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WORKSHOP

INFRASTRUCTURE AND HOUSING: CHALLENGES AND OPPORTUNITIES

JUNE 18 AND 19, 1992
LONDON, ONTARIO

WORKSHOP PROCEEDINGS

Sponsored by:
CANADA MORTGAGE AND HOUSING CORPORATION
and
THE CANADIAN HOME BUILDERS' ASSOCIATION

Hosted by:
THE CENTRE FOR STUDIES IN CONSTRUCTION

The UNIVERSITY of WESTERN ONTARIO

WORKSHOP PROCEEDINGS

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JUNE 18 AND 19, 1992
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Prepared by REIC Consulting Limited

June 1993

Cette publication est aussi disponible en français
sous le titre "Délibérations de l'atelier - Infrastructure
et habitation: enjeux et options".

Foreword

This workshop was held to examine economic and social issues related to the state of Canadian infrastructure, its expansion, maintenance and renovation.

The first day of the workshop assessed the current infrastructure situation in Canada and then, discussed and assessed alternative approaches aimed at reducing the cost of infrastructure through technical innovations and alternative planning approaches.

The second day began by focussing on the implications of various means of financing urban infrastructure and then moved on to an examination of the role of infrastructure in the economy and its relationship to international competitiveness.

Approximately 50 people attended the workshop. Participants included infrastructure experts from industry, universities and governments of all levels.

Papers had been commissioned to form the basis of the discussions. At the workshop, the presentation of papers was followed by panel discussions, question periods and general discussions. The following served as background papers for the discussions:

- "Urban Infrastructure in Canada" prepared for the Organization of Economic Cooperation and Development by Canada Mortgage and Housing Corporation
- "Municipal Infrastructure: Achieving Cost Efficiency/Effectiveness Through Technical Innovation" by Tom Field, CH2M Hill Engineering Limited
- "Achieving Infrastructure Cost Efficiency/Effectiveness Through Alternative Planning Approaches" by Marshall Macklin Monaghan Limited
- "Achieving Infrastructure Efficiency" by IBI Group
- "Financing Municipal Infrastructure: Alternative Methods" by Informetrica
- "Reinvesting in Infrastructure for Economic Growth" by A. S. Rakhra, Industry, Science and Technology Canada.

Copies of these papers can be obtained by contacting:

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OPENING REMARKS

- BY JOHN BRANT
BOARD OF GOVERNORS, UNIVERSITY OF WESTERN ONTARIO

Welcome to the University of Western Ontario. Western, of course, is very proud of its tradition in teaching and research, but a function such as yours today is really the third leg of the university's responsibility, that is its relationship to the rest of society — to the community. An institute such as the Centre for Studies in Construction is able to provide the direct link between those who are living the day-to-day issues in the community, and the university's academic and research activities.

I would like to offer some comments on my recent activity as the arbitrator for the London area boundary dispute. In entering this, I had no preconceived ideas. But there are a couple of things that I learned for sure. One is that the province of Ontario clearly understands that there are a number of municipalities in Ontario, with London being a great example, that have the financial wherewithal to create growth in the economy. And one of the reasons the province has felt it was so important to proceed with a resolution to the dispute was to free up the potential for economic growth that London has by developing new infrastructure.

They understood that as a straight economic issue. It has nothing to do with the potential of new people coming to London; it has nothing to do with whether London needs more infrastructure. It has to do with London's ability to spend the money. They know London can spend the money without a lot of provincial support and that was a clear driving factor. From an economic point of view, that may be a very, very important factor in decisions about where higher levels of government will allocate funds.

A second insight has to do with government resolve on social issues. As I asked certain questions of various sources I had in government, I found that on some issues you never get the same answer twice. I have no idea what this province intends to do on centralized sewage treatment plants for septic tanks. The answers that I got ran all the way from one end to the other.

But there was one issue on which they were unwavering and that had to do with housing density. There is no doubt whatsoever in my mind that within the next two years, this province will have very, very strong definitive policy on making housing more dense than it has been in the past. I do not know how they are going to do this but I think that it will go down in history as one of the things that this government has done.

It comes directly out of the work that John Sewell is doing and I think that there is such strong support for it that it will come through in a very definitive way, in a way that is made meaningful because by that time, they will understand how to make things happen. And so I think that you will see within a couple of years, very definite legislation that says housing shall be more dense in the built-up areas of Ontario.

I hope you have a good session. I know there is great potential for learning. There is a great resource here at the University; take advantage of it. Get to know one another and have a great meeting. Thank you all.

- BY DOUG STEWART
CANADA MORTGAGE AND HOUSING CORPORATION

It is my pleasure to welcome you on behalf of Canada Mortgage and Housing Corporation and the Government of Canada to this workshop where we hope to deal with a number of important challenges and opportunities that face us in improving and maintaining Canada's infrastructure.

I am very encouraged by the diversity of interests that are represented here. We have people from many walks of life, from all levels of government, from different parts of the private sector. I think this diversity can do nothing but encourage a very productive discussion over the next two days and I am very pleased that you have been able to take time out of your busy schedules to join us. I hope you find it worthwhile. I am particularly grateful to our panelists who have agreed to share their special knowledge and expertise in this area. I think we have assembled some of the best minds that are currently working in this area and I know we are going to profit from this over the next couple of days.

We are hoping that in talking to many people and hearing what they have to say, you will come away with new perspectives on what we can do to maintain our infrastructure and make sure that it will be there for future generations. Thank you very much.

- BY GARY REARDON
CANADIAN HOME BUILDERS' ASSOCIATION

Just over a year ago as the incoming president of the Canadian Home Builders' Association, I asked the Minister responsible for housing to call a national conference on infrastructure. I suggested that the purpose of this conference would be to develop ways to review and address this country's infrastructure issues. The time has come, I said, for the industry to take a stand. We have a vested interest in the quality of Canadian downtowns, Canadian suburbs and Canadian housing — we built it. Confusion and inaction over responsibilities and goals and public policy has a direct impact on that quality. I also noted that a well organized, integrated, infrastructure system, is a worthy goal for Canada. And I think it is fair to say that there is widespread recognition of the crisis in infrastructure that looms before us today.

A sense of shared national commitment is more important today than ever before. As home builders, we know from experience that if you want to build something, you need more than nice blueprints and pious wishes. You need something tangible to bolt it together; a home where you cannot get from one room to another is not much of a home. We can do better. It is again time for us to get serious about the social, cultural, economic and physical links which hold our communities and our country together.

You are gathered here today and tomorrow to discuss the linear and community infrastructure question under a number of its facets - technical, planning, finance and economic growth. Our deliberations will help the residential industry develop recommendations and policies relating to the residential component of the infrastructure question. This initiative is just one element of CHBA's strategic plan, a plan that the industry developed last year and one which will set our course for this decade.

This workshop will not give us all the answers but it will set the stage. I look forward to a continuation of the healthy discussions which started last evening. Good luck and thank you on behalf of the sponsors.

DAY ONE

INFRASTRUCTURE OVERVIEW OR TAKING THE PULSE OF A SICK PATIENT

BY STEVE JANES
S.H. JANES AND ASSOCIATES LTD.

This workshop on Infrastructure and Housing: Challenges and Opportunities, is a unique event. For we Canadians, notwithstanding our current and seemingly never-ending constitutional debate, we have gathered together under an umbrella of common concern to examine a problem that all parts of the country face. From the papers, I think that in the next two days we are going to find some interesting and completely maverick approaches.

I think I should, though, clarify the title of the workshop. We have called it a workshop on Infrastructure and Housing. Possibly we have introduced the notion that we will be dealing in some depth with the provision of housing, the cost of housing or some other aspect to the public concern with this specific subject. We are not doing that. Our concern over the next two days will be with the physical systems that underpin our way of living, our infrastructure and the services that these systems provide to us. We will be looking at the financing, we will be looking at the management of infrastructure systems and their relationship to housing.

For Canadians, and people in many other countries, the physical plant that we rely upon is rapidly aging or is becoming obsolete. In many cases it is much easier to build the plant than to maintain or replace it. And as we replace it, we find that we must still maintain the original system because of our service needs. Adding to this dilemma is the fact that some of the cost of the original municipal system is often still outstanding and a financial double burden occurs.

I think our objective then in this workshop will be to look at the total picture, the life cycle planning as it applies to infrastructure, the standards we develop at the outset, the operational and management techniques we use to ensure optimum life and finally, how we implement replacement.

There is clearly a close relationship with housing. Housing choice, cost and even type are influenced by the availability and cost of specific services — sewers, water mains and roads — to give the most obvious. I believe our task will then be to examine alternate urban forms and housing arrangements from a conceptual standpoint so that an improvement is achieved in planning and managing our infrastructure.

I have carefully read drafts of all of the papers that will be presented during the next two days. Adding my experience to this review, I do not think we have any distinct society (to use the constitutional debate's vernacular) that escapes the problem we all perceive. There is unanimity on the magnitude of the problem and the inescapable consequence of mismanagement. In a few minutes, I am going to show you a slide which I found astonishing when I added up the costs of servicing a single family detached residential unit.

Every one of the authors of the papers prepared for this workshop agrees with me that the wealth and well-being of our society can be

measured in terms of the availability, quality, reliability and cost of our physical infrastructure. A low standard of roads or water supply or sewage systems translates into a poor or more impoverished society. Given that Canada is comparatively well endowed, our task in this workshop will be to develop the best planning strategy to maintain this position.

On the timetable, I do not think we have a great deal of time to do this. I was asked how long did I think? I think we have probably something in the order of 5 years to affect the planning and the next 15 years after that, we will be busy doing the financing and the development to fit. Looking around at this audience and being a realist about that timetable, you and I are going to be paying for it when we are retired and living on fixed incomes and unable to do anything more than try to stay in our own home.

There is always a strange route through which problems surface. Here in Ontario, the term 'environment' was perceived to be an issue off in some remote corner of the Province or continent that Greenpeace or Friends of the Earth tackled with the help of Reuters or Canadian Press (at least that is how we heard about it). It was never a real issue to the average Ontario household. And along came garbage, and all of a sudden the garbage issue and environment are synonymous terms and on everyone's mind. The blue box in Ontario is a symbol of your environmental consciousness. If you do not get involved in it or your neighbour is not then you or he are suspect.

