. It is de-

sirable that a variety of institutional settings, methodologies, and theoretical and practical orientations come into play as this technique is applied to the public-policy process. Nevertheless, certain recurrent themes are likely to occur as systems analysis is applied to pragmatic, policy-oriented studies in a number of Canadian urban areas.

As the existing planning agencies are strengthened in their ability to apply this new capability, they are likely to undertake simulation studies of the effects on the total urban system of the optimization of particular sub-systems. For example: do elaborate urban highway systems really meet the alleged need of people for enhanced mobility, or is their major effect to increase total traffic density at the expense of the quality of the urban transportation system (public and private) and at the cost of intensified deterioration of the environment as a whole? Would elimination of downtown parking or closing of part of the downtown area to automobile traffic mean bankruptcy for merchants or would it help revive the downtown area (particularly if combined with innovative specialized systems for movement of shoppers, pedestrian malls and the like)? What might be the effect of different, more flexible zoning by-laws? In the long run, would creation of day-care centres for children, of parks and other public facilities, and of programs for city beautification so increase the tax burden as to lead to the phenomenon of "tax-payer's revolt", the mass alienation of the middle-income groups from the processes of government? Or would such programs, besides contributing to the esthetic and other aspects of a generalized "quality of life" in the cities, yield eventual returns in terms of reduction of welfare rolls and a decreased crime rate? What would systems analysis, including simulation, show us about the feasibility and long-term effect of adapting, for example, the Swedish program of building up the infrastructure of new suburbs by subsidizing the location of merchants in these suburbs and the provision of

high-quality public transit before such suburbs reach a size where they can "pay their own way" for such private and public services? Would such ventures simply amount to "give away" programs or would they have a beneficial effect in shaping the evolution of urban forms in a fashion which society considers desirable?

If systems analysis is brought into the activities of provincial municipal boards, working in conjunction with the local planning agencies, other questions can be explored: the impact of particular types of policies and variations within the province in the fields of taxation, land tenure, provincial-municipal welfare interface, etc., on the evolution of the respective urban areas of a province. Uniform regulations, adopted for legislative convenience and in apparent deference to a notion of equity, may in fact, given different social-economic and cultural conditions of a province's cities, lead to non-equitable results, the widening of discrepancies in urban performance, and exacerbation of existing urban tensions. The Science Council believes that application of systems techniques, whether at the urban, regional, or provincial levels, can help significantly to answer these questions—indeed, in some cases, it is impossible to think of posing the question in the hope of getting an answer *unless* we are prepared to apply such new analytical technologies.

Parallel to the integration of systems techniques with planning at the operational level of the urban policy process, a **National Institute for Urban Analysis should be established.** As Canada enters the 1970s, it is clear that something more than a discrete set of large urban entities is emerging in this country; rather, it is possible to speak of an inter-systemic network, a **system of cities**, bound together by a network of transactions so significant to the national existence that this system of cities constitutes the core around which Canada's future is being built. The system of cities in the southern part of our country, and particularly the sub-system ("corridor") between Windsor

and Montreal, is closely integrated in terms of transportation and sophisticated communications. In the near future, advances in data communication and computer applications will add further linkages to what already exists and intensify the transactions among the system of cities. At the same time, there is some degree of specialization and division of labour among the cities in the national system. Finance and top corporate management tend to concentrate in Toronto and Montreal; production is somewhat more diffused, according to local advantages and past history; each region has its own centres which play a key role in distribution of goods and services. Around each urban centre, there is an extended zone of economic and cultural influence; recent development of electronic media has played a key role in the extension of such zones. Toronto and Montreal have, in effect, a nationwide zone of influence. Under the impact of media influences generated from these metropolises, young people in the Maritimes, for example, are more likely to share values with their generational counterparts in Toronto than with the older generation at home.

What would be the scope of the proposed National Institute for Urban Analysis? Its general role stems from a recognition that any complex system is in turn built up from a variety of sub-systems, each a system in itself. Each urban system is a complex of "sub-systems"—work and leisure systems, transportation networks, familial patterns, the structure and process of educational and cultural activities, etc.; the set of urban systems, each complex in itself, is in turn sub-systemic to the nationwide system of urban systems (the central core of Canadian national life in the 1970s and beyond). How these systems build upon each other, how they relate to and interact with each other both vertically (relations among levels) and horizontally (the geographically-defined network of urban areas and linkages across the country) are important foci of analysis. In addition, we

need to know how they relate to the non-urban parts of the country (rural settled Canada, "Mid-Canada" and the farther northern reaches of Canada) and, particularly on the west coast and in central Canada, to patterns of settlement and activity that overlap Canada's national boundaries. Even if maximum development of analytical potential were to occur at the operational level of each specific urban-regional planning agency, no such agency or group of such agencies could be expected to explore questions of the generality and nationwide significance delineated above. In the broadest sense, then, **the scope of the proposed National Institute for Urban Analysis** may be defined as follows: **to synthesize and generalize urban problems in the light of Canada's national needs and aspirations.**

The program of the proposed Institute will, of course, largely develop in its initial planning phases, if and when it is established. It would be unwise to prescribe too rigidly in advance a research and analysis agenda. However, out of its own discussions the Science Council has been able to forecast a few specific conceptions of some of the areas in which the work of such an Institute might be a useful aid to those concerned with urban policy:

1. To compare the experience of Canadian cities, analyze this experience, and channel it back to those concerned with the specific problems of each urban area; here, too, the analytical integration of the work of systems and other analysts at the level of operational planning would certainly occur. Thus, one aspect of the proposed National Institute would be to provide an information and evaluation centre for anyone (in both the public and the private spheres) who has a serious interest in urban problems.

2. To examine such problems as the relationship of urban to rural or to undeveloped areas; population flows from one part of the country to another; the inter-urban network of transport and communications as it impinges on transport and communications *within* a given

city³; and other specific problem areas where the policy of an urban area intermeshes with policy applied to more widely bounded areas;

3. To study the impact of federal and of joint federal-provincial programs on Canadian cities. Although jurisdictionally the cities are the creatures of the provinces, there is no denying that the federal government wields a major influence on urban affairs through a variety of programs, such as those in the areas of regional development, mortgage financing, manpower, public works, and the like. The impact of such programs on urban Canada over various time periods should be studied by appropriate use of simulations and other techniques.

4. A more difficult question, because it is directly linked to people's values and perceptions, has to do with the "ought" of urban development as a future-oriented activity. Trends and projections tend to create an aura of "inevitability" around such a process as urbanization. "Inevitability" tends to imply that the question of the desirability of certain trends and policies either should not, or cannot, be raised. It seems unfortunate if this is the case with regard to the broadest consideration of further urbanization and its consequences. A meaningful inquiry into the trends in the broad urban process, just how strong they are, when and where they can be meaningfully affected by policy decisions, and where the switching-points occur in the urban policy process, would be a useful area for inquiry by the Institute. More specifically, the time may be ripe to study desirable levels of Canadian population and their consequences, distribution of population through the country, and the elusive question of the "optimum size" of various urban aggregates. Although some of these questions do not fall exclusively in the "urban" category, they will have a

strong impact on the fate of urban Canada. The public at large and those who are entrusted with the task of governing are entitled to have at their disposal the findings, however provisional, of carefully conceived and analytically sophisticated studies of such questions.

5. Finally, the various systems techniques, together with ancillary disciplines and methodologies, are still at an early stage of their development. Three tasks related to the theory and method associated with the systems approach to urban problems might come within the purview of the proposed National Institute for Urban Analysis: first, the progressive refinement of analytical techniques and of underlying theory and methodology, and the dissemination of these techniques to those who are actively concerned to employ them; secondly, the evaluation of work done outside of Canada, with an eye to its **interpretation in a manner appropriate to Canada's experience, present situation, and future needs**; finally, co-operation with those concerned with education to ensure that the necessary trained manpower and intellectual climate will be developed in this country, so that in this field, as in others, an intellectual resource will be available to meet emerging national needs.

The Science Council, having suggested the establishment in the near future of a National Institute for Urban Analysis, does not believe that it should delineate in detail, particularly in advance of public discussion, the kind of organization appropriate to such an Institute. We wish merely to indicate a few features on the organizational side which we believe to be desirable in a general sense, and which should be considered when the decision on how to establish such an Institute is made.

The National Institute for Urban Analysis, as proposed, would *not* be an arm of the federal government; it would be a truly **national** institute, in the sense that the term "national" has been used in other Science Council publications. Participation in governance of the Institute

³For example, the meshing of urban transportation with such new inter-urban transportation modes as STOL (short take-off and landing) systems. See Science Council of Canada, Report No. 11, *A Canadian STOL Air Transport System—A Major Program*, December 1970.

should be shared, and in this, as in other aspects of its activities, qualified people should be drawn from the various levels of government, from semi-public institutions (universities, professional associations, voluntary organizations, organizations of urban-dwellers, etc.), and from appropriate private bodies. The Canadian Council on Urban and Regional Research may be able to play an especially helpful role as one of the bodies called upon for advice in establishing the National Institute for Urban Analysis. When CCURR was established, there were some who envisaged its role in somewhat similar terms to what is now suggested for the National Institute. For a variety of reasons, CCURR has not developed along these lines; rather, its primary function has been to stimulate research in a number of areas. It is hoped that, if the National Institute for Urban Analysis is established, it and the Council on Urban and Regional Research will establish close and co-operative working arrangements, and will perhaps explore appropriate institutional links.

Within those limits necessary to ensure its continuing "public interest" role, the National Institute, though funded largely from the various public bodies, should be free to seek additional support through a variety of means usually not available to public institutions (grants from private foundations, public campaigns aimed at eliciting "small donations", contracts for special research where such research is entirely compatible with its purpose). The Institute's findings should be broadly available, and it should conceive of itself in part as a service agency available to those who care to seek its advice or to whom it feels it should, from time to time, address itself.

Legislation defining the role of the Institute should seek to root it as much as possible to a broad clientele, instead of tying it to a particular set of institutions. For example: the Minister of State for Urban Affairs will require his own research and analysis services. The research staff attached to the Minister of State

would, of course, be able to draw on the services of the proposed National Institute. If this were to happen, the Institute would be directly responsible for internal advice on policy and, under the existing system, it would be inhibited with regard to the diffusion of its analytical studies and proposals. Thus, its opportunities for assisting other levels of government (or for relating to groups outside the public sector) would be jeopardized. Even without such a direct linkage to federal government policy, it is important—if the National Institute is to function in the way that has been proposed—that its own image not be that of an instrument for imposing policy from above on agencies and groups that deal with urban problems at the grass roots level.

The scale of financial support required for the National Institute for Urban Analysis can only be estimated at this time. In all probability, adequate funding of the National Institute for Urban Analysis would involve about \$50 million over its first 10 years; this would fund a core staff of about 75 professionals across a range of disciplines, with appropriate support staff and facilities and the capability of drawing on outside expertise as needed.