I think it strange that we were able to crystallize public concern about the environment with what is probably one of the more easily solved problems. Would it not be even stranger if we found that infrastructure triggered a full re-examination of our urban structures, the way we work, play and participate in life and the way in which these systems are serviced?

The task that Alan asked me to undertake was to provide an "overview" and through this to set the stage for what I believe will be an extremely timely and significant workshop on infrastructure and housing. To help answer this challenge and provide a base for my observations and concluding remarks, I would like to use a real life case in which I have been involved for some twelve years — the community of Thornhill in the City of Vaughan, just north of Metro Toronto.

In the old pre-York-Durham days, that is when the sewage system was not in existence, urbanization stopped at Steeles Avenue, the northern boundary of Metro. There were a few historic nodes existing to the north along Yonge Street - Richmond Hill, Aurora, Newmarket. And these urban centres along with others such as Markham, Woodbridge and Maple had evolved primarily as agricultural service centres but in the mid- to late sixties were converting to dormitories for a work force that migrated largely to Toronto.

In 1970 the province, perceiving the possibilities of extensive urbanization, had created the regional municipality of York, an intermediate tier between the local area municipalities and the province. Vaughan is one of these area municipalities within the region and Thornhill a community within the area municipality.

Provision of water, sewage collection and treatment and road systems underscored the Province's rationale for creation of the regional government. My first task, incidentally, was to organize the region and to transfer the assets, (infrastructure), and liabilities, (debenture debt), back and forth between the municipalities in accordance with the legislation that created the new regional government.

By the end of the 1970s the province had created the York-Durham sewage system and with it the latent potential for urbanization became realizable.

Some nineteen developers who we call the Group, appeared before town council — Vaughan was then a town — with a scheme to develop lands north of Steeles and west of Yonge Street to the Parkway Belt. For those visitors who do not know Ontario, the Parkway Belt was one of the few surviving by-products of an earlier provincial exercise in long range planning known as the Toronto Centred Region Plan. Then it was intended to serve as an open space zone with a few utilities but now has become a utility corridor with only a few remnants of useable open space.

The scheme was intended to serve as an urban community for 75,000 people. We had at that time a town council who were used to managing the problems of 16,000 people spread over 240 square miles. And they did not know what to do with this proposal. Their primary activities up to that point had been managing roads, drains, septic tanks and fences; they truly were not prepared for this exercise.

The Group turned up with a very attractive plan for the community with a ring road, district centres, recreation facilities, libraries, firehalls and a linked open space system. All of this was packaged in a nice, attractive community plan, the prime purpose of which was to sell to the community, first politically and then to future home buyers.

At this point, some questions arose and these are the kinds of questions that I think we have to start thinking about through the next two days and I think the final wrap-up questions listed in your agenda point at them too.

- Who is the community being planned for?
- What type of housing will there be?
- What is the level of service they will need and will want?
- Who will pay for the service?
- When will the services be provided?
- How long will the services exist? And how will they be replaced and by whom?

Over the years, as this community has evolved, a vastly different and sophisticated appreciation of the driving forces behind the creation of these services has emerged.

Engineered or hard services — sewer, water mains and roads were absolute requirements and had to be built to recognized standards. They also had to be built at the outset since most of the area was literally a "green field". Soft services — recreation, parks and libraries — were partially prebuilt to help "sell" the community and then, as the users arrived, altered to satisfy their specific needs. Because of the municipality's limited experience and even more limited financial capabilities, some very fundamental questions were posed.

I repeat some of the previous ones:

- Who will set the standards? Would it be the government, the developers or the province? By the government, I mean the province or the town.

- Who will pay for the system? The new home buyer or the general public through property taxes? When we were raising that question there was insufficient capacity in terms of the financial ability of the municipality to deal with it.

- How will operational costs be handled? By the user? On a user-pay basis? By the property tax or a blend?

- Who pays to replace or upgrade the systems — the public through water rate charges for both sewers and water mains or through the property tax base or a combination?

None of that was resolved.

Looking back on this exercise, we were able to solve the question of standard of service by relying on the norms of that day and the plans presented to us by the Group. In this example we had to deal with a "surrogate population" since no residents were then in place. Remember, we were looking north of Metro Toronto into green fields and there was truly nobody in residence. They were developing a city, a small city for a population that will come in.

For the cost of the capital works or infrastructure, the Town had insufficient resources and were reluctant to burden the old residents with all or part of the growth cost, so a lot levy was developed. This is something that I am sure anybody involved in the home building business will know is a major problem today and is before the Ontario Municipal Board for the challenges raised by UDI. It is not yet resolved but is a fact that we have to live with at least for this year and next. As for the other questions, we are trying to resolve how to proceed in as fair and equitable a way as possible.

What I have said is that this new town planning process should have left us with a scene of absolute happiness, the outcome of a fully planned community, but it has not. Now we have the developers, (the same ones incidentally), fighting the level of service they help set; the public, who are now in residence, demanding even more recreation and library services but objecting to higher housing costs which is translated by the levy for hard and soft services and of course taxes to run the same system; and finally, the most difficult one, everybody split on different agendas and fighting. We have that problem in Vaughan. They are all split. Nobody has one clear direction to take.

In my view it is becoming a mess and there are no easy answers.

This was theoretically a brand new city, everything brand new — all the problems solved. But the administration is now starting to perceive the scale of the emerging dilemma that we face in common with almost every other area in the country.

A new small city has been built following the common wisdom of the times. The service standards that were developed; the planning

guidelines which evolved and set land use relationships; the technical decisions on systems; the design and materials all follow the traditional approaches of the day. All in all it was strongly oriented towards single family detached housing with an auto dominated transportation system. John Brant's comments about this government and intensification, I think, are real. Recreational facilities, libraries and other community services were designed to serve a future resident population with an anticipated average family size of slightly less than 4 with two children per household.

Now it is changing. The family sizes are dropping, the population is aging, the demand for multiple housing is on the rise, as is the demand for transportation linkages. So you may ask what is the difference between this new town as it turned out and the rest of Metro Toronto. Well culturally and economically it is the same; visually there's little difference between the densely developed scene south of Steeles in North York and the new town of Thornhill-Vaughan.

But now the problems are really emerging and they are consistent with trends elsewhere. We have a shrinking family size, an altered demand for community services. With fewer children, the proportion of residents in the work force is increasing and so the demands for public transit are going up. The question is being asked, 'How do they get into Metro Toronto — how do they get across Metro Toronto?'

Vaughan is now slowly having to cope with the management, redevelopment and replacement of a wide range of infrastructure to suit an evolving and ever changing population. This evolutionary characteristic is not normally built into the design and development of most infrastructure, certainly not the buried services. That is one of our major problems, I think. How to react to these changes while at the same time allowing life to continue are problems the city must now face and resolve.

What I hope my microcosm example of Thornhill demonstrates is the development course we have been drawn into and the kinds of problems that an absence of long range strategic planning permits.

In Thornhill, we followed the conventional approach to New Town planning. Residents, before they moved in, assumed that not only would water, sewage, roads, power lines, gas lines and telephone lines be there when they moved in but so would a full range of community services like libraries, recreation, fire protection facilities and so on. Not only do they expect this infrastructure to be there but there was no doubt in their minds that the systems would be functional, ready to use at any time and at an operational cost they could afford.

To residents of Thornhill, indeed to much of the rest of Canada and elsewhere, the continued availability and reliability of all infrastructure components is not only assumed but is expected to be an essential feature of life, just as it is in the US or Britain or in other developed industrial areas. Now we have to acknowledge a new problem. All of this infrastructure, whether it is under municipal, provincial or federal jurisdiction has been created in the period following World War II. Regardless of the type of facility, the simple

fact is that the structures are aging rapidly and a massive replacement exercise of the broadest scale imaginable is just around the corner.

This seems to be coming at a time when high operational costs — both maintenance and service performance — have risen to the point where payment burdens in the form of taxation and user charges are being publicly challenged. And I do not think we really know where that one will take us yet. Adding to this muddle are the nationwide factors of changing demographics and fluctuations in local, regional and national economic patterns that continually upset long range planning exercises.

The challenge before this workshop, I think, is of immense importance to Canada, to our Provinces, to our municipalities and most importantly to each of us as individuals. Fortunately I think we have reached a crossroads, and this workshop is one of them, where it is possible to peer out into the future, to define our options, to model the consequences and find and wisely choose and implement strategies. In a nutshell, this is the task before the workshop.

In the agenda, I outline some eight theme issues that, I think, have to be considered in this workshop. The list could be much more extensive and here I have tried to, focus us on those issues that concern people in their everyday life — as we go about leaving home, going to work, coming home, shopping, recreation, education, and so on. Wherever appropriate, I am making cross references to the Thornhill-Vaughan case to support the commentary.

Linear infrastructure

Linear infrastructure includes what I will call engineered services — roads, water supply, waste water treatment and utilities. They also represent a colossal investment that directly or indirectly translates into much of the provincial and municipal debt. In the urban building process, these hard or unmoveable and sometimes invisible services are absolutely crucial and the level of service availability and reliability probably provides the most exacting measurement of a society's wealth and well-being. In the context of this workshop, the equity which a single-family housing unit has in engineered infrastructure that serves the individual home is astonishing. For Thornhill-Vaughan, the figure is nearly $50,000 per housing unit.

DEVELOPMENT CHARGES AUTHORIZED BY BILL 20 IN THORNHILL-VAUGHAN FOR A SINGLE FAMILY DETACHED HOUSING UNIT

Jurisdiction	Service	Amount		Total
Region of York	Administration	74		
	Police	153		
	Health (Hosp)	447		
	Homes for the Aged	103		
	Child Care	4	781	
	Solid Waste	234		
	Public Works	22		
	Regional Roads	2442		
	Water Supply	2233		
	Sanitary Sewers	508	5439	$ 6220
City of Vaughan	Sidewalks & Streetlights	651		
	Intersections	183		
	Roadways	1103		
	Sanitary Sewers	221**		
	Watermains	30**		
	Drainage Works	166		
	Bridges	174	2528	
	Recreation	3427		
	Libraries	150		
	New City Hall	398		
	Management Studies	161	4136	
	Transit	240		
	Hydro	34		
	Fire	106**		
	Public Works	204**	584	$ 7248
Developer's Internal Costs	$655 / ft. for 50' lot			$ 32750
Education	Public Board	2451		
	Separate Board	1172		$ 3623
Total Infrastructure Costs for Single Family Detached Unit on a 50 Foot Lot				$ 49,841

If you start at the top and come down, there are four different sets of costs that the average home faces in an urban setting on the fringe of the Greater Toronto Area. The first are the regional costs and the region now is assessing to every single home the full costs of these services. So the full cost on a growth related basis for administration — that is the new administration building, police, the hospital, homes for the aged, child care — those are the charges for the individual homes — $781 is their share of the total equity of those services in the region. The hard services — solid waste, public works, regional roads, water supply, sanitary sewers, put that up to $6220 per unit. That is the charge in 1991 dollars as of November 23rd, 1991.

The City of Vaughan, and this is the Thornhill case, picks up where the Region leaves off and charges for sidewalks, street lights, intersections, roadways, sanitary sewers, the collection and sewers, the distribution water mains, the drainage works, and bridges; those are the hard services — $2528. The recreation, libraries, new city hall, management studies — $4136. You see recreation sitting at $3427. That covers not the park land, but the park facilities and the community centres. It does not cover the programs — the physical cost of recreation as being defined in the GTA in Toronto today.

On transit, transit is based upon the Ministry of Transportation of Ontario (MTO) transit studies and it assumes 75% subsidy. We are told that with deregulation and the disentanglement that is proceeding in this province, the 75% grant will be withdrawn on January 1st, 1993. That figure will go over a thousand. We do not know what to do. This, in itself, it will constitute a need to amend all the municipality's bylaws.

Hydro is the real winger of them all. Hydro now, by the new legislation, can charge transmission, transformation and the public works side of Hydro as a capital cost against the house. Fire service and public works comes to $7248. I got the developers' internal costs from the Savanah Group in Toronto. I think for most it will be a surprise to see $655 per foot for the 50-foot lot. Obviously if you shrink the lot to 20 feet or go to another variation in housing, that figure, which is the biggest of them all, will drop substantially. And, Gary Reardon, I think that is exactly what you people have been talking about and what John Brant was talking about in terms of the changes in densities this government is looking towards. It affects the developers' internal cost.

The last cost is a cost introduced by the Peterson government and upheld by the current NDP government on the education side. And this is the cost for the new classrooms to serve growth. There is a Public Board charge of $2451, a Separate Board charge of $1172 or $3623. The total is just a bit under $50,000 per housing unit. Now in terms of the community that we are talking about, the 75,000 people and 22,050 housing units, we are talking about an investment of over half a billion dollars in that small town in the infrastructure.

I did one more exercise. I decided that I would take a look at which of all of these services, Regional or Board of Education etcetera, were in some way being handled by reserve accounts. Was there a long term plan being created by the municipality to replace the infrastructure? The answer is, as per where the double stars appear

in the table, only in sanitary sewers, watermains, fire and public works.

I started to take a look at the reserve account bases. The development industry, the UDI, is challenging mismanagement of reserve funds. This is a key area where that can be raised, in that sanitary sewers are paid for on the water bill but only for the average maintenance cost per year — no replacement. It is an idea of "Keep your thumb in the dike each year and hope that at the end of the day when the whole thing crumbles, somehow there will be money to replace it." If everything does not collapse at once it might work. So the water mains and sanitary sewers are handled that way and the fire service. There actually are funds where the fire trucks are charged out on a use basis and there is a recovery for the rolling stock but there is no recovery for the fire stations. The technology has been changing, locations of stations change with the changing demographics and land use patterns and there's no replacement being created for that. The recovery again is on the rolling stock.

To me, the saddest part is that these reserve accounts, when established, have been borrowed upon for other purposes across municipalities so there is no discrete reserve being created to fund the service for which the reserve was originally intended in the mill rate. Looking down the total range of services, the conclusion I have drawn is that the developer's internal costs are being funded on the water bill to replace and rebuild them inadequately.

Almost all the services at the municipal / regional level in this province are not being funded by reserve accounts. So there is no longer term plan in place today to deal with the impending disaster that I think is going to occur in the early part of the next century when the stuff really does start to collapse.

Community services

In established areas in this province and elsewhere, we have always looked at these as a responsive type of service that has occurred after the community is in place. I do not think from the standpoint of flexibility and adaptability that we have satisfactorily developed these services for the simple reason that we have ignored the fact that they are removable and therefore inherently flexible. Why do we build monstrous community centres? Why do we build elementary schools, high schools that are absolutely immobile when the population moves and we end up having to bus the people to the schools in order to keep them full? We build ourselves a system which should be much more flexible and I raise that as a question for consideration.

From the viewpoint of building financial reserves, I will just repeat what I said a minute ago. Community services suffer far more so than do the linear services. None of the community services are funded.

Infrastructure and the Environment

Our infrastructure funnels the byproducts or wastes of today's society to treatment facilities and then discharges these to a receiving environment. The relative well-being of the receiver is directly related to how well the system works. Until only recently, all of us have relied upon the system to solve what we, as individuals or corporations, create and flush

away. But as the waste products of society become even more complex, this is no longer adequate.

At least three deficiencies exist in evolving a sound insurance system: 1) public ignorance of infrastructure and the need for better public education that translates individual actions into recognizable impacts on the same individual, (You tell me something and if I do not understand how it affects me, I am not interested.) 2) lack of a capability to forecast cumulative effects of longer duration phenomena or more frequent emissions, and 3) the inability of the "treatment" industry to keep abreast with the production technology both from the standpoint of new byproducts and the potential for dynamic interaction of byproducts themselves to create a series of complex second generation products.

You may have asked how this relates to housing. And the answer is, using Thornhill-Vaughan as the case again, housing pays much of the capital cost of the infrastructure that protects our environment. In this model, sewage is provided by the Province, the York-Durham system, but the full cost of that system is charged back in the gallon of sewage. So the user is paying. Housing pays for the physical system that I have talked about here; the treatment works themselves come back into the water bill which is translated to the house and its operation.

Out of the process emerging in Ontario, the provincial government is steadily withdrawing from providing grants to municipalities for infrastructure under their jurisdiction. Increasingly, the responsibility for life cycle planning and management of the physical system we use and need in our daily lives is being taken over by local municipal levels. Much more attention is therefore needed at this level to improve infrastructure management.

Infrastructure and Housing Affordability, Quality and Choice

Our system makes a clear distinction between what I will generalize as "trunk" systems and "local" systems. You and I pay for this "local" system in our house price but rely upon a sharing of "trunk" cost with a vastly broader base of users. Just to clear that up, all of the York costs and all of the education costs are taken on a Region basis and averaged out over literally 70 to 80,000 housing units. Vaughan is averaged out on the basis of 22,050 housing units for that community. So there is a much broader base in Regional and education costs.

If we can assume that a uniformly high quality is achieved in terms of the commodity production, then the question of costs is determined mainly by distribution.

We are all well aware of the direct relationships between servicing cost, lot size and the extent of horizontal development. The more compact and vertically dense the housing is, the lower is the cost and hence the more affordable is the housing.

While these relationships are well understood and reported, we have not adequately translated them to the consuming public in a way that achieves acceptance. Thus far we have tended to ghettoize affordable housing, neatly separating it from the rest, which by definition, must be unaffordable. We have failed to communicate the fundamental pattern

of human interrelationships over time. What is the real difference between the open nest or starter family and the empty nest retired couple?

If we are to succeed in swinging the subject of infrastructure around to affordability then it is clear that a far higher level of public comprehension and acceptance of new denser forms of housing is essential and I think infrastructure is one of the key routes to that end.

Infrastructure and Rational Land Use Planning for Quality and Choice

Throughout the industrial nations and certainly here in Canada, there has been a growing awareness that the suburban sprawl with widespread reliance on automobiles that evolved following World War II is not working well. There is also a sense emerging, particularly with informed groups such as this workshop, that we may have created an urban system that we cannot afford to maintain and replace at the same time. And we are beginning in earnest to question how our future urban areas will be planned.

Studies undertaken by an interdisciplinary group for the Greater Toronto Area (GTA) concluded that from the standpoint of land development and redevelopment "spread development" far exceeded costs estimated for "central" and "nodal" patterns. In the GTA, historic development, certainly in the 1960 to 1980s, has been almost exclusively "spread" and this finding was no surprise.

In its view of the Thornhill-Vaughan experience, the City of Vaughan undertook a fresh examination of how the City should develop into the next century. Vaughan concluded, as did the GTA studies, that a "Central City" pattern was substantially superior to "Spread" and "Urban Villages". This had been the historic pattern for the City and Vaughan is now in the midst of a final planning exercise to secure provincial approval for a preferred scheme.

These planning exercises have not been restricted solely to infrastructure costs, but have extended to more esoteric considerations like urban identity, open space maintenance, transit access, housing choice and affordability and so on. The new planning approach evolving at the local levels, and supported here in Ontario by the current Planning Act Review will see a much more comprehensive examination of the options. No longer will the planning process be dominated by a development driven mentality that sees only a short term and fragmented market as the client and ignores the critical necessity to develop and adhere to a long range plan.

Infrastructure and Financial Planning — Public Awareness of Infrastructure Issues

I raise this as something for the workshop. In examining the Thornhill-Vaughan example, it should be clear that a problem of major proportions is slowly building at the local municipal level in terms of infrastructure and financial planning. I think from the papers prepared for this workshop, that this problem appears to be fairly widespread.

I am just going to repeat quickly some of the comments I made a minute ago on the services. With the help of the Commissioners of Finance

for Vaughan, a review has been undertaken of all municipal services that are tied to major capital works to determine the status of reserve accounts. Here is the sad summary:

- Water and sewers - rate charge on water bill covers only ongoing maintenance. No fund being developed for replacement.
- Roads - no fund, only yearly maintenance and now provincial grants are disappearing.
- Transit - no fund, and provincial grants disappearing.
- Libraries - no fund for structures, book replacement in yearly operations budget.
- Recreation and community facilities - no fund, only yearly maintenance.
- Fire service - fund for rolling stock but none for buildings.
- Public works - only rolling stock being funded, no reserve for structures.
- Administration - no reserve for structures or computers.
- Parks reserve - based on cash contributions by development, but now being drawn down for other community services.