The Science Council believes that discussion of the proposals made in this chapter, leading to augmentation of systems capabilities at the urban planning level and to the establishment of the National Institute for Urban Analysis, can help thrust Canadians into a well-defined discussion of the objectives of urban policy.⁴ Present urban policy is too often based on means rather than on objectives. Completion of so many miles of expressway, the number of building permits applied for or granted, or specific changes made in ordinances or in the structure of local government, are too often taken as the yardsticks for measur-

⁴The possibility of such discussion is significantly enhanced by the publication of *Urban Canada: Problems and Prospects*, a report prepared by Professor N.H. Lithwick for the Honourable Robert K. Andras, Minister Responsible for Housing, Government of Canada, Ottawa: Central Mortgage and Housing Corporation, December, 1970.

ing urban “progress”. If the adequacy of policy is to be more humanistically assessed, it will be necessary to differentiate clearly within total urban systems between ends and means; to do this, we need to know more about the nature of these systems and, in the light of evolving knowledge, to keep the urban phenomenon under continuous review and analysis. Accordingly, before turning to some of the specific areas in which science and technology may be applied to urban development, **the Science Council recommends that:**

1. The use of sophisticated systems techniques and simulation models should be incorporated in the planning efforts of all urban regions and of all provinces in Canada. In the early stages of implementation, the costs of such programs should be borne largely by the federal government; however, provision should be made to shift to a more equitable cost-sharing arrangement, involving all levels of government, once any of these programs has been in effect for a period of time sufficient to generate demonstrable benefits in the urban policy process.

2. A National Institute for Urban Analysis be established, involving all levels of government as well as groups outside the public sector.

Chapter II

Urban Transportation

Although the Science Council believes that long-term improvements in urban living depend on a better understanding of the total urban system, it has at the same time studied a number of urban sub-systems. One of these sub-systems is urban transportation. Increasingly, difficulties are encountered in the movement of both people and goods within our cities.

The dominating modes of transportation are the private automobile and public transit. The trend away from public transit toward increased use of the private automobile is well documented. For example, during the period 1961-66 the rate of increase in the number of passengers carried by the Toronto Transit Commission barely kept up with the rate of growth of Toronto's population, despite the fact that a new section of subway was opened during this period. Thus Toronto's accomplishment, unique in magnitude in North America, led merely to a situation of public transit barely holding its own. In Ottawa, the population increased by about 15 per cent from 1960 to 1968, while the number of passengers carried by public transit dropped by more than 4 per cent. This trend has developed in virtually all urban areas in Canada. From 1945 to 1966, the annual number of passengers carried by public transit in Canada declined from 1.5 billion to slightly more than 1 billion, despite a 66 per cent increase in population during that period.

A number of factors contribute to the general decline of public transit. A large part of the population exhibits a distinct preference for the automobile over public transit. Increased prosperity has enabled more people to afford an automobile. In addition, policies pursued by the cities and the provinces measurably contributed to the decline of public transit. Through improvement of urban streets and construction of freeways, more and more people were, in effect, encouraged to transfer from public transit to the private automobile. Stagnation or decrease in number of passengers led to increases in fares and reduction of service, which caused still

more people to abandon public transit. The effect of this on increased use of the private automobile enhanced pressures to improve streets, build highways, etc., and so around the circle again. The first victims of the resulting squeeze are those Canadians who do not own automobiles: roughly one out of five households.

The automobile combines the advantages of door-to-door travel, comfort, privacy, convenience, dependability, status, independence and flexibility, and a relatively high speed of travel. In all these, the automobile out-performs present modes of public transport. However, the inferiority of public transport is in no small measure precisely due to the fact that the automobiles *are* present. Speed of travel, flexibility, frequency of travel, dependability, convenience and comfort of public transit would all increase greatly if no automobiles were present.

In addition, the form of the city and urban life as we know it today are to a large extent shaped and determined by the automobile. For example, suburban living was made possible by the automobile. Suburbia without the automobile would be quite inferior, even quite impossible, in its present form and design. Automobiles are more suited to suburban living; public transit is most economically advantageous in areas of highest population density.

The negative aspects of the automobile are equally well known. These include repercussions on those who do not own automobiles, the high costs of individual and government expenditures on transportation, space requirements, air pollution, noise, accidents, congestion problems, over-expenditure of energy, driver tension, and the generally negative impact that the automobile has on the urban environment. There is a developing trend of expressed antipathy against the automobile as an urban vehicle. Indeed, many people wonder whether our cities have been built for automobiles or for people.

Although it is nearly impossible to perform a satisfactory analysis of the benefits and the costs of the automobile, indi-

cations are that the automobile owner in Canada does not pay the full cost incurred. Total costs of the automobile include construction and maintenance of highways, part of the cost of police forces, costs due to pollution, etc. It appears that barely one-half of the cost incurred by the automobile is returned to different levels of government in gasoline taxes and licence fees.

The time has passed for thinking our urban transportation problems will be solved by ever increasing the urban expressway mileage. Increasingly, attention must be given to the great social cost incurred by the automobile. While the Science Council recognizes that the automobile as an urban vehicle has served us well during the past half century or so, it also realizes that entirely inadequate support has been given to public transit authorities. This has resulted in severe imbalances in most urban areas of the country, characterized both by inadequate facilities for mass transit and by an undue influence on the city of the automobile and its associated problems. Policies for the next decade and beyond must be geared toward finding a better balance. This will require large infusions of funding for mass transportation of various kinds. Funding by itself, however, is not enough; a great deal of ingenuity, new methodology and new systems will have to be employed as well. In brief, governments will have to be constantly vigilant for opportunities to change the transit / automobile ratio in favour of public transit.

So far, the discussion has centred on the movement of people. The other side of the transportation picture, the movement of goods, presents no less of a problem. Some observers have estimated that 20 per cent of the traffic in urban areas is accounted for by goods movement. The difficulties encountered by trucks are in part attributable to the general congestion present in urban areas. A decreased dependence on the private automobile would also benefit the trucking industry and facilitate goods delivery.

Congestion, however, is by no means the only obstacle encountered in moving goods. City centres have not generally been designed for the automobile age, and this is particularly a problem for trucks. Equally problematic is the inadequacy of many buildings as regards facilities for loading and unloading goods. One still finds many "modern" office complexes that lack special provisions for the handling of goods. Surely, major complexes entailing high volumes of goods movement should be built with special facilities for handling those goods, preferably interior docks below ground level.

The Science Council asked Mr. Neal Irwin to undertake a study in the field of urban transportation. He points out that the transportation problem in many, if not most, of Canada's cities above the 50 000 population level is characterized by automobile and truck traffic congestion during peak periods of travel, severe and rising accident tolls, increasing levels of noise, air pollution, tension and neighbourhood blight caused by automobile traffic and parking requirements, and by the destruction of developed areas to provide additional road capacity. A general decline in the quality of public transit service is coupled with steeply rising operating deficits and large, and rapidly increasing, capital and operating costs for improved highway and parking facilities. In spite of enormous public investments during the past several decades, many segments of the urban population witness a decline in the quality of transportation services. Growing frustration among urban dwellers accompanies the rising financial and social costs of urban transportation.

The underlying causes of these problems include rapid post-war growth of Canadian urban municipalities according to an overall low-density pattern: centralized employment concentrations in downtown and selected suburban areas was combined with highly de-centralized residential development. This was accompanied by very rapid growth in automobile ownership and use, and relatively

insignificant improvements in public transit technology. The automobile has become predominant in all Canadian urban centres, with 80 per cent or more of total daily trips transacted by this mode of travel.

Experience in large cities throughout the world, and technical analyses of the carrying capacity and space requirements of the private automobile as we know it today, point clearly to the fact *that attempts to rely solely or even primarily upon the private automobile for a solution to urban transportation problems in growing cities of 100 000 people or more must lead to frustration*, given the urban form and densities which we have come to expect in our larger cities.

Attempts to continue expanding road and parking facilities lead to severe land use conflicts; in a number of large North American cities, the resulting public reaction has been sufficient to halt new major expressway projects. One might point to the tendency for most large cities to spread out on the periphery, at lower densities and with dispersed employment, as a basis for arguing that the private automobile will, in the final analysis, be able to service such cities effectively. This argument underlines our central dilemma: today's de-centralizing trends produce a dispersal of urban trips which can be served most effectively by a private automobile. On the other hand, concentration of activities in the original urban core areas continues to increase and additional new areas of concentration are created; these become simply too dense to be served effectively by the automobile alone.

Added to this is the fact that our cities have come to depend upon the private automobile and truck for their very existence. Any attempt to ban or to significantly curtail the use of trucks in our urban areas would bring goods movement quickly to a standstill, unless some flexible and rapid means of conveying goods were substituted. Similarly, the banning of private automobiles over *any* appreciable area of a major city for a significant

period of time would have serious effects upon the social and economic functioning of our cities. Clearly, there is no simple answer to the urban transportation problem.

By the year 2000, Canada will probably have eight cities with a population greater than 1 000 000, 9 cities whose population will range between 250 000 and 1 000 000, and 39 with populations between 50 000 and 250 000. The largest urban areas, Toronto and Montreal, will be extensive megalopolitan urbanized regions. Therefore if the current transportation problems in Canadian cities (3 with populations greater than 1 000 000, 6 between 250 000 and 1 000 000, and 24 between 50 000 and 250 000) are projected to a point 30 years hence, assuming current trends continue unabated, we can anticipate severe reduction in the quality of life in Canada's major urban centres, due in large part to the negative impact of a continuously expanding transportation system.

In the face of such a situation, it seems clear that no single transportation concept or system will "solve" the problem during the next few decades. Some people have speculated that the need for transportation might be reduced in the future by means of modern communication technology and different forms of land use planning. While a reduction of the need for movement should always be a key consideration of urban planners, it appears unlikely that such a major reduction will indeed take place. The inventions of the telephone, radio and television, all important instruments of communication, should supposedly have created less need for movement. But movement of people and goods has in fact increased very considerably. There is no necessary direct link between a decreasing *need* for travel and the actual amount of travel. Equally, the often-proposed solution of a proximity between the home and place of work appears less attractive when one considers the large number of households with two working members (one working near the home, the other far away?), the frequent shifts of place of work of most Canadians

(nearby first, then far away?), the value systems of individuals (we moved to this neighbourhood because it has the best school in town, because we like the view, because my mother-in-law now lives in the other end of town), the large number of "non-work" trips, etc. A better solution is to maximize freedom of choice, rather than engage in an all-out attack to minimize need for movement. It appears likely that we shall require specialized modes of transportation to serve specialized trip purposes.

What type of transportation system should we be moving toward *now*, so as to create the basis for serving our larger and more populous cities 30 or more years from now? With this question in mind—and an answer is obviously intimately tied to the type of urban structure and form we wish to work toward—we can begin rationally to make many "incremental" changes in our transportation system and urban forms.

No one expects overnight improvements in the urban transportation field. On the other hand, it is not too much to expect an immediate start on a program of gradual improvement with emphasis on public transportation. Some elements of the program we recommend can be implemented in the very short term; the results of others will take longer to materialize, although the planning, research and development should start very soon. Thus,

The Science Council recommends that a program emphasizing public transportation be initiated with the aim of:

- a) increasing the efficiency of existing transportation facilities;**
- b) developing and applying advanced urban planning techniques to ensure transportation-land use compatibility;**
- c) developing new transportation technology.**

While the Science Council recommends a program of developing new transportation technology, it does *not* endorse high-cost projects for developing new full-scale systems. A policy of *imported* technology of such systems appears to be a more

reasonable course to take. Canada will need to develop *its own* technology in two important areas. First, there is the area of systems design, to meet specific needs of Canadian cities; for instance, programs aimed at increasing the use of "collective transportation" as a means of increasing the load factors of vehicles using urban streets promise considerable pay-off, both socially and economically. Second, programs of systems adaptation to Canada's extreme climatic conditions would be highly useful. Experience with the Turbo train has shown that U.S. cold weather technology does not necessarily meet Canada's requirements. Development of new technology along these lines is within the means of the country, and will help both to alleviate Canadian transportation problems and to develop exportable industrial technologies.