The net result is that probably close to 95% of total municipal infrastructure expenditures are not funded.

If this pattern applies to the infrastructure provided by other government levels, as I believe it does, then a major problem is truly emerging. If I were a private corporation (and much of this will be moving hopefully towards the private side) I would be heading into a financial disaster for which my shareholders would dismiss me. I just cannot understand how we are getting into this. We have to change.

Unless we can develop a sound, long term financial plan the public accepts and understands, I think a serious problem is imminent. There is no free ride; user charges and general taxation are the principal means open to fund infrastructure. What we're moving towards is a linking of the service need and the level of services supplied, the technical system standards adopted, land use planning and long range system management in a way the public can understand so they can participate in the decision-making process.

Infrastructure and International Competitiveness

I have a rather shocking example to give here. Here in Ontario with the advent of free trade, a massive adjustment is occurring as our industrial activities align with new markets. Infrastructure plays a silent role in the cost of production — whether it is the raw land cost, the water and sewage bill or the power bill.

Maintaining a competitive position and being able to move our products to the market with a high level of efficiency are directly dependent on our infrastructure.

An example of the infrastructure cost or problem occurred here in London some two years ago. An early proposal of the City was presented for the assessment of development charges that would have charged, to new industrial development, $23.50 per square foot of floor area for infrastructure. Had this occurred, and fortunately Council withdrew its initial position, the charge to industry on the basis of 30 percent lot coverage would have exceeded $300,000 per acre. Serviced land would have tripled in cost.

The effect of such an increase was seen as a major setback to the City's economic position. Maintaining a competitive position and efficient management of infrastructure went hand in hand in Council's mind, just like housing affordability and infrastructure. So they backed off. I think the same concerns apply to levels of service and land use planning and system management in the case of industrial development. We have been talking about housing; the same kind of problem is there with respect to infrastructure and our industrial, commercial and institutional side of the economy.

Some Concluding Remarks.

At the outset I noted the timeliness of this workshop. The papers which will be discussed over the next two days will serve to prepare a sound foundation on which we can plan our next steps. To all the authors, infrastructure is a key measurement of society's well-being and hence the importance of this workshop.

From my perspective, one task dominates all others in terms of better managing our infrastructure. Hopefully this workshop will provide some insights into resolving this issue.

Ultimately the public, either privately or corporately, will pay for the infrastructure it needs. Where we have failed, in my view, is effectively integrating all elements of the infrastructure planning process in a way the public can understand and evaluate. When the public increases its demands for services or the level of service, do they take into account all the issues of long term management of the physical assets and the ultimate full cost of this service?

As technical people, I think we have failed to adequately communicate this relationship. Our recreation departments sell us a service level but we never ask nor are we told what it will cost and who will pay. On a much bigger scale, the life cycle costs of various forms of urban development have not been communicated in such a way that the public can appreciate and, in turn, provide clear direction to the elected bodies.

If we cannot resolve the challenge of effective communication, then we will continue to build an infrastructure that may prove to be inflexible and, in the final analysis, beyond our means.

In conclusion, infrastructure is an extraordinarily important topic to each and every one of us. As technical and administrative people in this field, we have a responsibility to improve the total planning process. There is, in my view, a strong argument that one or more cases should be undertaken, possibly with the support of the agencies involved here, to demonstrate how to develop a long range plan. That could be the outcome of this workshop.

I think we have a tremendous opportunity. There is a lot that can be done, a lot to be probed at and concluded. I am looking forward to these sessions. Thank you very much.

MUNICIPAL INFRASTRUCTURE: SCOPE FOR ACHIEVING COST EFFICIENCY / EFFECTIVENESS THROUGH TECHNICAL INNOVATION

BY TOM FIELD
CH2M HILL ENGINEERING LTD.

The topic that I will be discussing is Municipal Infrastructure: Scope for Achieving Cost Efficiency/Effectiveness Through Technical Innovation. As an introduction, we can look at the historical development of Canadian infrastructure which followed the urbanization of the country. In that, we have been fairly lucky compared to the European cities. European cities grew up before and during the Industrial Revolution and they are now the inheritors of even greater problems than we have. On a comparative basis, we live in a country where infrastructure is fairly expensive because we have quite a large land base and as home owners and urban dwellers, we have probably one of the highest home ownership ratios in the industrialized world.

I have noted in the paper the distinction between visible and invisible infrastructure. I consider the visible infrastructure is the infrastructure that you see. You drive on roads going to work. You go swimming in swimming pools at recreational centres, visit the libraries. These are all the visible infrastructure. Politicians and to a certain extent the general public see these as more important. It gets more attention and more emphasis than what I call the invisible infrastructure, which is the water and sewer system, the collection systems, the waste water treatment systems and then, the water treatment systems and the distribution systems. How is this intertwined with the housing issue? Housing actually determines the location, the routing, the sizing for most of the infrastructure. Residential water consumption constitutes the great majority of water consumption in our typical urban environment. And waste water quantities are mostly determined by our water consumption. The whole issue of housing and infrastructure, both existing and future infrastructure for growth, are intertwined.

I would also like to discuss the concept of level of service. This has been an extremely useful way of explaining how infrastructure provides services to certain areas in urban agglomerations. When we look at, let's say, the drainage infrastructure, we need to look back and see how this phenomenon evolved. Initially the level of service that it provided was related to public health. We needed drains and drainage systems to take away the sanitary sewage and deposit it or discharge it to receiving water bodies because we recognized that it was associated with various diseases. Protection of public health by removing the sanitary waste water from the dwellings was the objective of the engineers who initially planned urban centres. Later on, people saw that during rainfall, the whole place was flooded and it was a major impediment to traffic. It also created flooding hazards, which in some cases, caused loss of life and loss of property. So storm drains or combined systems were built and these drained the urban areas, took the combined storm water and sanitary flows to the receiving waters.

Today I think we are dealing with a different level of service. We are talking about ecological health. In other words, we are

worried about the health of the receiving water bodies and this is a higher level of service that has come in to our way of thinking basically because of our higher standard of living. We now have to provide treatment facilities to protect the receiving water bodies and the environment.

As infrastructure stands today, we have to deal with problems because in certain areas of cities, one level of service is provided. For example, in the older areas of Edmonton and Vancouver, we have combined sewer systems and that is a different level of service from a drainage point of view than in the outlying areas where full storm water management design is incorporated into the development. This is a design issue that goes beyond the actual manholes and pipes. We have to inform the politicians that we have to deal with this issue. Do we upgrade the level of service in the inner parts of the cities? And in some cases do we say that we design the storm water management systems in the outer areas for less stringent conditions? These are issues that planners and engineers have to face.

In a lot of cases, and this has happened quite frequently in areas that are subject to very high growth rates, in the interest of bringing developments on board, not enough attention was paid to the way the drainage systems behaved. For example, in Calgary and Edmonton during the '70s, the newer areas drained into the older areas and the existing infrastructure was not able to take that added load. Severe flooding problems and the resultant legal problems caused a lot of worry to both the administrators and politicians.

The other point, as far as our infrastructure is concerned, is that with increasing standards of living, we expect higher levels of service all the time. We expect that the receiving waters are going to be protected and this demands more money in order to provide that. So we need to look at some innovation, some methods by which we can provide that service. We are not going to be able to provide it by building larger pipes. There needs to be some more effective and more planned approaches to dealing with this problem.

I would like now to talk for a while, to stand back and look at the overall problems that we face on a daily basis and how we treat them. As engineers, I think we have typically addressed the problems with state-of-the-art methodologies. In a lot of cases, we are called in to service something that has been approved and we apply the methodologies that have been tried and true. We need to review our approach. We like to take standard details from past projects; we like to use the design methods that we have used in the past because it is fast. We think it works, whereas in a lot of cases it does not. And we suffer the consequences. I have given an example in the paper where we are still using the rational method to design our drainage systems and, from the experience of a lot of cities in the '60s and '70s, we see that those analytical methods really do not work, particularly in the large developments. We should realize that we need more innovative, more complicated design methods to actually model and design the complex infrastructures that we are putting in today.

Are we using what is available? I have some experience of working in the oil and gas industry and also in the power industry. I find that people in the power industry — and again it may be the way that they are financed that they can incorporate this into their charges — they are constantly looking for improvement and efficiencies and ways to bring methodologies and efficiencies that they have seen in other areas, in other countries, to bear on their systems.

I have given some examples in the paper that I think are quite common, everyday occurrences of technical innovation. We see the scanners, for instance, in the supermarket. The application of that technology has really changed the retail industry enormously. It has shifted power from the suppliers to the retailers. Basically they have adapted modern technology to their operations and in doing so, they have made it more efficient and competitive. As a society, we all benefit from this. We benefit from a more competitive environment and better pricing.

I see certain deficiencies in the way that we apply technology to the design of infrastructure. Here in Canada, we are facing the challenge of upgrading the existing infrastructure and, based on its performance, we know it is substandard. We know, in a lot of cases, it is reaching the end of its life. We are not currently in a position to replace it because if we followed the patterns of past years, we would put in the same systems that were put in for the last 50 years. We need to look at new technology, at what people are doing in other countries and also, at the research that has been carried out in Canada and abroad so that it can be brought to bear on these problems.

In the paper, I mentioned Bruce Jank's sludge-to-oil technology which has been pilot tested and a project which is now underway in Toronto. This is the kind of thing that we need. Somebody needs to go out there and get approval for these technologies so that we can point to proven instances where it works. Setting a high standard of the types of technologies we use will help us within the country, and also internationally.

What are our needs in the infrastructure issues? We need to be able to upgrade the existing infrastructure and to provide the new infrastructure. Bear in mind that, under normal circumstances, we are dealing with a system where the new feeds into the old and impacts on it and this has technical, legal and political implications. I also contend that, in the next 20 years, we're going to be dealing with real growth in our urban centres in Canada. We can see the pressures already evolving where Canada is going to probably have to accept an increased immigration rate and this, in itself, is going to put pressure on our infrastructure.

Some of the challenges that I think we have to face when one looks at the overall picture of Canadian infrastructure are as follows. We need to know what, exactly, is in the ground. We have been fairly negligent in recording and maintaining it. In a lot of cases, we don't even know what is down there in the ground. If it is invisible, if you cannot see it, you tend to forget it. We drive to work on the roads so the road system gets somewhat more emphasis than the stuff that is underground.

There are some major improvements in some municipalities; they have inventory systems where they can bring things up on the computer.

This needs to be publicized and made available, even to the smaller communities. In a lot of cases, they don't even realize that they have problems until flooding occurs, until they add more development and then suddenly they are faced with the problem and they have to go and see what exactly is in the ground.

The second challenge is what can it provide? We have got these facilities in the ground. They are of a certain age. We have not been able to tell the home builders and the people interested in expansion what exactly this infrastructure can provide. Generally speaking, communities need to develop systems where they can analyze the impact of various developments — whether they are housing, commercial or industry — on their infrastructure, particularly the sewer infrastructure and the water infrastructure.

There have been some court cases recently where municipalities have been sued and I mentioned two or three in the paper. One notable case was in the community of Beauport, Québec. A hotel owner whose facility burned down sued the municipality because, when the firefighting personnel came out, they connected to a hydrant that was in some way deficient. That hotel owner was successful in his suit. This has created an awareness that there are issues that need to be addressed in development and also in operations and maintenance. We need to find out what exactly can be provided by the infrastructure we have, in order to be able to tell the development community what it can sustain and what new developments can be brought to fruition. And probably the major challenge is, How can these infrastructure items be upgraded? What upgrading we are doing at the moment is reactive and we are basically using the same old technology. I am not going to enumerate the types of technology that have been used elsewhere. I have listed some of them in the paper but we need to get into the frame of mind where we look at new ways of upgrading our infrastructure.

One of the issues that we are going to have to face in the next ten to twenty years, as far as infrastructure is concerned, is waste water treatment. As most of you know, Halifax and Victoria, at both ends of the country, do not have waste water treatment plants at the moment. One is planned in Halifax and they are at the initial stages of planning in Victoria. But here are two major urban centres without waste water treatment. Also, a lot of the waste water treatment facilities that were put in the '60s and '70s are now not meeting the more stringent environmental requirements and regulations. There is going to be pressure from communities to put in more advanced waste water treatment facilities and we are going to see more investments right across the country in waste water treatment.

In water treatment, again the regulations are going to become more stringent and you are going to see cities that currently do not have water treatment facilities, like Winnipeg and Vancouver, looking at major investments. Of course, we are talking about major deterioration where the collection systems for waste water and the distribution systems for water have actually reached the end of their lives. Even the ones that are sufficiently sized to take the flow are going to need major upgrading. How do we deal with the environmental aspects and the flooding and the capacity aspects of the combined sewer systems in the major cities?

There was a video clip on the news in Vancouver recently. During a storm, a TV crew was filming a combined sewer overflow location where you saw raw sewage bubbling out into False Creek. The television interviewer was interviewing one of the senior engineers in the City of Vancouver and he asked them, "Well how come this is happening?" The city engineer said, "Oh yeah, we know this happens. Whenever it rains, raw sewage goes out into False Creek." And the interviewer said, "Well, what are you going to do about it? Do you have program to fix it?" And one of the city engineers said, "Yeah, this particular outfall is scheduled to be fixed in 2060."

In the paper, I have dealt with demand management and, in particular, with demand management in relation to water. As consumers, we are basically wasters of water. We are blessed with major water resources but I do not think we realize the cost involved in treating and distributing the water to our homes. We are going to see more emphasis on conservation as a means of postponing or deferring the facilities needed to supply us with potable water.

This overhead shows an overall management system that I think is relevant to infrastructure. The first block is a response to challenge number one, that is to find out what is in the ground. We need some inventory scheme so that we can know the age, condition, location, and depths of all the facilities we have. And because it is important in evaluating how these facilities are performing, we need to know the history of failures, flooding, and so on.

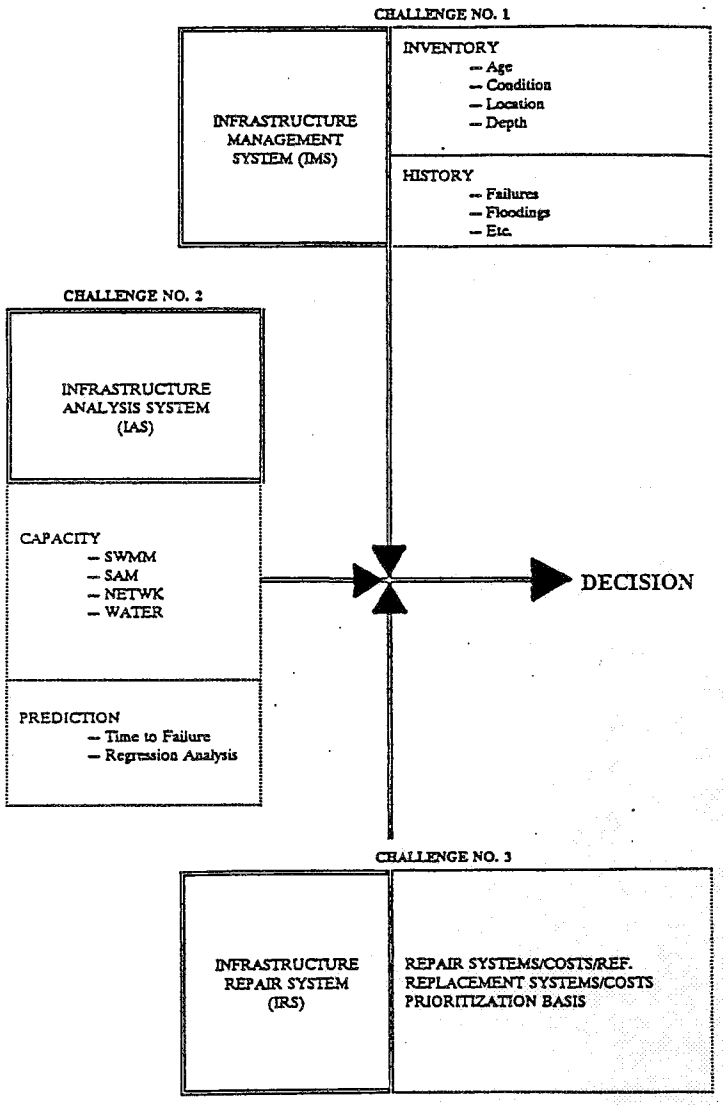


FIGURE 1: TOTAL INFRASTRUCTURE MANAGEMENT (TIM) (IMS + IAS + IRS = TIM)

Then, challenge number two, what can the infrastructure provide us as far as capacity is concerned? There are programs and facilities — software and hardware facilities — available to provide us with this information, but a lot of municipalities are not aware of it. And in a lot of cases, even though some facilities are not that expensive, they really do not have the funds to acquire it.

Challenge number three, is how do we repair it and upgrade it — again a major module in the infrastructure question.

I would like to emphasize that we have the challenge of dealing with an existing infrastructure which has not been provided with the required operations and maintenance budgets. There is no fund there for replacement and now we are finding that when it comes to the end of its useful life and we have to deal with the existing, then the new infrastructure to deal with population growth, there is going to be continual pressure on standards of living, improved standards and improved levels of service.

In closing, I would also like to emphasize the basic approach and frame of mind that I feel we need to adopt. As an engineer who has been minutely involved in the details of infrastructure design, I have seldom had the opportunity to come back and look at the overall picture as one needs to do in dealing with a problem like this. To illustrate this I will use two examples. For the first I will go back to a time in the beginning of the seventies when I worked in Germany in the power industry. The company I worked with was a large German company building nuclear power stations and basically, they were licensing the technology from the U.S., from General Electric and Westinghouse who were at that time also building nuclear power stations in North America.

Working with a German company, I found that they were continually improving. Consulting engineers and engineers in general in North America, we like to use things that we have done before. We like to take standard details — and actually it is even worsening now with computer drafting — you see these standard details in contract after contract. In Germany, at that time, there was an amazing resistance to doing this. If they built a nuclear power station the same as the one they built before, they considered it almost a failure. They were continually improving the construction and the design. Every aspect was looked at in detail to see if there was some way of improving it. And you know, after five years they were competing with the Americans on the world market and beating the Americans in providing the other countries with nuclear stations. This is a frame of mind that we need to get into.

The second example is taken from today's context. In Vancouver, at present, there is a lot of interaction with the Pacific Rim countries and a lot of Oriental money being invested in B.C. My firm is working with a Japanese company which is developing a major resort-residential area just north of Vancouver. It consists of a golf course, a marina and residential dwellings. It is a change to work with this Japanese company. I find the same situation holds, that they are continually asking us, why do we do it this way? We tend to use the standard way and they ask us why are we doing it this way. And they bring situations where they have used different

methods and it is a real eye-opener to work with them. They are continually improving.

This is the point that I would like to emphasize in closing. We need to get into this sort of frame of mind in order to achieve cost effectiveness and competitiveness in the infrastructure area.

PANEL DISCUSSION

BRUCE JANK
ROCKCLIFFE RESEARCH
MANAGEMENT/WASTE WATER
TECHNOLOGY CENTRE

The final two points on innovation that Tom Field made lead into my presentation. I acknowledge that there are many problems with the infrastructure. On the other hand, as an interim measure, there are many innovative approaches that can be used to get full utilization of the infrastructure capacity that we have. That applies not only to the collection and distribution systems but also to the water and waste water treatment facilities.

The Waste Water Technology Centre has developed the majority of the programs on the waste water treatment side. However, we are moving more into the water treatment side and also will provide some technical support in addressing issues associated with the collection systems for the waste water facilities as well. I want to quickly go through six topic areas in terms of identifying areas where we know that major advances can be made by introducing innovative steps in managing the facilities. In the majority of the cases, the steps taken represent the introduction of instrumentation, computer control and other automation techniques.

The first item that I will identify is what we have done in the pollution control planning area. The Province of Ontario has a very interesting program in terms of identifying the requirements for expansion upgrade within the collection system and the requirements for

expansion of the treatment facilities. They are Pollution Control Plans. What we have done, along with CH2M Hill, is develop a Pollution Control Planning Advisor. This is an integrated computer-based pollution control planning program designed to assist engineers and municipal officials in the planning and design of water pollution control systems.