Mr. Irwin considered some 33 transportation improvement projects for further evaluation. The evaluation took into account such factors as the contribution that would be made to the solution of national urban transportation problems, potential for improvement of total transportation system performance, public acceptance, positive effect on environment, contribution to efficient urban development, ability to integrate with existing transportation systems and programs, potential economic feasibility, and ease of implementation. Five specific programs appear particularly promising. They are presented in summary form as examples of the type of programs that might be implemented. Before any program is decided upon, a more detailed study should be made, with consideration of all the alternatives.

Increased Efficiency of Existing Facilities

Traffic Management Centre

The central concept of this project is that all aspects of an urban transportation system should be organized, planned and managed on a co-ordinated basis. In practice, it would mean that the traffic

department, roads and streets department, public transit operator, parking operators, commuter rail operators, truck operators, and traffic law enforcement agency would operate on a co-ordinated basis, either as a public-private confederation or, more ideally, from a single traffic management centre. The centre would operate as a command centre or operations room into which would be fed, on a continuous basis, up-to-date information on traffic flows in problem areas, locations of public transit vehicles and police cruisers, etc. It would concern itself with the movement of both people and goods. Computer and communications technology would be used to monitor and direct these operations. The centre could also be concerned with short- and long-range planning for transportation facilities, including the establishment of pricing policies for public transportation and parking which, if consistently set, could, in concert, have a significant effect upon user behaviour and resulting volume of transportation.

Bus Rapid Transit

There are many situations in which existing conventional bus service is too slow to compete effectively with the private automobile, yet where expected passenger volumes are not high enough to warrant fully grade-separated rapid transit. In such situations, bus rapid transit, utilization of express buses on freeways and/or upon special rights-of-way (but operating on local streets for passenger pickup and distribution), has considerable merit. When properly designed, this type of service can offer travel speeds and convenience reasonably competitive with those of the private automobile, utilize roadway space much more efficiently during peak periods of travel, and, with appropriate propulsion, contribute much less to air and noise pollution than the number of automobiles required to move equivalent numbers of people.

Advanced Urban Planning Techniques

Community Design Demonstration Projects

The nature and structure of residential communities and major activity centres in our future metropolitan areas will have a profound effect upon both the quality of living for their inhabitants and the effectiveness with which they can be served by the transportation system. For example, in residential communities housing can be created in clusters around vehicle-free areas with road access at the rear; thus they can be served effectively by public transit and trucks while pedestrian traffic is largely or entirely separated from the vehicular traffic. Similar concepts could be employed for major office areas, commercial centres, educational/cultural centres, and recreational areas; in centres such as these, grade-separated rapid transit could penetrate into the pedestrian-only areas, which might also be served by a form of segregated local transit. Truck traffic and private automobile traffic would be either underground or at the periphery of the activity centre, with goods transfer and parking areas suitably located.

While functional analysis and simulation models, coupled with town planning judgment, can go far in designing such communities and activities centres, actual demonstration projects would be needed to provide much-needed experience in actually developing and operating them. The objective would be improved land-use/transportation arrangements, particularly at the local level of residential communities and activities centres.

New Transportation Technology

Demand Responsive Bus System

This project would develop and test systems of small buses or limousines which would provide door-to-door service on demand by telephone. Operating essentially as a group taxi, initially with a radio dispatcher (but ultimately dispatched by computer), this system would

provide service intermediate between that of fixed-route buses and individual taxi cabs, at an intermediate price level. Local service would be provided between points within a community, and to rapid transit stations and major activity centres serving communities.

This project is classified as an application of new technology because of the sophisticated computer dispatching technology and operational procedures which would ultimately be required. Its objective is more efficient use of existing roadways while providing a level of service almost equal to that of the private automobile.

High-Speed Intra-Urban Transit

Two broad areas of research and development are included in this project: first, the improvement of existing rail transit systems through advanced control techniques, integration with other modes, and increased market penetration; secondly, new systems research based on components (propulsion, guideway, control of monorail, etc.) which are now in a fairly advanced state of individual development.

The new and improved transit systems produced by this project would be keys to the creation of the structured, nucleated regional urban form discussed earlier as a long-term growth objective.

Implementation of the Program

Urban administrations, faced with transportation problems and trying to devise solutions, encounter one overriding obstacle—a lack of funds. There is general recognition of this point. It appears likely, and proper, that the participation of the federal government in the financing of urban transportation will become increas-

ingly important. Indeed, the federal government already has played, and is playing, a role in this field. For example, it provided \$29.1 million as a federal loan to the Montreal Rapid Transit System, and \$29.5 million to the Toronto subway system, of which \$7.2 and \$7.3 million respectively were forgivable. Another example is the urban portions of the Trans-Canada Highway System.

Municipalities, and conglomerations of municipalities, are in no position financially to undertake, on their own, experimental programs in urban transportation which are costly in the short run, even though the longer-term benefits may be very great from a financial, social and environmental point of view. It would appear to the Science Council that the senior levels of government have a special obligation in this field of experimental programs and demonstration projects. The Transport Development Agency, recently created as part of the reorganized federal Ministry of Transport, can play a vital role in program planning and can assist in the undertaking of specific projects. In addition, the proposed Ministry of State for Urban Affairs might well become a main negotiator for the federal government.

The Science Council recommends that the federal and provincial governments embark upon a co-operative program to fund experimental programs and demonstration projects in urban transportation.

Mr. Irwin has projected some rough cost figures for the projects which have been discussed in this chapter. Each of these figures is naturally highly dependent on the scope of the project and the depth to which it would be developed and implemented. The range of cost of each of the projects is shown in Table 1.

Table 1—Range of Cost of the Five Experimental Projects in Urban Transportation

	Traffic Management Centre	Bus Rapid Transit	Community Design Demonstration Project	Demand Responsive Bus System	High Speed Intra-Urban Transit
Range of Cost	\$1 to \$5 million	\$0.1 to \$2 million	Site: \$5 to \$25 million Planning: \$0.5 to \$1 million Development: variable	Initial demonstration: \$1 million Total system: variable	Up to \$50 million or more depending on the scope.

A *total* program of this type would cost less than \$100 million. This figure may appear high on first consideration. However, it is not high in the light of total expenditures on urban transportation in Canada. To place this figure in perspective: the cost of the subway system in Toronto alone, a single cog in Canada's total urban transport system, was in excess of \$340 million.

In conclusion, it should be emphasized that all urban areas experience problems in transportation, and that such problems will increase as our cities grow if no new approaches are incorporated in the urban transportation mix. However, this does not mean that the problems are the same for all cities. The types of problems encountered, and the solutions to them, are related to a number of factors. Size is very important. Solutions in Montreal and Toronto will not do for Winnipeg or Edmonton. It is therefore essential that experimental projects are geared toward the solution of different problems for different cities, and this necessitates a variety of projects. In addition, an experimental program should not just serve the two or three very large cities in Ontario, Quebec and British Columbia, but should incorporate the concerns in all major regions in Canada. The recommended co-operatively financed program among federal and provincial governments would encourage this desired distribution.

Chapter III

Housing and Community Building

Choice is an essential element which distinguishes a democratic society from other forms of political, economic and social organization. Unfortunately, no meaningful choice with respect to the utilization and consumption of housing exists for a substantial proportion of the Canadian population. If the Canadian "housing crisis" means anything, the lack of meaningful choice is its characteristic. Many Canadians have been forced into the "no-housing-choice" position in which a third to one-half of their regular income goes for housing. In this process they do not necessarily gain better quality, but may be forced into accommodation that is considered, by any set of criteria, to be substandard. During the past half century, Canadians have developed from a nation of tenants to a nation of owners; they are now moving back toward being a nation of tenants. These changing patterns are a response to what is available, not an exercise of choice.

To many Canadians this lack of choice means that the user requirements are not being met. User requirements have physical, social, and environmental aspects. Physical requirements relate to a concern with the individual house, its heating, plumbing, and wiring systems. They pertain to structural safety and to the development and determination of housing standards that will engender good public health. At least half the total housing stock in the 1970s was created prior to 1945, and a fair proportion of it was built in the first quarter of the century or earlier. This very substantial amount of reasonably good old housing deserves our profound attention during the balance of this century. User requirements, however, should be seen in a much wider context. A dwelling is located in a neighbourhood, and much more attention should be paid to the wider environment as one of the important aspects of user concern. Therefore, user requirements must be conceived as social and environmental in nature rather than merely physical.

In our history the process of community

building has been characterized by the filling in of empty lots, the outward extension of city boundaries by means of dull suburbs, and the construction of endless miles of highway; much of this with an appalling uniformity from coast to coast. It was this that prompted the Task Force on Housing and Urban Development to state in its report, "The Task Force did find planning at work in urban Canada. But it frankly was disappointed and discouraged by it. So much of it was concerned with minutiae while the need for a grand urban design goes begging. So much of it was a negative scripture, written in 'thou shalt not', when the situation cried out for positive thought and initiative. The Task Force found rules upon rules to establish the width of streets, yet it uncovered hardly a single community with a long-term plan and design for basic transportation corridors. It found a multiplicity of regulation at all levels to set minimum requirements and hardly anyone to spell out maximum objectives. Some planners and officials had an economic term of reference; hardly any seemed to have given much thought to the broader ecological or sociological issues. The urban scene seemed to abound with bureaucrats—but to be sadly lacking in dreamers." This lack of vision, and lack of experimentation, should be corrected.

Experimentation in the social and environmental aspects of user requirements should be actively encouraged. Experimentation is required at four levels—the street, the immediate neighbourhood, the sub-regions within an urban area, and the broader community itself. A whole array of possibilities is open; these include mixtures of housing and shops, communal guestrooms, recreation spaces, child-care facilities, and schools located within apartment developments. An active movement to form urban communes has started among our young people; experimentation in these forms of living may well be an important part of an urban development program. In short, the emphasis should be on experimentation. Funds should be made available which make possible ac-

tive experimentation in new ways of community building.

Economic innovation should also be stimulated. Some examples of this may be seen in Ontario. The Ontario Housing Corporation will, reportedly, include a number of new development concepts in a new community near Kitchener. It is contemplating the establishment of municipal government facilities on a rental basis in a privately-owned building, the free use of park land by nursery growers in return for maintenance by the grower, and a monorail as the community's transit system, to be built by developers in exchange for fare receipts.

Over the next thirty years, the Canadian family may evolve as a small family with both parents working. As a result, the family will dispose of a substantial family income, particularly where both adults are well educated and are members of professional groups. What many families will want, and what will be developed for them in due course, will be a new form of environment—a multiple dwelling building complex within which the child will be raised in day-care centres, nursery schools, elementary schools, recreational facilities and play space.

While it is not the role of the Science Council to suggest specifically what kind of experimentation is desirable, we strongly urge that funds be made available for experimentation necessary to adapt our communities to new forms of living in the remainder of this century. When the Science Council started studying urban development, it gave serious consideration to recommending a large-scale program of new towns or of experimental city building. While this is still attractive, and although the Science Council is convinced that valuable insights can be obtained and innovative modes of urban living could be attempted, the Council now realizes that even a very large-scale program of this kind would make only a small impact on the total amount of growth that is going to take place in our existing urban areas over the next 30 or 40 years. Despite these caveats, the Science

Council is convinced that a considerable number of new towns *will* be built in Canada over the next few decades, whether as satellites to existing cities, as major expansions of presently small towns, or as resource towns. Canadians should not miss the opportunities for innovative forms of land use, life style, transportation and housing that are possible in this context. Funds must be made available to encourage this kind of innovation, insofar as the costs of this innovation exceed the normal costs borne by developers. The goal should be to create an environment that will encourage developers to think along non-conformist lines. Incentives must be provided for the unorthodox builder; the thou-shalt-not philosophy should be replaced by a policy of encouraging social and physical innovation. The Central Mortgage and Housing Corporation and the provincial Housing Corporations are in a strategic position to provide leadership in such an effort.

Canada's record in the elimination of slum areas in its urban areas is far from being a source of pride. However, we are in a relatively better position than many other developed countries. According to our consultant, Dr. Albert Rose, we possess "pockets" of slums. In the past 25 years, major changes have taken place in federal legislation related to slum clearance. Rose points out that the notion of slum clearance evolved through the successive concepts of "housing redevelopment", "urban redevelopment" and "urban renewal". These changes were not only semantic; they implied an important revision in the nature of the program which could be mounted to "treat" a blighted or vulnerable neighbourhood. In the 1970s, the problem of discovering the balance between the retention and the dissolution of traditional neighbourhoods, which may be judged to be substandard or blighted, must come to the fore. Much more study is required of whether neighbourhoods, which might be considered on *prima facie* grounds to have deteriorated and to be damaging to residents, do or do not in fact provide certain important

social values and other benefits. Also more study should be undertaken of the manner in which such neighbourhoods might be redeveloped without investment in an inordinate quantity of public housing accommodation.

The Science Council recognizes that we have a considerable technical knowledge of house building, the servicing of land, and the provision of physical facilities within a house, on a street, or in a neighbourhood, but that we have very little knowledge about meeting people's social and community needs. A major objective is to obtain that knowledge. This is not to say that we should attempt to obtain this understanding in isolation. Whatever experimentation is going to be tried should be intimately embraced within the systems approach outlined in the first chapter. It should be part of the effort to obtain a better understanding of the total urban system.

Already, many innovations *have* been made in Canadian urban life. Satellite towns near large urban areas *have* been built, new forms of urban governments *have* been introduced, and new and better ways of moving urban traffic *have* been attempted. What has often been lacking is monitoring of these innovations. It is only through organized and systematic monitoring of experiments that answers can be obtained on what works and what does not.

As an outgrowth of our analysis in this first part of this chapter, **the Science Council recommends that a program of widespread experimentation be encouraged to make our communities and our dwellings more livable, and that experimentation set in motion be monitored.**

In the foregoing paragraphs we have discussed the social and environmental aspects of housing within the community. Enhanced choice in the housing market would also be promoted by a lowering of the cost of housing. In this context the Science Council has studied the Canadian housing industry and more particularly the promise of industrialization.

The situation in construction of housing is particularly difficult. As our consultants (Scanada Consultants of Ottawa) have pointed out, it is a wonder that the industry has done as well as it has within the constraints that have developed around it and within it. Housing production is a fragmented and wasteful "non-industry". Other countries have begun to realize that the inefficiency of the construction industry, given its size, constitutes a major drag on the whole economy, and that reliance on government measures which use the housing industry as a lever to stimulate or depress the economy as a whole helps to exacerbate this trend.⁵ The recommendations made at the end of this chapter will therefore be addressed *not* primarily toward a program of new technology, but rather toward removing a number of constraints, enumerated below, within which the Canadian construction industry presently operates and which inhibit effective application of technology already available.

Some of these constraints are intrinsic to the housing industry; others are artificial. The first intrinsic constraint is the bulkiness of the product. It is different from the automobile, for example, in that its size requires localization or regionalization of production and distribution. The second intrinsic constraint is the degree of permanence of a dwelling. This almost automatically requires publicly imposed performance criteria: an indirect form of public control. How can establishment and enforcement of criteria be channelled into the encouragement of faster and better evolution of housing design-production-distribution? More serious than the intrinsic constraints are the artificial constraints. In the words of our consultants, some of these are almost sacred, some are simply convenient to one interest or another, some protect forces within the industry from challenges to their present form.

⁵See, for example, E. Jay Lowenstein, "Rising Construction Costs and Anti-Inflation Policies: A Report on Western Europe". U.S. Department of Labor, *Monthly Labor Review*, June, 1969.

The first of these artificial constraints is in the area of building codes and by-laws. Although no one would deny the necessity for codes and by-laws, in many ways the local specification codes protect a fragmented traditional industry and hurt alternative efforts and innovations, and the consumer. The gain from removing several critical constraints against industrialization will be substantial. Better production techniques and the availability of better houses require uniform, performance-based codes, with standards, criteria, testing and approvals taken out of local hands. Provincial adoption of the National Building Code is essential in this respect. The Canadian National Building Code has in the past been held up as a model of its kind in the world. It is not a static document. The Science Council believes that in the continuing evolution of the National Building Code, increased attention must be given to qualitative criteria for human habitations, in addition to the existing quantitative ones. The National Building Code adequately reflects the concern for structural safety of housing. There may well be a need in the coming decade for considering more explicitly the incorporation of environmental quality standards in the Code. The Science Council fully realizes the difficulties of doing so and is also aware that incorporation of environmental concerns in the Code might lead to a situation whereby environmental innovation is restricted rather than enhanced. Nevertheless it believes that increased participation of social scientists, psychologists, architects, and environmentalists in the formulation of the Code may well lead to a greater recognition of the importance of qualitative standards for housing.

A second artificial constraint is countercyclical financing. Canada (like most other countries) has used housing construction as an economic regulator. This reinforces stop-start policies and the high-risk element in the housing industry, which tends to be offset by developers' opting for high-profit opportunities rather than for volume. If we want to attack

Canada's housing problem seriously, by giving industrialization a chance, this policy should be replaced.

A third constraint that inhibits the possibilities for "industrializing" home-building has to do with jurisdictional boundaries among the building trades. Historically, members of these trades sought, quite legitimately, to protect themselves by organizing craft unions composed of skilled workers in particular trades (carpenters, plasterers, etc.). Elsewhere in the union movement, there has been a tendency to move from craft unions, organized around particular skills, to industrial unions, organized according to segments of the economy. Indeed, since 1945, the building trades in West Germany and Austria have been organized along industrial union lines, and in the Scandinavian countries and the Netherlands, there has been significant evolution toward this kind of organizational approach. This could facilitate across-the-board bargaining between unions and the construction associations and thus ease the way to an industrially-oriented home-building process more suitable to increased use of technology.

At the same time, it should be realized that to point to a possible contribution that the labour unions might make in the housing field does not really go very far in answering the problem. It must be recognized that the rights of labour need to be protected in our society, within the framework of the rights and obligations of citizens at large. It would be preferable if labour itself were to evolve industry-type bargaining units. We may be dissatisfied with the present form of protecting jurisdictions, at a time when some old skills are becoming obsolete, other new skills are scarce, and productivity and quality control seem to be declining, but we should recognize the human side of this question. Many of the older tradesmen have spent their whole lives acquiring a skill, and fear that removal of jurisdictional protection—unless something more adequate is devised—would endanger their livelihood. Finally, it is important to

realize that disputes in the building trades are often not simply disputes about wages and hours. Working conditions, supervision, stability, training and safety are all poor in the construction industry. In the Netherlands, under a rationally encouraged industrialization of home-building, the accident rate in construction is only a fraction of that which prevails in Canada. As we shift to an improved economic organization of the housing industry, we should be mindful of the need to improve the situation of those who work in this area.

The present system of land ownership is the fourth, and possibly the most important, constraint on development of the housing industry. Here we come into conflict with long-standing, deeply held views on the nature of private property: despite the fact that community-created values play a key role in the process whereby raw land is converted into an economically valuable commodity, so deeply rooted is our private property approach to land that (with the exception primarily of expropriation procedures) we allow the main choices about when and how it is to be brought into productive use to be made by the individual entrepreneur. In the classical tripartite economic mix (land, labour, and capital), despite the regulatory mechanisms that *do* exist as regards use of land (e.g., zoning laws), the land entrepreneur is allowed far more leeway in withholding his good from the market until he finds the price suitable than are the possessors of either labour power or capital. The mechanisms of the interventionist state set the limits within which labour and capital can operate; they barely begin to touch the speculative prerogatives of the land entrepreneur.

It is impossible to deal adequately with the technological possibilities that *could* exist for the housing industry unless we boldly confront the value-system outlined above. Consider, for example, how the dwelling unit is to be produced: a main reason why the industry has not been oriented to productive efficiencies in manufacturing housing is that the biggest profits are in the sale of the land that is attached

to the house. Despite gross inefficiencies in planning, in installing streets and services, and in acquiring land and securing various legal clearances and municipal approval, a large builder in some areas can still realize a profit of about 30 per cent or more on the land portion of his investment. From the point of view of the prospective homeowner, developed land represents up to one-third of the purchase price of the dwelling. To bring housing once again within the area of choice of the individual citizen by providing incentive for builders to introduce technological efficiencies into their enterprise, it is necessary to launch in the near future a program that, over a period of time, would transform our present system of land ownership from one in which private values predominate to one in which the public interest is centrally represented.

Accordingly, **the Science Council recommends that the governments concerned make greater use of public ownership of urban and expansion-area land in order to counter the harmful effects of speculation and to ensure the freedom of planning necessary for the orderly development of new cities.** The exact form that public ownership would take cannot be prejudged. In the long run, the forms and procedures for those measures of public ownership that might be required would have to be the object of study and consultation among the three levels of government. However, in this connection, the Science Council endorses the plea of the Task Force on Housing and Urban Development: municipalities or regional governments should be encouraged to acquire, service and sell (or preferably, in the Council's view, lease) all, or a substantial portion of, the land required for urban growth. Even at the present time, it is our view that the provincial governments should make more vigorous use of the permissive powers granted them under the Federal-Provincial Land Assembly Program and sections 35(a) and 35(c) of the National Housing Act.

It may be appropriate at this time to comment on more immediate questions of land tenure and taxation. Downtown land,

and land whose value has been greatly enhanced because of some public intervention such as the building of a public transit line, should be in public ownership. The public body which has to incur the considerable expense of building the improvement would thus also reap the benefit of the increased value of the adjacent land, or could alternatively pass on to the less privileged the benefits of the improvements in the form of sites for social housing. Rather than being sold for development purposes, land so acquired by the public body should be leased on a long-term basis.