Typically the Pollution Control Plan identifies the impact that the expanded residential area, the industrial expansion, and the storm water problems would create with respect to the collection system and the treatment facility. Typically, this work is done by the consulting engineering firm with insufficient input by the municipalities. We have put together an expert system that allows the municipality and municipal engineer to take a much more important role, a proactive role in the implementation of the Pollution Control Plan.

The consulting engineering firms will be retained to collect the data. However, in terms of the decision making, the pollution control planning initiative will be handled through the expert system involving the municipal engineer. The other major feature is that all of the documentation is retained within the system in the municipality. The municipal engineer can upgrade the data base and the Pollution Control Plan on an annual basis as opposed to waiting for a five year period or whatever the time frame would be when they would consider going to the next expansion.

The next item that I have identified is the Enhanced Process Audit. The Process Audit is a microcomputer-based real-time monitoring technique which is a powerful tool to identify and correct deficiencies in treatment plant design and operation. We have discovered, following the implementation of a computer-controlled program, that virtually all of the existing facilities that we have looked at have had major process design deficiencies. The Process Audit basically provides the equivalent of a stress test or an on-line data collection system under various loading conditions. This allows you to make the appropriate intelligent decisions with respect to the actual effective life of the facility, the effective capacity of the facility, again with respect to the expansion of the residential area, industrial expansion and storm water problems.

The Pollution Control Planning Advisor and the Process Audit are very closely linked in the programming initiative. However, the Process Audit is strictly an audit on the liquid train of the waste water treatment facility. We have looked at 15 of the areas of concern within the Great Lakes Remedial Action Program and identified that if the Process Audit is used on system upgrades in those areas, by conservative estimate, we would save approximately $130-million out of a projected $770-million expenditure. By using the Process Audit — in the majority of the facilities — you can extend the effective life of the facility without going in and adding more steel and concrete at the present time.

What we are doing is tightening up the safety factors in the design of the facility. And we have done this on new facilities. We used the same principles in the design of the Banff sewage treatment facility and we were actually able to reduce the capital cost of the facility by approximately 30 per cent.

The third component that I had identified was instrumentation and control applications. In this area, we are talking about computer control of the waste water treatment facilities. The shift here is into an area where you are using expertise both from the design perspective and from the operational perspective. This requires a totally different skill base than we have used in the past.

Tom referred to the German approach which was basically to ensure that the appropriate optimized design had been provided for the system. This is an approach that has to be followed through into the areas of instrumentation control and automation. You must continually upgrade the control packages. If we adopt this philosophy, there will be a major retraining program required in terms of the skill base required for the operation of the facilities. Major cost savings will be incurred in the long run if we use the approach, but the requirement for the follow-up and the optimization is obviously important.

The next one I wanted to identify was dynamic modeling and expert systems. Typically, the European approach in design has been to use a dynamic process in developing the design fundamentals, the design principles. We have not used the same approach in North America and our designs are almost exclusively based on a steady-state approach. To get around this, we have been working with McMaster University to develop a General Purpose Simulator.

The General Purpose Simulator is a state-of-the-art computer program developed for dynamic modeling and simulation of large waste water treatment facilities. It is a model that simulates a treatment facility from the influent to the effluent. Lots of very inexpensive models are available to simulate the activated sludge process but you have to consider the total system if you are going to have control over the full facility. In the case of the Hamilton sewage treatment plant, there are 126 unit operations in the facility and each of the 126 unit operations are modeled within the facility. Very powerful computing capability is required to handle this kind of modeling approach.

The General Purpose Simulator effectively gives you the opportunity to cover off the operational side and the training side. The facet of the program that we are looking at now is integration of the General Purpose Simulator with the control loops. Once you have done that, you can then take the operator out of the control loop and the operator can observe what the computer will do in terms of the operation of the facility. Once I have taken the operator out of the control loop, then I have the information that can be used for the optimized design of the facility. Then I can go back to the Banff scenario and use that as the optimized design of the facility. And as I say, our database would indicate that there will be significant savings in capital expenditure by using the optimized design approach.

The two final issues I will talk about are storm water management and compliance monitoring. The storm water management issue as it impacts on the collection system is very important. I will use Hamilton as the case example. In fact, you have three options. You can separate the sewer systems which is a very costly option — definitely the most costly operation. You can do what the Germans have, that is, put in some 10,000 storage basins. They

collect all of the excess storm water and then they expand their treatment facilities and run that storm water through the waste water treatment facility. That is the number that has been identified in the Pollution Control Plan for the City of Hamilton. The estimated cost of that is $245-million - $110-million for storage basins and $135-million for extra capacity at the treatment facility to treat the stored water after the storm event.

The third approach is real time computer control. The option there is to use a limited number of storage basins and put in flow control devices within the facility. Once you reach a certain percentage of dry weather flow, you divert the flow to high rate treatment facilities that will provide a degree of treatment to a moderately contaminated waste water. Theoretically, the system should be linked with radar that identifies the intensity of a rainfall event in advance to the collection system. In that way, you can prepare the control devices within the collection facility, ready your storage basins and prepare the collection facility in terms of the high rate treatment facility that would have to kick in, say when you reach two and a half times dry weather flow.

The other major factor is control strategies such as step feed at the treatment facility. In the case of the Dundas treatment facility in the Hamilton Harbour area, the plant had been scheduled to shut down because of excess storm water bypasses. A step feed program was implemented on that treatment facility in January 1990 and there have been no storm water bypasses since that time. The total integrated package in terms of a real-time computer control facility, with a certain amount of modeling should provide a control system that will minimize the impact of the flows on the treatment facility, minimize the number of storage basins that are required and actually reduce the cost. And I would assume that we are looking at about 20% of the projected cost of the $245 million that's projected for the Hamilton treatment facility. The City of Seattle is one of the major leaders in implementing this type of a control strategy and, obviously, it has to be demonstrated at full scale before you can effectively take the technology to the market place.

The final component that I had identified was compliance monitoring and evaluation. Ontario's Municipal Industrial Strategy for Abatement program (MISA) has a very significant toxics component. Toxic chemicals management represents a challenge to the environmental community — both the designers and the operational people — that we have not had to deal with before. There have been extensive programs funded by the Ontario Ministry of the Environment to look at the fate of these compounds within the treatment facilities, the techniques that have to be used to optimize the design of the facilities to ensure that you can, in fact, maximize the removal of the compounds and also to identify waste streams that have to be treated at source prior to going to the treatment facility.

A rough estimate would be that we may in fact have to treat — and this is personal opinion — something like 10 percent of the industrial flows at source because of the toxic chemicals in the discharges. The other waste streams basically have compounds that are adequately treated in the centralized treatment facility. On balance, the total cost to the industrial

community and the municipality would be such that it is desirable to treat as much as possible at the centralized treatment facility. The modeling techniques, the measurement techniques that are required to provide that information, have been developed and are now being implemented in specific developmental programs.

GEORGE MIERZYNSKI
ONTARIO MINISTRY OF THE ENVIRONMENT

When invited, I said I would try to play devil's advocate at this session. Why do we have a problem in infrastructure? The first question we have to ask ourselves is, where does the money go? Well, obviously we pay taxes to the federal government, the provincial government, the municipal government and I think one of the things we have to understand or maybe assess is where the best bang for the buck occurs. It seems to me that the responsibility for infrastructure rests with municipalities. It does not rest with the federal government. Although the federal government at one time did provide money for infrastructure, it no longer does. The province, we have heard, is pulling back on its financial assistance, so the burden will fall on the municipalities.

Now, why is there no money? Well, where does the majority of our money go? It goes in program areas — not program areas in the context of infrastructure but in more general program areas. About a third of it goes to education, about an equivalent amount — 34 per cent or something of that order goes to health. Very little goes to infrastructure. The rest goes to social services. That side of the equation is growing rapidly. There is only one source of revenue. And that is why there is no money for infrastructure. Now there are fewer dollars because of the economic situation and over time the balance in spending has changed. If we are going to support those programs, then we have to find new money for the things that we always thought money would be available for

— roads, sewers, water mains, bridges and the like.

Now we talk of user pay. I am not opposed to user pay. But user pay to me means another tax. You pay a specific tax for a specific purpose and whether that is correct in principle or not, that is what user pay is. If you look at the Ontario budget as an example, you will have noticed statements in the back of the budget that there is some consideration of three new crown corporations being formed. One is the Land Corporation, which is a fact already; another is the Water Corporation which has been talked about for two years now and it still has not reached fruition; and a third is the Transportation Corporation which could mean tolls every five miles on Ontario's 400 series highways.

We talk about the issue of standards for water and sewage. I think when we are talking about to what level we build facilities, we have to ask ourselves not just the questions with an engineering basis, but another question. And the question is, does everyone have to have the same level of service no matter where they choose to live and in what environment? I would suggest not, but I think we all have to answer that question.

Next question: What level of service can be environmentally acceptable based on specific circumstances, i.e. location perhaps? Does society insist that if I live in Toronto I have to have the same level of service as I have at my cottage in Barry's Bay or on the outskirts of Red Lake on an individual lot in the bush?

The next question is best available technology (BAT). It is wonderful that we can develop new technologies, for many reasons — export market, economics, research. But just because we develop it, does it mean we have to use it in each and every case? If our water is good enough but it is not BAT, do we have to apply BAT and put the societal costs on that? I think we have to assess whether that societal value is worth the dollars versus the risk.

Here is an area we will not talk about very much — waste management. And we talked about Ontario regulations. Please remember, I am speaking as a panelist, as a devil's advocate, not as a representative of the Ministry of Environment, particularly in this area. It seems to me that currently, on an annual basis, we are taking out of the Ontario economy roughly $500 million for waste management and not reinvesting it back in Ontario for any good purpose.

A typical example — we all read about Metro waste going to New York and other places because of the tipping fees over there. This is export in reverse. This isn't the kind of export we want. This does not gain our economy anything in Ontario. Also, we do not have bio-medical waste facilities in Ontario. We have hospital incinerators which are all about to be shut down because they can not meet the environmental standards within reasonable cost. What are we going to do with biological waste, all the lab waste, all the hospital wastes? One hospital bed in Ontario generates four pounds of bio-medical waste a day.