Today is the era of the multi-use building development and tomorrow will be the age of the multi-block development. There is no reason why a public body such as a federal-provincial corporate partnership, once it has acquired a major tract of land and once it has expended substantial sums of money to build a public utility such as a subway transit line, should not lease some air rights to different government or private agencies. The second stratum or level of these air rights could be sold to a private corporate entity which would be responsible for the development of a major shopping plaza and for the leasing of space to different retail establishments. The next level could be sold in condominium to a school board, park authority, recreational club and community centre organization for purposes of developing on that platform level those facilities for which they have special responsibility. Superimposed at another level, and allowing for adequate open spaces for the levels below, leasehold or sub-leasehold interests could be granted for purposes of developing office buildings and apartment blocks, some of which could be individually leased or even sold in condominium. Omnibuilding developments of this nature would have obvious advantages in terms of costs and planning over what seem to be piecemeal and unrelated developments in many urban centres. The key to such developments would be retention of land ownership in public hands and adequate co-operation with private enterprise.

Provincial governments should be en-

couraged to attempt to reduce legal costs in some jurisdictions, such as the Atlantic Provinces and some parts of Ontario, by modifying their land tenure system and adopting the Torrens system of land registration which exists in Northern Ontario, the Western Provinces and Australia. To discourage land speculation, the Australian and New Zealand system of real estate taxes on vacant land should be studied. Such taxes are set on the basis of development potential instead of the minimal vacant land value.

To encourage rehabilitation, studies should be made aimed at developing a system of tax credit that encourages renovation, instead of immediately penalizing the owner with an increased valuation and an additional tax levy. Similarly, authorities should explore the possibility of devising a system whereby owners of major buildings would be given realty tax credits for maintaining and making available on their property small parks, open spaces, or public shelters with benches that would be open to the public.

Although these and other improvements should be considered, we emphasize that a fundamental reconsideration of housing policy is required if technology is to be employed at all adequately. The absence of effective national policy for public deployment of land and for application of up-to-date concepts of land usage will ultimately have to be remedied; otherwise, ameliorative policies will be mere stop-gaps, to be eroded as the built-in constraints take their toll of the national effort.

In sum, artificial constraints exert a significant negative influence on housing and community development, which goes far beyond immediately visible cost effects. **The Science Council strongly recommends that governments give urgent attention to the construction industry's fragmentation, under-capitalization, inadequate economies of scale, seasonality, hazardous work conditions, and lack of effective utilization of highly qualified manpower in adequate numbers. Construction is virtually a non-industry, characterized by a tendency to**

emphasize high-unit-profit production rather than volume production; in part this stems from a desire to offset the high degree of financial risk arising from the unevenness of financial flows in the housing and other construction areas. The use of housing as an economic regulator, in accordance with the dictates of countercyclical monetary and fiscal policy, tends to be a major factor that exacerbates these unwanted tendencies in the construction industry. Other factors are the multiplicity of local codes and local enforcement, inadequate criteria and strategies for land deployment, and the fragmentation of labour into craft-oriented unions. If governments desire a significant improvement in housing, policies that reinforce the non-industrial nature of activity in this field should be dropped or modified, and other policies to encourage industrialization should be promoted. Only in this way will existing science and technology be given a chance to have an impact on the housing field. It is only by removing the negative constraints that effective use of technology can have a major impact upon the alleviation of the housing crisis.

Our consultants have studied the effects of removing the constraints, by simulating *sustained* high volume production runs, by measuring actual runs or portions of such runs in North America, by studying such industrialization at work in housing in other countries, and by studying the mobile home industry. They reach the conclusion that sustained deployment of even *conventional* materials and methods in large controlled projects can produce conventional housing at construction prices that are 15 per cent or more below the present norm in Canada. By going further and turning to more intensive industrialization, usually factory based, further savings can be achieved through sustained use of available, adaptable, or immediately developable building systems: the range of such savings is 13 per cent in medium rise and 7 per cent in low rise where considerable design flexibility is retained, and over 20 per cent in medium rise and 12 per cent in low rise where

reasonably standardized "people's housing" of high quality is the goal. While one might quarrel with the precise figures, the magnitude of the suggested savings is such that it would appear desirable to experiment in the application of these techniques on a large scale. It should be emphasized that the savings pertain to *known* technologies, not *new* technologies. It would be premature in the Canadian context to engage in a large scale search for new technology while existing techniques of such great promise are available, but not used.

In summary, the Science Council wishes to state that the situation in Canada with respect to enhancing choice in the housing market, providing housing at lower cost and building communities better adapted to the needs of Canadians is far from satisfactory. *This situation cannot be remedied in the first instance by a program of new technology; rather it requires creating an environment in which technology is given a chance. This environment can and should be created by removing existing constraints.* Only in this way will the Canadian housing "industry" become a real industry of benefit to Canada and its citizens.

With regard to building better communities (*and* a better shelter industry), the Science Council recommends that funds be made available to developers to enable them to try out new concepts and ideas. Old communities will be redeveloped and new communities, towns and cities will be initiated. *These projects will offer great opportunity for experimentation, demonstration, and monitoring on a large and continuing scale which will invite capital-intensive industrialization within the industry.* The involvement of the Canadian social science community in this process will be indispensable. In order to make these experiments and demonstrations of lasting and more general benefit, feed-back mechanisms should be instituted. It would appear that the systems studies recommended in Chapter I would be desirable vehicles for providing these feed-back mechanisms. The potential pay-off, in more than the monetary sense, of a program of this kind will be great indeed.

Chapter IV

Recycling and Waste in the Urban Environment

Concern for environmental decay tends, in many instances, to be focussed on the non-urban environment—on our fields and forests, our lakes and rivers and streams. But most Canadians are affected most directly and persistently by one specific type of ecology, the ecology of the city. While it is important to safeguard the environment in the non-urban areas, a major task of the coming decades will be to mount a counter-attack on the environmental decay that has occurred and is steadily increasing in Canada's cities. This chapter deals with one specific set of influences on the quality of the environment in Canada's cities: the generation of waste, the problems it causes, and the possibilities of shifting from a production-waste linkage to a recycling process.

The amount of waste produced in our society directly reflects the size of its population and that population's standard of living as conventionally defined. Waste is the inevitable end-product of the manufacturing and agricultural industries. In this sense the rate of increase of the Gross National Product is an indicator of the increase in total waste generated. For example, between 1957 and 1967, when per capita GNP increased at an average annual rate of 2.5 per cent in Canada, the amount of waste increased each year at about the same rate. At the present time, Canadian households are responsible, collectively, for the production of some 25 000 tons of waste solid every day, and for an equal amount of wet sewage sludge. In addition, industrial and commercial establishments produce daily an amount of solid waste at least five times, and perhaps as much as ten times, that produced by households. Additional large quantities of gaseous and liquid wastes are discharged into the atmosphere and into our rivers and lakes. By far the largest share of such activity takes place in and around our urban areas. As urban population continues to increase, waste disposal, as a concomitant to the generation of waste, becomes critical to urban survival.

How should we tackle pollution and the associated degradation of our environ-

ment? Many proposals put to us reflect the same policy-oriented bias toward attacking effects rather than causes that was noted critically in Chapter I of this report. Recently, however, there have been indications of an emerging tendency to shift from discussion of pollution itself to a more comprehensive view of pollution as one facet of an urban-industrial society. Pollution should be recognized as related to a chain of cause and effect that reflects back on increasing depletion of a limited supply of non-renewable resources.

This more comprehensive view has led many to the concept of recycling—i.e., the re-introduction of a spent product or material into the productive economy in a manner that will provide additional utility to man. Emphasis on waste as a part of a total system and on recycling as a key to both the greater efficiency of the system and ultimate improvement of quality of life could give rise to a new orientation of technology based on the value of lasting performance rather than on built-in obsolescence. We will return to recycling in this chapter; first, however, we need to discuss in some greater detail some aspects of the problem of waste as a part of today's urban problems.

A distinction should be made between (a) waste disposal and (b) the treatment of wastes. Waste treatment is a phase of waste disposal: it entails the partial removal of pollutants from a mixture of substances. Even after such treatment, significant disposal problems remain. One would think that, at a time when we are already beginning to consider ultimate problems of disposal in terms of possible re-utilization of "waste" in the production process, the existing technology at least for waste treatment would be fully exploited. This is far from being the case in Canada today. Let us take the example of liquid wastes: with half of our population living in metropolitan areas of over 100 000 people, we find that 42 per cent of the population living in these larger centers is not even served by primary treatment facilities; only 35 per cent of the population in such areas is served by

secondary treatment.⁶ This is quite unacceptable, given present-day standards and objectives, and with the level of technology that *presently* exists and *could* be utilized.

The impediment here is not primarily the level of available technology, though additional work should be done to review standards and methods of waste-water treatment and to provide guidance for construction of new, and urgently needed, treatment facilities. As in other areas, an impediment to application of technology to *this* urban problem is the financial situation in which municipalities find themselves. If they are to make the heavy capital expenditures required to develop or expand treatment facilities, they need both financial support and guidance on the nature of long-term performance requirements, and on the possibilities of recycling and of integration of treatment facilities with those used for other liquid or solid waste streams. At a minimum, it appears to the Science Council that guidelines that could aid the cities in making the best use of expenditure on new treatment facilities are an urgent and immediate requirement in Canada.

Associated with waste treatment as a present-day problem is the question of produce packaging. Increased use of packaging, often in multiple layers, contributes to increased litter, the rising cost of waste collection, and in some instances (as with non-degradable plastics) great difficulties as regards either ultimate disposal or possible recycling. In addition, since packaging does utilize various non-renewable resources, we are faced with the question of whether we can indefinitely increase our use of packaging materials at the same rates as have prevailed in the last 10-25 years. A five or ten cent chocolate bar may involve the use of two or three layers of packaging for the bar itself, plus additional packaging at the grocery display stage, the shipping stage, etc. In some

instances (particularly lower-priced consumables), the cost of disposing of product packaging may be as high as, or higher than, the original purchase price of the product.⁷

Quantity of refuse is an important factor in waste disposal. Its composition can be of even greater concern, since the variety of materials involved in the total complex of waste causes difficulties in various disposal methods. Thus, degradable materials are more of a hazard when we use landfill techniques than are inert materials such as plastic and glass; but in incinerator operations, certain non-degradable materials such as plastic containers create problems. Potential recoverability of materials should be considered. The use of certain materials for packaging, even in greater quantities than at present, might in some instances even be encouraged, provided that they are reclaimable and that a reclamation process is established.

Governments are showing an increasing interest in various aspects of produce packaging. As they move into this area, they should attempt to develop integrated guidelines for packaging, taking into account the need to reduce the disposal problem, to encourage the use of those packaging materials that are more amenable to recycling than others, and, in the longer run, to shift the burden of raw materials for packaging away from the scarcer of our non-renewable natural resources.

Packaging materials are one important component, but not the only one, in refuse. In this category of waste we also include: garbage, litter, abandoned household goods, ashes, abandoned vehicles, demolition and construction wastes.

The most comprehensive recent account and evaluation of municipal waste disposal has been provided in the report that Clark and Brown prepared for the Ontario

⁶Hugh R. Eisenhauer, Water Pollution and Control in Canada, Paper presented at ACS/CIC Joint Conference, Toronto, May 26, 1970.

⁷In New York State, the cost of collecting and disposing of non-returnable bottles has been estimated at 30 cents per unit (*Industrial Research*, November, 1969).

Economic Council.⁸ Among the problems cited by these analysts are the gaps in Canadian data on waste disposal, our inexperience in the operations of newer systems of waste disposal, and the long-standing bias that has existed in favour of dealing with the waste stream in terms of destruction or permanent disposal to the detriment of recycling. Clark and Brown document the fact that the largest share, by far, of the total cost for municipal "garbage disposal" is attributable to collection. For many communities, a cost of \$8 per ton for collection is normal, as contrasted to \$2-\$3 per ton for disposal. This has important effects on policy. While many communities, according to these findings, tend to regard collection costs as relatively irreducible, they exert stringent control—often to the detriment of long-range planned development of waste treatment and disposal facilities—over the costs at the disposal end of the process. Clark and Brown recommend a review of collection procedures and methods, with a view to redressing the balance in favour of greater cost-efficiencies in collection and a sounder approach toward investment in waste disposal facilities designed to serve the long-range needs of the communities.

Liquid industrial wastes are among the most difficult and expensive to deal with, because of their great variety. Substances included in liquid industrial waste may be inflammable or explosive, toxic to micro-organisms, corrosive, radioactive, or otherwise dangerous. Even the "safer" liquid industrial wastes tend to be malodorous or undesirable for other reasons. Existing disposal practices vary widely. These include trucking to landfill sites or to disposal lagoons, treatment by the industry that generates such wastes or by an associated industry with a view to recovering salvable constituents (partial recycling), incineration in specially designed facilities, treatment of liquid wastes to a degree sufficient to permit discharge,

deep-well disposal (to strata several hundred feet below the water table), and encasement in special containers prior to disposal in specially-designated locations; in addition, various of these methods are sometimes used in combination.

Many industrial wastes are generated in small batches. Although these wastes may contain substances that could be re-utilized in production processes, such substances are often too small in volume to make their use economically feasible. The Metropolitan Toronto region does not currently possess a site for disposal of liquid industrial wastes. Disposal of liquid into sanitary landfills has been prohibited because of the potential leaching problems caused by such practices. An interesting development is the announcement by Acres Ltd. of the construction of a closed-system treatment facility for liquid industrial wastes. Facilities of this kind hold real promise of a much greater extent of recycling of waste. Many industries produce wastes of which the composition and characteristics are virtually unknown. In addition, when wastes are generated they are frequently combined before they leave the plant or before they are trucked away. Consequently, treatment of the wastes is frequently not possible. Variation, over a period of time, in the quantity of waste and in its composition also tends to reduce opportunity for re-use. For example, salvage industries frequently cannot reclaim materials economically, because incompatible materials, which are individually reclaimable, have been mixed (beverage cans with aluminium tops and steel bodies).

Another category of waste includes the by-products of treatment and of pollution control: waste treatment sludges; water treatment sludges; by-products of air pollution control. Sludges from waste treatment are produced by gravity sedimentation or other solids-liquids separation processes, with or without the use of chemicals. Such sludges may be biological, organic or inorganic in character; frequently they are of mixed character. These sludges are attractive to rats and

⁸R.H. Clark and J.H. Brown, *Municipal Waste Disposal, Problem or Opportunity*, a Report to the Ontario Economic Council, February 1971.

other vermin, and provide breeding sites for flies. The cost of de-watering sludges must also be considered. In addition, such sludges may include phosphates, which tend to leak into water ways, as well as pathogenic organisms. And of course, sludges are unpleasant to our senses.

The sources of air pollution are manifold: power plants, incinerators, manufacturing establishments, domestic and commercial furnaces, motor vehicles, etc. A wide variety of particulate matter is generated and, where air pollution control systems are installed, has to be collected. The magnitude of this problem is indicated by the following data: municipal incinerators generate approximately 17 pounds of particulate matter per ton of refuse burned. This means that an incinerator which burns a thousand tons per day generates approximately six thousand tons of particulate matter per year that, somehow or other, has to be disposed of. An estimate of the amount of particulate matter generated in the operation of stationary combustion equipment in all of Canada is in the order of one million tons per year. If this particulate matter were collected by using various types of wet scrubbers, as much as 10 billion gallons of liquid effluent would be collected which would require further treatment. At present, the methods for disposing of the by-products of pollution control facilities include incineration, land disposal (burial, spreading on farm land), and stock-piling for pickup and use as soil conditioner—or a combination of some of the previous methods. As we develop new facilities for air pollution control, the amount of by-product waste thus generated may render existing methods of disposal, which are relatively primitive, increasingly unsatisfactory.

The above paragraphs have delineated some of the components of the waste problem, treated as separate entities. In large measure, this is the way in which we have viewed the problem in the past. But as with other aspects of our urban dilemma, the fragmented approach to urban

waste is clearly inadequate. We cannot think of air pollution, or of water pollution, as isolated problems which can be “solved” independently of each other. What is already required, and will become more urgent in the future, is a comprehensive view of the problem, an approach to waste management in terms of a total system.

At present, our economy is characterized by a “production-waste cycle”. This cycle starts with extraction of resources from the environment, and proceeds through production and packaging of finished goods to use, generation of waste, and ultimate return to the environment. Our needs, real and perceived, are indeed satisfied by such a process. But the cycle also entails short-term annoyance and inconvenience and long-term environmental degradation. The newer approaches to waste management (recycling especially) involve attempts to intervene in key phases of this cycle and to apply existing and emerging technologies in the effort to reduce the strain on the environment and to enhance efficiency in the use of resources.

In a comprehensive view of waste management, the setting is indicated by a diagram (Figure 2) in which the production system relates two elements of increasing significance for the Canadian economy and society: resource utilization (input to production), which should be increasingly oriented toward a more intensive strategy, and waste management, where our aim is the minimization of ultimate waste (end-product of production and use). Here, the Canadian economy is viewed as consisting of the total of a large number of operations as diverse as the manufacturing process undertaken by a corporation or the use of a particular consumer good by an individual. Each of these operations requires one or more inputs and results in one or more outputs. Output, sooner or later, will result in a waste: e.g., as by-product of manufacturing or as end result after use of a product. These principles are valid even as regards treatment of identifiable waste streams.

Here, our aim is to take the input, the waste stream, and process it so as to produce as an output a stream of water or air that is cleaner than it was before such treatment. But there still remain other outputs that are classified as wastes—e.g., the sludges that remain after treatment.

Recycling interposes into the production-waste cycle a loop whereby some wastes are retrieved as materials (or, perhaps, in future, as energy sources) and fed back as inputs to the production processes. A zero level of *ultimate* waste (as can be seen from Figure 2) would involve a complete recycling as a feature of our economy; this, of course, is an impossible goal. But in the search for a general strategy of resource conservation and waste management, there are a number of broad options:

1. The level of gross output may be decreased;
2. Whether or not gross output is decreased, its composition may be changed;
3. Technologies which minimize residuals may be used in the productive processes and/or the treatment of wastes;
4. Greater use may be made of by-products in production processes;
5. Some wastes may be recycled into the production process.

In the industrialized societies, reconsideration of a growth-oriented approach to economics has begun. Such reconsideration ranges from cautious questioning of the tendency to emphasize Gross National Product to the more holistic “zero-growth” approach (often associated with proposed stabilization of population). Much of the discussion is still at the advocacy stage; only the beginnings are to be seen of empirical consideration of what would be involved and what its implications might be. Discussion of this approach at a level of understanding, and with sufficient detail, to provide a basis for policy is still far off into the future. In addition, it is doubtful whether stabilization of growth or decrease of output, even if desirable, could be implemented on a national basis; a complex readjustment of the international economy would

be required. In rebuttal of the zero-growth position, the Deputy Secretary General of the Organization for Economic Co-operation and Development, Mr. Gérard Eldin, has pointed out the need to also consider the fact “...that present environmental problems result largely from past neglect which has allowed towns to deteriorate and waste to accumulate”.⁹ In his view, arresting growth “would only make the application of remedies more difficult”.

Changing the composition of output is closely related to a re-definition of what we mean by growth, and of what is encompassed by the productive economy. This approach has received much more widespread attention than growth-reduction, and, in theory at least, is more acceptable to many analysts and practitioners of public policy. What is involved, in Mr. Eldin's view,

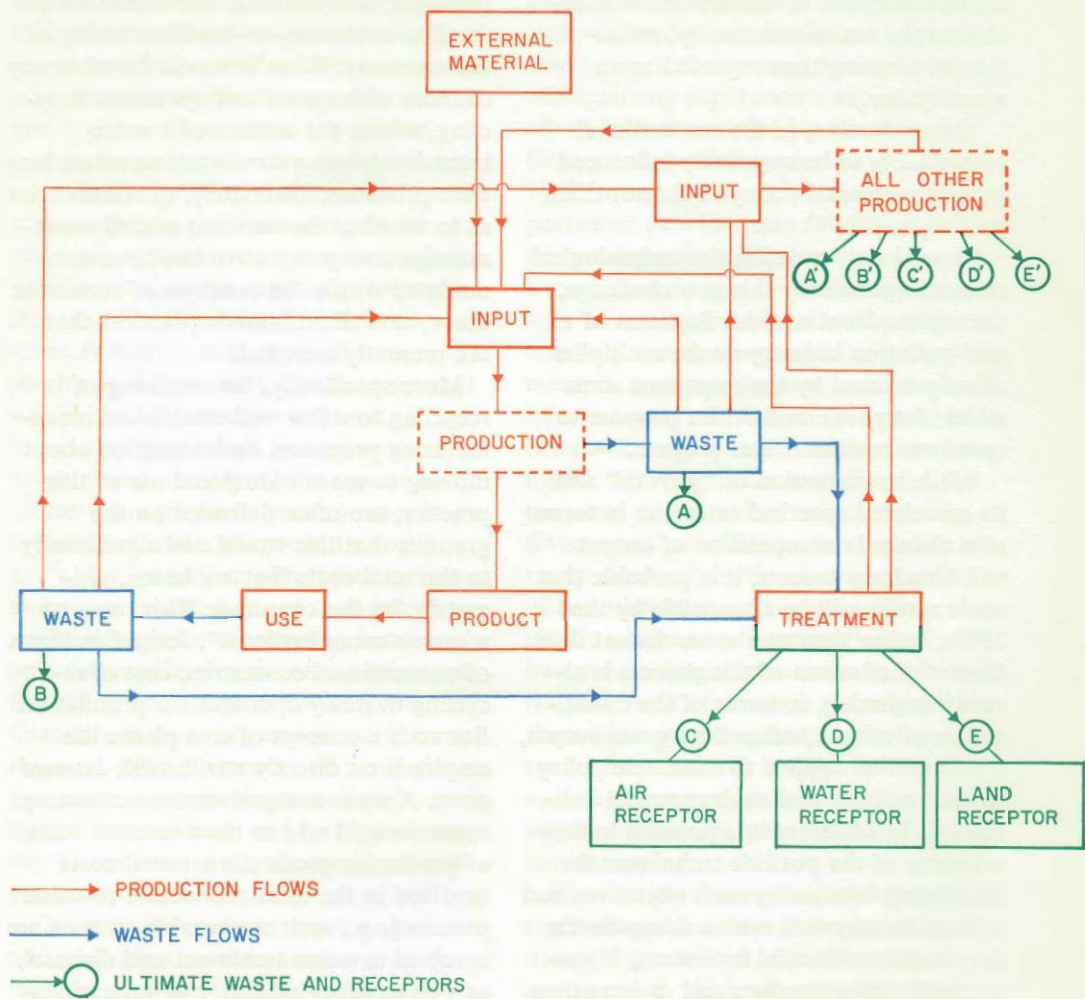
“...is to challenge growth as now measured by such economic indicators as GNP and to suggest that if GNP were corrected for such negative factors as deterioration of the environment, growth would be nil or almost nil.