Let me now turn to our urban structure and the infrastructure that is required to support it. It seems to me that there are a number of principles which we can agree with collectively. We can all agree, for various

reasons, that we should avoid urban sprawl. It is just inefficient, environmentally unacceptable and there are many other adjectives that could be used to describe the disincentives for that kind of a system. So one of the principles should be that we should avoid urban sprawl. The other obviously should be to preserve, in a sustainable sense, those sensitive environments that we can — the wood lots, the ravines, the wet lands and so on.

The next principle would be that we should certainly maximize the use of our existing infrastructure. We obviously should practice water conservation and energy conservation. All speakers really touched on that. Economies of scale goes without saying. That goes for urban form which I will touch on again in a minute. For water and sewage area specifically, true cost accounting has not been practiced in Ontario or its municipalities and it certainly will be, so we must deal with it.

I have touched on user pay. There is another word that I have not — and that is beneficiary pay. There has been a lot of confusion in most people's minds of what we mean by user pay and beneficiary pay. Beneficiary pay could be anyone from the federal government to the provincial government to a municipality to a developer who wants to do something new and to get revenue back from it. If it is beneficiary pay then all those players who want to do something should be putting money up for that purpose. Once it is put up and things are built, the users of it should be falling under the definition of user pay. You pay for what you have.

What are some of the solutions that I think should be considered and perhaps implemented? We talked about urban structure and form already. Most of you, I am sure, are familiar with GTA-20-21, the report which has recently been completed. As Chairman of the sewage and water component of the GTA, I know a little more detail about that.

Reviewing some of the solutions, under water conservation, obviously we have to have tighter systems and better designed systems. We have to have metering, we have to have increasing block rates on our water charges and not the other way around. You pay for what you use and if you use more you do not pay less, you pay more. That does not mean we should reduce our water use in comparison to other countries. I take objection to people saying we are wasters of water in Canada and in Ontario. We have to assign ourselves a reasonable amount of water in the context of not wasting it from an energy perspective and a treatment perspective. But we should not necessarily compare ourselves with other countries and set our targets at those levels because we have the resource. Provided that we do not abuse it, we can use it. Societally we have to take advantage of our resources provided that they are sustainable. And a water resource is sustainable because what we take we put back, but we have to put it back clean.

GTA-20-21 identifies other solutions. We must share our resources, our infrastructure facilities, sewage and water facilities on a more reasonable basis and across municipal boundaries. It makes absolutely no sense for a sewage treatment facility to sit across the fence from another one because it happens to be in another municipality. In that kind of scenario, there should be one facility shared between the two municipalities which occupy the same

drainage basin. It can be done but there has to be the political will to do it.

Similarly, in the sharing of infrastructure facilities, it is not just the actual facility which could be shared in perpetuity, it could also be shared in time. For instance, if we build a very large diameter water main from our South Peel water system over to Brampton and places beyond, and it is designed for the next 40 years, we will have capacity in there that will be unused for the next 20 years. Why can we not give that 20 year capacity to Halton who has no trunk water facilities in the area of Georgetown, for example. That can be done. We should share those facilities, not just over time but also across pressure zones, and we will not have to duplicate facilities down the road.

We certainly need to solve our urban structure forms and our servicing problems through what is now being called nodal intensification. It is certainly easier and cheaper to service.

Finally, let's talk a little bit about rehabilitation. Again, the reason there is no money for rehabilitation, that infrastructure is falling apart, is because of the way we have done our financing. The absence of reserve accounts is one problem. Provincial facilities that were built from the early sixties onward were built without reserve accounts, as a matter of policy because the answer at that time was, there will always be money.

Rehabilitation is an area where we can use novel approaches and new technology. In Ontario, we have started to develop management systems to inventory the infrastructure systems and their condition. Those systems have been developed in Ontario and they are available. But they have to be implemented not only from an inventory perspective but from a management perspective so you know what you want to do and in what priority you want to do it, when you want to do it and how much it is going to cost.

Finally, we have to give very serious thought to using trenchless technology to rehabilitate our existing systems, not only from the economic perspective but also from the environmental perspective. We have to put the right criteria behind it to make sure that our political masters understand the true costs of doing that kind of work.

LAVERNE PALMER
INSTITUTE FOR RESEARCH IN CONSTRUCTION

Mr. Janes has said that it is generally acknowledged we have a problem, and I accept that. Tom has said we need to have innovative solutions to that problem. Then Bruce has given us some examples in one area of solutions that are available. Then George has said, yes there are solutions; we need to look at them and make sure they are the right solutions for using our money. Here is the nub of what I am going to say at this point; innovations exist that are not being used; other innovations are being used that should not be; and there are others coming along that we have to find out whether we should use them or not.

There are limitations to developing new technologies and to using them. If you have new technologies, you must have the people trained to use them. You must have a way of evaluating them. You must have the knowledge to evaluate them, which implies research to back it up and you must have an incentive to use the technology. Just because it is there, it will not necessarily be used.

There are relatively few civil engineers graduating in Canada annually. Depending on the amount of capital investment made in Canadian infrastructure, anywhere in the order of 500 to 1500 civil graduates will be required. Obviously we could have an undersupply. I do not want to debate that. The fact is we are certainly going to need these people and need them trained for the way in which they are going to be employed if they are working in the infrastructure area. Most of us in this room who are civil engineers were trained to build things. Most of the money being spent on infrastructure these days is not to build but to repair and renovate it. As much as 80 percent of budgets in certain areas goes to renovation. Yet, we are trained to build, not to fix.

There are 400 Ph.D.'s a year coming out in Canada. These are the people that are going to give you the knowledge to assess or develop the new technology. At least half of those will probably return to their home countries or may not continue on in Canada. That leaves us with a pool of maybe 200. How many of them are working in the areas where we need help? I will leave that question for you at the moment.

Basically, if we do not have trained people, we are not going to have the technical innovation and it is going to be difficult, if not impossible, to bring in that innovation. Bruce spoke of a new program, of new software. We are going to have to train the people to use it and then in the long run it is going to be worthwhile. The universities have to be encouraged to go more toward repair and appreciation of the current problems. I was very encouraged to learn recently that there is a new staff member here at Western who is specifically going in that direction. That person is rare, looking at what is being done in Canada in research in varied services.

One way to answer the question George raised is life cycle costing. You have to appreciate how much it really costs over the entire life of any particular item.

We frequently overlook usage. As a matter of fact it is rather convenient to overlook it because it is not easy to deal with. For instance, Steve mentioned if you have poor facilities you

have a weak society. If you have good facilities it will enhance economic investment. If London develops industrially and does not have any water to service those new industries, it will not work. If you cannot treat the pollution that is going to be generated, the development cannot go ahead. So usage is an extremely important element. When you put in a new service, you need to know not only how much it is going to cost to repair it, but what are the total benefits and detriments of that facility in its lifetime.

We are lacking the history of performance of new materials — we do not know how long things last. We know the older materials. We have had some form of concrete around since the Roman days. But somebody comes along to your office or to the city engineer and says, "I have just the greatest new thing. Let's put it in. It is going to last you for 50 years". How do you know? I certainly do not know. We do not have the facilities, the capability in Canada — as a matter of fact the capability does not really exist — to take a new product and subject it to that type of lifetime usage under the conditions that we know our infrastructure facilities have to exist. We need these facilities — a very easy statement and extremely difficult thing to develop. And even in itself, developing any better facilities has to be considered with respect to what benefits will come of those facilities.

I mentioned research; there is very little research taking place. You have a new staff member here at the University of Western Ontario. How many other staff people do you know across Canada who are working in research on buried services? I do not need all the fingers on my hand to talk of those who are working on the engineering aspects of buried services. They are very few and far between.

I looked at the area of pavement. Refering to the figures for the City of Vaughan, if you looked at the responsibilities of the region and the city, you would find that almost 50 percent of that 7000 odd dollars that was their responsibility was for roadways. That is true if you look at the general figures. You hear numbers — $8-billion needed for highway transportation — $4-billion of that is for pavements, roadways, a lot of that is for maintenance. Yet, in Canada, the amount of research that is going on in pavements is concentrated at only two universities. If I looked at all the industries that are contributing a little bit, the provincial governments who are doing most of the research, the total amount of money is less than a tenth of one percent of the amount of money that is being spent. Those of you from industry will say a tenth of one percent being spent on trying to solve a problem is inadequate.

Just because you have the technology does not mean it is going to be used — not at all. It is a risk. In the area of engineering, who takes the risk? It is usually the contractor and he cannot afford to take that risk. It must be a pretty good payback before he can take that risk. There is very little incentive for consultants. Those of you who are consultants here will realize that because of liability considerations you are better off not to take a risk on something new. In fact, if you look at the true possibilities of liability, you do not want to innovate.

What can we do about that? If it is a risk and one part cannot afford to deal with it, we need to share that risk. You have a new idea.

Suppose you are going to repair a bridge in a better manner. There are four or five companies, suppliers, who can benefit from it. There are applicators or the construction firm that will benefit from it. There is the owner of that structure and ultimately all of us — my pocketbook and yours, the taxpayer, we may benefit by improved technology. We should all share in that but every party that shares some of the cost will certainly work hard toward making it work. The other thing is we should not go into a demonstration project without realizing that failure can occur. If failure does not occur, depending on what you are doing, it may mean that you do not really know anything more than when you started.

One other limitation that I have found is that when it comes down to who is going to do it, who is going to get involved, we have an endless split of our jurisdictions. We have got political jurisdictions, we have got jurisdictions according to division of demographics, and so on. Obviously, duplication of effort is going on that is wasteful. Duplication of effort is inevitable, but it does not necessarily need to be wasteful. We have to work together.

One example of how that can actually take place relates to the problem of sidewalk breakup that occurs in western Canada and to a certain amount in the east. Sidewalks may not sound like a very important topic, but when I visited several cities I asked them the question, "Where are you spending a lot of money that you find either politically embarrassing or you feel you should not be spending?" Several of the cities in the west said, our sidewalks keep breaking up. They keep cracking; right down the length. These cities can all come together, each of them contributing a certain amount towards the project. They will all have a stake in it. We will be using some materials provided by a couple of companies. They will be paying part of the cost for doing so and there will be some of the money coming out of the taxpayers' base too.

DISCUSSION PERIOD

John Kenward of the Canadian Home Builders' Association asked if there was some method which could be used to simplify the challenge without making it simplistic, i.e. a starting point towards a solution.