“...Just what is economic growth other than a reduction in the scarcity of goods and services? So long as goods such as pure air, unpolluted water and amenities derived from nature or a pleasant environment were regarded as “free” goods belonging outside the economic sphere, it was quite legitimate not to account for them. Today an altogether different situation has arisen—to make these goods less scarce is to add to the world's assets and to increase human satisfaction. It thus means contributing to economic growth taken in a broader sense than the mere expansion of production, which itself is but one means of better satisfying man's needs.

“Extending the goals of economic policy to embrace a new ‘quality of existence’ concept is apt to change the alloca-

⁹Gérard Eldin, “The Need for Intergovernmental Co-operation and Co-ordination Regarding the Environment”, *OECD Observer*, February, 1971, p. 5.

Figure 2-Inter-Industry /Environmental Model



tion of resources significantly (structure of consumption, needs met by private consumption as compared with the consumption of services made available to the entire community, reduction of working time regarded as an amenity, etc.).

"Is production, in the conventional sense, likely to be negatively influenced by environmental policy? I do not think so....

"I need only mention the technological research spurred by this new challenge, the rapid advent and development of an anti-pollution industry or the multiplier effect produced by the enormous sums which the public authorities propose to spend on environmental projects."¹⁰

While re-evaluation of "growth" and its associated practical extension in terms of a change in composition of output will be a long process, it is probable that some results will be discernible by the 1980s, rather than at a more distant date. Operationalization of this process is already beginning, in terms of the investigation of criteria, other than gross output, that could be applied to economic policy (social, cultural and environmental indicators). In addition, it is possible to foresee some of the possible techniques for translating into policy such objectives and criteria as may well evolve alongside the development of social indicators. Hypothetically, tax incentives and disincentives might be used as a main tool for implementing policy. In addition, recent initiatives taken by private firms and some government agencies in various countries, to write into procurement contracts (e.g., for stationery and packaging) the use of a percentage of recycled material, might be more widely emulated.

Greater use of by-products (a long-standing and profitable process in some industries, e.g., petroleum refining and slaughtering) is really the first phase in the more general practice of recycling. In these terms, recycling is by no means new; to a limited degree, it has been practised for generations. The processing

for re-utilization in production of used car hulks and other sources of scrap metal, of newspapers, glass, and other products, is something with which we are familiar in the day-to-day functioning of the economy. What is new is the advocacy of more widespread and systematic recycling, within the context of a value-intensive debate over short-term versus long-term priorities. Ultimately, questions arise as to whether the resource-related waste-management perspective can be accommodated within the concepts of economic theory and the economic practices that are presently accepted.

More specifically, the confining of recycling to a few well-established manufacturing processes, and hesitation about moving to more widespread use of this practice, are often defended on the grounds that this would add significantly to the total costs that are borne, ultimately, by the consumer. This turns on what we mean by "cost". Judged in terms of conventional economics, cost of recycling in many operations *is* prohibitive. But such a concept of cost places the emphasis on directly attributable *internal* costs. A more comprehensive accounting system would add to these internal costs of producing goods the external costs involved in the total production-to-waste process (e.g., such measurable costs as are involved in waste treatment and disposal, as well as some indication of intangibles involved in environmental decay, discomfort, etc.). Even more comprehensively, from a national welfare point of view, a pricing system should take account of increasing scarcity of resources. It is ironic in this connection that through the mechanism of depletion allowances the incentive is precisely the opposite, i.e., favouring rapid exploitation of non-renewable resources. Thus, a new look along the lines indicated in the discussion of the more sophisticated approach to growth may well result in the balance of "costs" being altered significantly in favour of incorporating greater recycling into our total economy.

As a concept, recycling has few overt

¹⁰ *Ibid.*

opponents. As a practice, recycling has only a few adherents. The dichotomy between the support for the concept, and its implementation in practice, is due largely to the way in which we assess costs. To assess recycling would involve a study of aspects of the Canadian economy that goes beyond the scope of the present report: for example, it would be necessary to evaluate the effect that policies aimed at encouraging the wider practice of recycling would have on the competitive position of Canadian industry vis-a-vis that of other countries. The Science Council believes that, given the complexity of such a study and the time that would be required to carry it out, governments should soon set in motion the procedures for studying the economic incentives required to promote greater recycling of materials presently considered as "waste", together with the economic and social implications of such incentives.

The economics of recycling is not the only factor affecting the extent of its use. Recycling poses a great challenge to Canada's engineering and scientific communities. New processes and methodologies will have to be discovered and developed. This challenge can be as great as any that science and technology have as yet faced.

Other considerations centre on public attitudes. How would consumers accept recycled products? Given our lack of experience in this area, some initial failures in practices should be reasonably anticipated; would the public tolerate these? Ultimately, a massive technological shift is entailed; would the public have the staying power to support these programs politically, in the interests of better resource utilization and more effective control of wastes and pollutants? In the long run, each of these problems could be overcome. But this will require that Canadian society takes a more comprehensive and longer-term view of its relation to the environment, and in particular to the urban eco-system, than has hitherto been the case.

Finally, though our greater emphasis

has been on the need to explore the practicability of recycling, we would be remiss if we neglected to touch on the problem of jurisdictional confusion, or lack of jurisdiction. Conflicts of jurisdiction have existed at each level of government, among departments and agencies which have overlapping-sometimes conflicting-responsibilities for certain aspects of the waste problem. In other cases, a particular problem may fall into a jurisdictional gap between departments, and would be in danger of not being dealt with adequately. Jurisdictional problems may also exist among levels of government. A municipality seeking to deal with its own waste problems may be subject to competing regulations from agencies of a higher level of government. Finally, for purposes of waste disposal, territorial divisions of jurisdiction are often too narrowly drawn. Pollution is no respecter of boundaries. One political entity, completely without malice, may "solve" its own waste disposal problems by a process, the end result of which is detrimental to the welfare of a neighbouring entity. The need exists to clarify responsibilities for operations and regulate control among private, municipal, provincial and federal authorities.

The Science Council believes there is an urgent need to review present jurisdictional responsibilities for urban waste management. *All* levels of government should participate in such a review. Only on the basis of adequate and integrated study can better legislation be drafted for the various jurisdictions. The recent federal government reorganization plan, calling for the formation of a Department of the Environment, is a heartening step in the direction in which the Science Council believes we should be moving, and should result in the streamlining of jurisdiction and administration at this level of government. It is hoped that the legitimate concern for the total environment that led to the formation of the new Department will be accompanied by some specific urban-related programs aimed at dealing with the environmental problems

that affect the daily lives of the vast majority of our citizens. The streamlining of the regulatory approach, and the greater emphasis on long-range environmental considerations which seems to be emerging, can provide an improved framework for the development of scientifically-based standards and the emergence of greater expertise in administrative practice.

Scientific and technological advance, economic and jurisdictional reform, and changing attitudes and perspectives on the relationship between the productive economy and our total environment, can all combine to produce a retardation in environmental decay and perhaps an improvement in the eco-system within which the other aspects of urban development are to be dealt with. The challenge is great, but it can be met. However, actions consciously undertaken are necessary if the drift to further decay is to be arrested. This is part of the problem that Seymour Melman strikingly encapsulated in a single sentence: "We must cease thinking of technology as having an initiative of its own and understand it as a man-made instrument, subject in its characteristics to the requirements that man imposes."¹¹

Within the next decade, Canada will require a major, co-ordinated, and multi-faceted program to establish and enforce systemic procedures for reducing the quantities of urban and other wastes, identifying and separating residuals, and applying existing and emerging technologies to their treatment. On the basis of a preliminary study, the Science Council believes that recycling could provide a major focus for such an effort. However, the costs and the economic and social implications of a recycling orientation to the urban waste problem are not yet clear. The Science Council believes that its preliminary consideration of the urban waste problem should be reflected in this report, but that it cannot, at this time, go beyond indicating what the possibilities for a

more systemic approach might be. Accordingly, **the Science Council recommends that a detailed study of waste recycling and disposal be given the highest possible priority, either in the program of proposed National Institute for Urban Analysis or on the part of such new urban and environmental agencies as are being created by the federal and provincial governments.**

¹¹ Seymour Melman, "After the Military-Industrial Complex?" *Science and Public Affairs: The Bulletin of the Atomic Scientists*, March, 1971, p. 9.

Chapter V

Communications Between Citizen and Government

Both the role of government—as reflected in the nature of government policies and services—and the place of the citizen in society have changed markedly during the past several decades. When the bulk of our population lived in rural communities and small towns, it was relatively easy for the citizen to obtain information about government policies and services through *informal* mechanisms. The citizen could approach his clergyman, doctor, or other community notable as the source of information. Today, the problem of informing the citizen about governmental programs, and conversely, informing the various levels of government about the needs and desires of the citizen, has become quite severe. The scope and extent of government programs have increased to such an extent that those people who were formerly sources of help and assistance to their fellow citizens are often themselves inadequately informed. This problem arises with particular urgency in the larger cities of the country and among those citizens who are most in need of information—the poor and those who are otherwise disadvantaged.

In previous chapters we have addressed ourselves to “harder” problems, such as transportation and housing. There can be no doubt, however, that the “softer” problems, such as the one discussed in this chapter, urgently require answers if we want to make our urban society a more humane one in which to live.

The Science Council arranged a survey in the Montreal and Toronto areas to test whether individuals are adequately informed about the various services presently available to them. The results of this survey confirmed the finding of the federal government’s Task Force on Government Information:

“...our research suggests that...the gulf between the educated thinkers who participate in ruling the country and the more poorly educated, who are ruled, is still very much in existence in Canada. The government information services do not appear to have helped close this gap,

and the way things have been, and the way they remain, is that all those people who have the deepest need for the services of the federal government are exactly those people who are least likely to know anything at all about these same services. They are the least sure of where to find information and, at the same time, the most timid or reluctant to seek it. When it comes to exploiting their full rights as citizens of Canada, they have a powerful handicap.”

These findings apply not only to the federal government, but to the other levels of government as well. The Science Council survey was directed not to the whole populations of Montreal and Toronto, but to that part of the population in each city which is less well off. Not surprisingly, the existing channels of communication between these people and their governments are even more inadequate than are those for other socio-economic groups.

The problem of government-citizen communication is admittedly complex. It may be divided into four broad areas: general information; specific information; service; and participation.

General information encompasses information that public authorities intend for the community as a whole. The need here is to use the most efficient means available in order to inform the greatest possible number of citizens of the nature of the services and programs provided by government in response to a perceived collective need. The Science Council does not wish to engage in a detailed critique of deficiencies of present information programs of the various levels of government.

A horizontal integration of information has recently been initiated at the federal government level to deal, in particular, with the need for general information (as defined above). Information Canada’s main functions are four-fold:

1. To initiate information programs on broad subjects, such as federalism, which

affect the nation as a whole, and which go beyond the responsibilities of departmental information divisions;

2. To promote co-operation among departmental and agency information offices in major information programs;

3. To advise and service, on request, departments and agencies;

4. To help Canadians get across their viewpoints to Parliament and government. To the extent that Information Canada is able to carry out these functions in the years to come, it should contribute greatly to the dialogue between citizen and government *at the Federal level*. Its broader objectives, as defined in the most recent edition of the federal government's organizational manual, highlight the kind of service function (in the general information field) that all levels of government will, increasingly, be called upon to perform:

"The organization's two main sections, Information-in and Information-out, reflect its aim of assisting in the dialogue between Parliament and the government and the people. Eventually, Information-in will have enquiry centres across the country where citizens will be able to ask questions, receive information and buy books and periodicals. It will arrange summaries of the printed and electronic press and collect and make available to the public surveys of opinion. Information-out will include publishing, audio-visual and exhibition expertise and a small communications group to initiate and co-ordinate some information programs."

Even Information Canada, however, may find its resources significantly taxed in providing general information; the need for specific information (as defined above) may require further organizational development, even at the federal level, if it is to be met at all adequately. We would like to point out, moreover, that there is an urgent requirement, in terms of the needs of the users of information—the citizens of Canada—to co-ordinate services

among the three levels of government. So far, little has been done to move toward such co-ordination. **Such co-ordination seems essential.** The problem is compounded: not only are information services at each level of government isolated from counterparts at the other levels, but our findings confirm that lack of co-ordination still exists between different departments of the same government. It is a considerable challenge to bring the various departments of any one government or municipal administration together in a unified information program; it may appear almost impossible to seek the participation of all three levels of government in the setting up of integrated machinery to meet public needs in the information field. The fact remains, however, that the need for an integrated system for social communication is as essential and urgent as the need for a joint attack on many more obvious problems. The public, as consumer of necessary information, cannot be expected to wander about a congeries of offices to seek out available information vital to its everyday needs.

The Science Council investigated in more detail *specific information* needs. Here, the communication process must respond to the needs of tens or hundreds of thousands of citizens in special circumstances. First, there are those that are not reached by general information. Others, vaguely aware of a particular program, need more detailed knowledge so as to establish what their rights are under the program, and where and how to claim their rightful due.

The communication process pertaining to specific information should be a two-way process. Not only should governments inform the public, but equally importantly the citizen should be offered ample opportunity, and indeed, should be actively encouraged, to express their reactions to the services offered them. Therefore, a feed-back mechanism should be built into the process. The Citizens' Advice Bureaux in Britain offer an ex-

ample of such a specific information mechanism. The purpose of the Citizens' Advice Bureaux in the United Kingdom is to provide the individual with reliable information and skilled advice on problems that arise in everyday life, to explain legislation, and to help the citizen to benefit from and use wisely the services provided by the state. However, the Citizens' Advice Bureaux do more than that. They acquire a unique range of knowledge of individual and community problems having to do with the adequacy of services. This knowledge is a very valuable input to refining the government-citizen relationship; the bureaux help in appraising the quality and adequacy of services, in considering the need for new legislation, or in developing changes of procedure or administration. *In Canada, there is no network comparable to that of the British Citizens' Advice Bureaux*, although several Canadian cities have agencies set up by welfare councils which pursue similar objectives but with more modest means. Examples of prototypes of this kind of service are the Referral Centre of Montreal and the Information Service of Toronto.

Service is the third area of concern. City planning specialists and others face a formidable task as they try to rationalize the development of our cities and to help correct the many anomalies which have been allowed to take root by neglect in the absence of planning. One of these anomalies is the dispersion of public service distribution points in most of our cities, an oversight which is costing citizens dearly, socially as well as in financial terms.

An awareness of this gap has begun to develop. Pressure has been mounting from users of services and has melded with the clear-sightedness of a number of social workers and activators in various professions. Both the social agencies and the public service administrators are showing an increasing interest in the possibility of grouping services so as to increase their social effectiveness.

This subject should be the theme of a broad research program, in its own right, especially if the simple idea of physically grouping service points within neighbourhoods is expanded to embrace the much more complex notion of co-ordinating various government programs so as to maximize effectiveness for the user—the citizen.

Once again we deal, not with utopia, but with a basic need that has already been realized to some degree. A modest start has been made in some communities. For example in the Montreal area, a community centre and a services centre has been set up in the Pointe Saint-Charles and Sainte-Cunégonde districts. In March 1968, three social agencies decided to open offices in the same premises in Pointe Saint-Charles. In less than six months, eight other services joined them. Today the Pointe Saint-Charles Community Services Centre houses eleven agencies, five of which employ full-time staff. Services offered by the centre already cover the following sectors: social service, advice to consumers, placement in manpower, recreation, financial help and vocational guidance. This, however, is *only a modest start*; there is still a great deal to be done to rationalize the development of community services.

The fourth general area of concern is that of *participation*. We are increasingly aware that democratic society must favour maximum citizen participation in the decisions that determine the development of communal life and, thus, the structure and content of the individual life as well. How can this be achieved? Certainly, Canadian society has not yet come close to perfection in this field. It is encouraging to note that many people are becoming as anxious over the apathy of a growing proportion of citizens toward the source of decisions as they are over the desperate and destructive character of certain forms of participation. The discouraging complexity of social and political institutions, contributing to what is commonly summed up as "alienation"—the obverse of participation—

is doubtless at the root of both social withdrawal and, probably, violent protest.

The minimum responsibility of the public authorities in the area of participation by citizens is to furnish them not only with good information and services that meet their needs, but also with an input structure that encourages participation in all its forms.

Among the four general areas discussed above, we have chosen to emphasize the area of specific information. The goal in this particular area is to provide the citizen with the means of obtaining freely, rapidly, easily, and in an atmosphere of courtesy and interest, information on government programs that he or she is in need of. The Science Council wishes to stress that *the problem must be tackled from the point of view of the citizen*, rather than that of the governments. To the citizen it matters little whether a service is provided by the federal, the provincial or the municipal level¹²; he is, and has a *right* to be, interested in the service provided rather than who provides it. The implication of the foregoing statement is an intergovernmentally-funded service that, in its operation, is independent of any government. Some urban areas already have an embryonic service of this kind. Logically, these existing mechanisms should be expanded into the type of service agency that we believe is needed.

So far we have mentioned only the establishment of contact between the citizen and the required government office. However, in some cases it will be necessary to go farther than that. Once the citizen has established contact with the appropriate agency, there is no guarantee that he will obtain the required service, though he may well be eligible for it. Or alternatively, the problem the citizen tries to have solved may not always be the basic one he requires an answer to. The

service should, therefore, in some instances be an advocate or a source of advice for the citizen as well. In this connection, it is worth noting that the Manitoba government is now considering whether to organize its existing consumer protection agency in such a way that that agency will also service the information needs of the citizen.

Furthermore, though we have stressed the interest of the citizen, the usefulness of such a service to governments should not be overlooked. In fulfilling its primary function of giving information to the citizen, the service will be a main feedback linkage to the public authorities and other interested bodies (i.e., universities, private public-interested organization). To fulfil *this* function adequately, it will be necessary for this service to have on its staff competent social scientists to monitor and gather data in usable form and on an ongoing basis.

The ultimate goal would be a national network of information bureaus. Technology, including social techniques as well as hardware, can and must be brought to bear on this network. Earlier, we indicated the indispensable need for competent social scientists; it will be equally necessary to use the services of communication experts and computer specialists. Here is an area where it may be possible to reverse present fears, or at least insufficient appreciation, of computer technology by demonstrating, concretely and at a level where the citizen can claim his share of socially-induced technological growth, the benefits of the cybernetic revolution.

Although the ultimate goal is a national network of information bureaus, an immediate objective should be to establish a number of pilot projects. It is suggested that an immediate start be made in each of the five major regions of Canada—the Maritimes, Quebec, Ontario, the Prairies, and British Columbia. Although, as noted earlier, the service should be independent and outside existing government structure, it is suggested that the *funding* be done through a shared-cost program by all levels of government.

¹² Examples of the bewildering array of government offices that the average citizen may at one time or another have to deal with are outlined for the cities of Montreal and Toronto in Table 2.

Table 2—Government-Citizen and Citizen-Government Communication

Information Counters in Montreal

A. Municipal and community services	B. Provincial government services	C. Federal government services
Social Welfare Service	Family and Social Welfare Dept. (various pensions)	Canada Manpower Centres
Health Service	Quebec Manpower Centres	Family Allowances
Police Service	Rental Board	Old Age Security
Parks Service	Workmen's Compensation	Immigration Services
Assessment Service	Minimum Wage Commission	Federal Income Tax
Finance Service (taxes)		Unemployment Insurance Commission
Roads Department	Income Tax	
School Board	Quebec Pension Plan	
Social Service agencies	Student Aid	
Aid to Consumers	Quebec Family Allowances	
	Immigration (provincial services)	

Information Counters in Toronto

A. Municipal and Metropolitan services	B. Ontario government services	C. Federal government services
Metro Clerk	Department of: Correctional Services— Institutions Rehabilitation	Department of: Consumer & Corporate Affairs
Dept. of Emergency Services		Indian Affairs & Northern Resources
Housing— Housing Registry Senior citizens apts. Home for Aged	Financial and Commercial Affairs—Consumer Protection	Manpower and Immigration Manpower Division Immigration Division
Licensing Commissioner	Health— Ontario Hospital Services Com. (O.H.S.C.)	National Health & Welfare Canada Pension Old Age Security Family & Youth Allowances
Parks Department	Ontario Health Services Insurance Plan (OHSIP) Mental Health (Ontario Hos.)	
Planning Board		
Police Department Roads and traffic	Justice— Provincial Courts Division Court Probation Services Legal Aid Plan	Veteran Affairs—Canadian Pension Com. D.V.A. Welfare Services
Welfare Department		Unemployment Insurance Commission
Metropolitan Separate School Board	Labour— Employment Standards Human Rights Industrial Training	National Revenue— Income Tax
Toronto Transit Commission	Provincial Secretary and Citizenship— Registrar General	Secretary of State— Citizenship Branch
Catholic Children's Aid Society		Post Office
Children's Aid Society of Metropolitan Toronto	Social and Family Services Family Benefits Vocational Rehabilitation Indian Community Development	
Public Library	Trade and Development Ontario Housing Corporation	
	Workmen's Compensation Board	
	Air Pollution	
	Liquor Control Board	

Federal funding might be channelled through the Department of Communications, Information Canada, and, where appropriate, the Department of Regional Economic Expansion, while provincial funding could be accomplished through the appropriate departments in each participating province.

In summary, due to a breakdown of the conventional channels of communication between citizen and government, and due to rapid urbanization, the communication between governments and their citizens has severely deteriorated. The need for this kind of communication is particularly acute for the people occupying the lowest strata of society. These people, in need of and eligible for services provided by the government, have inadequate means of getting to know about them and thereby obtaining them. The difficulty is compounded by the fact that the multiplicity of services is spread out over three levels of government. In looking at this area of concern, the Science Council found that the need for improvement was very great. Therefore, **the Science Council recommends that the different levels of government initiate the funding of an independent network of information bureaus. The functions of the bureaus will be to provide the citizen with access to required government programs, and to provide governments with feed-back on the adequacy of government programs. The immediate objective is to establish a number of pilot projects in the five major regions of Canada, and the ultimate goal, a national network of information bureaus.**

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