A panel member replied that it is such a multifaceted problem, there is no real quick and easy fix. He suggested that the task of the workshop is to develop a common understanding which can be conveyed to the public and the politicians.

Laverne Palmer responded that one way to answer that question is to look at the resources that are available to us. "No one city or municipality can afford, for example, to invest in the level of research necessary to tackle a particular problem. Using the example of sidewalks, if we go to the City of Calgary and say, in order to answer your problem it is going to cost you X dollars, they cannot afford it. But could I go to Calgary, Edmonton, Regina and Saskatoon and say "Are you willing to share in trying to move toward the solution of that problem?" I could go to a few suppliers of materials that will be used in the course of that research program and say "Are you willing to kick in your materials at nominal or no cost, and provide the advice of your technical people for putting it in place?" This is what I mean by sharing. We do not have the resources individually across the country, in the municipalities, in the cities, to tackle the problems that need to be tackled. But by working together, it can be done."

Laverne Palmer went on to explain that the National Research Council of Canada, particularly the Institute for Research in Construction, uses club funding to tackle problems. Another example of that was corrosion of parking garages. Those of you in municipal regions know that this is a multi-billion dollar problem really, if you look at total cost. One major approach to solving that has been a consortium that was set up by some of my colleagues together with some major real estate companies. By pooling resources, research was done there that would not have been done any other way. And of course we, i.e. the federal government, put in money too."

Tom Field noted that there is a new realization of the cycle that water goes through, not just use or delivery but through the cycle of waste water collection, waste water treatment and then disposal to a receiving water body or a river. He noted that there is going to be a greater realization of the cost of providing water.

Howard Atkinson, of the City of London, asked Mr. Janes if, in the Thornhill-Vaughan model of private homes infrastructure cost, a model was calculated for low density and high density as well, and what the figures might be.

Steve Janes replied that figures were developed under different densities and that the $32,750 does adjust very substantially when you go vertical in denser housing. He added that the other factors tend to be specific to the housing unit. There are changes in terms of trunk systems of course but the bulk of those other costs are independent of the density of the housing itself.

Larry Draho, City of London, asked the panelists to comment on the role that natural

areas should play or are playing as a solution to addressing such matters as storm water quality and whether there is any cost effectiveness to that approach. He noted that the whole philosophy coming out of the Sewell Commission Report stresses this ecosystem approach to planning, i.e., making use of the natural environment as a solution as opposed to relying on manmade or man built structures.

George Mierzynski commented that the ecosystem approach as described by Sewell does not relate to specific treatment methods but to the same philosophy that the Minister of Environment is espousing, in other words the prevention philosophy. Do not build in the wrong places, build with setbacks, build with natural areas. Do not build storm sewers if you do not have to. Do not put your roof leaders into storm sewers because there are no storm sewers. Use natural ponding.

Richard Kirwan of Urban Policy Associates highlighted the issue of pricing in relation to infrastructure. "Any of us who live in the politically real world know that as soon as rehabilitation, redevelopment, intensification of residential land use goes on in existing built-up areas, there is an immediate demand in those areas for the renewal of virtually all the infrastructure that is in place. Everything is found to be worn out, all the community facilities and the physical infrastructure. And of course, the fact that that is worn out goes back to this issue of pricing. Those of us who have been arguing for a long time that people should be charged replacement cost pricing will say that is the reason why the infrastructure has been allowed to run down."

"However, " Mr. Kirwan continued, "that relates to the issue which has been raised this morning about reserves. It is one of those ironies that a country like Germany pursues what to the English speaking world seem rather old fashioned practices both in municipal accounting and in business. In the English speaking world, there has been a rather different approach to public finance and part of that was the removal of reserves that used to exist in, for example, the 1960s. All municipalities were required, at the end of the 1960s to get rid of their reserves which were thought to be an unnecessary luxury, little pots of money sitting around and doing nothing. During the 1980s, of course, public finance was given the once over by the private sector and they tended to look at public finance through the lens of things like the balance sheet. They identified deficiencies in public finance like the insufficient accounting for liabilities. At the same time they required that public authorities should get up to date in things like cash management and that while you should have properly structured accounts you should also not have money sitting in piggy banks doing nothing or just earning interest. We do not have to look at the disasters of M. Maxwell and so on to see what happens in the private sector if you do your accounting in one way but manage your cash in another way. But nonetheless there is a fundamental dilemma there. People do not manage their assets with a view to their income earning potential which would give you an incentive to maintain them. They maintain those assets with a view to reducing their perceived costs in the short run."

Steve Janes replied that that is the nub of our problem. "We have to understand the value of the asset and at what point in time the asset

will have to be replaced. Whatever we do, the problem is that we have not built into our system a way in which to measure, monitor and replace that asset. Metropolitan Toronto's waste reserve account is an example of the point I was raising about the rob Peter to pay Paul method. There was $200 million sitting in an account about two years ago. It is now down to less than 5 per cent of that. A major hunk of that money was used to defray an increase in the mill rate. And it was not to be repaid. They are now looking to the province to solve the problem. From my perspective, this is a financial disaster."

In response, Tom Field recounted an instance that occurred at the beginning of this week. "I was talking to the Capital Regional District, the regional government for the area around Victoria, about the condition of their sewer collection systems. We were talking about some very seriously deteriorated areas that had very high infiltration inflow resulting in overflows to the ocean that the provincial government regulators were telling them to control. The municipal engineers were saying that not only do they not have enough money to maintain these systems, there is no way they seem to be able to get money allotted to rehabilitation. Water and sewer systems in particular have been totally underfunded from a replacement and from even an operation and maintenance point of view. This needs to be addressed at the political level, not really at the engineering level. Every engineer, every operator realizes the need for this and the implications of not doing it. But the political will is just not there to put this money aside and to keep it for an eventual upgrading or replacement."

ACHIEVING COST
EFFICIENCY/EFFECTIVENESS THROUGH
INNOVATIVE PLANNING APPROACHES

BY KENNETH WHITWELL
IBI GROUP, AND
ROBERT WEBB
MARSHALL MACKLIN MONAGHAN

KENNETH WHITWELL

Just to put the infrastructure problem in perspective, it has been estimated that about $18-billion is required across the country to bring the existing urban infrastructure — roads, sewers and water primarily — up to what might be considered acceptable standards. In the future, we are looking at vast sums of money to handle the increased population. For example, in the GTA, i.e., the area around Metropolitan Toronto, total capital cost requirements to handle the increased population until the year 2021 are estimated between $75-billion and $80-billion. It should be recognized that that is more than just roads and sewer and water. The sewer, water and roads component of that varies between $26-billion and $39-billion depending on whether one goes with the concentrated or dispersed pattern of development. Metropolitan Toronto has estimated that maintaining its existing infrastructure will cost about $6-billion over the next ten years.

One indication of the problem is the reduction in the amount of money that governments have put into hard services. For example, in Ontario in 1950, 27 per cent of the total budget of the province went for transportation and communication. That has now been reduced to about 5 per cent of the total budget.

Looking at the reasons for that, one of the difficulties in maintaining infrastructure is that maintenance is not sexy. Building a new road is something that people like to see. Maintaining a road is something that does not gain the politicians any additional benefit, so there's not the same emphasis in looking at maintenance; it is even worse when you have invisible or underground services. The other factor is that there is no immediate negative reaction to not spending money this year on maintenance. Politicians who are looking at the maximum of three years in the future are not concerned about cumulative problems. Politicians can just put off maintenance for one year and not have any down side. This is very appealing in times when there are other demands for the dollar.

To some degree, the increased emphasis on citizen participation is tending to move us away from infrastructure and more to "immediate gain" types of investments. So there is a tremendous move away from infrastructure, particularly maintenance, where the benefits are long term, and towards health, education and social welfare where the benefits are seen up front. Perhaps the last reason for the shift away from infrastructure is that infrastructure investments require a very long environmental assessment process. It does not require any sort of a process to pour more money into social welfare and a much shorter process is required for capital investments in hospitals and educational institutions.

The development trends that are taking place are ones that I suppose are familiar to us all. The larger cities are growing the fastest, which means there is an increasing concentration of

the population in a few large centres within the country, and the growth that is taking place is primarily on the periphery. Obviously the periphery is the area where there are no existing people, where the land is available, and so the tendency is to expand further and further outward as more population comes to the large cities. In fact, around the major cities there is a large population increase that is moving out beyond the immediate urban envelope and is developing on large lots on septic tanks and wells in the exurban area.

The employment opportunities are following the move of the people into the suburbs so there is a large growth in office and industrial jobs. These are becoming more and more dispersed throughout an urban area. The net effect of all this, of course, is that the concentration of jobs which gives rise to transit usage is lost as the jobs are dispersed into a wider number of locations. The total area that is consumed increases. As jobs move out to the suburbs, they tend to move to locations at lower densities than they would have had if they were in the central parts of the urban areas. So there is an increased dispersion and an increased use of land both by housing and by jobs.

The dispersion of the jobs and the dispersion of the residential locations means that there is an increasing dependence upon the private automobile. The private automobile is the only mechanism that can handle a very dispersed pattern of employment and therefore there is less and less use of public transit, and more of a need to provide wider and wider roads at longer and longer distances to handle the population growth that is taking place. The net effect is that the journey to work distance tends to increase. As people moved further from the centre, their journey to work in the centre got longer. Then the jobs went out behind them and this reduced some of the journey to work times. But now as the areas become policentric, multi-centered, multi-modal, there is an increasing range of opportunities for places of work. The distances, even in the suburbs, are becoming longer and longer for people to get to work.

This problem is exacerbated by the fact that many households now have more than one wage earner and while it might be possible to move close to the job location of one of the people, the other one then probably has to go an even greater distance to get to work. So the combination of the two-income household and the dispersion of jobs results as well in a requirement for two cars and a greater travel distance to work for at least one, if not both of the people in the household.

The reduction in transit usage automatically follows. Transit has difficulty competing in low density environments and difficulty in competing where there is no central location for jobs so that the dispersion is virtually impossible to handle by public transit.

Between 1956 and 1986, the Canadian population increased by about 60 percent. This growth was not uniform across the country. The West grew slightly faster than the Centre and by West I mean the four western provinces plus the territories. The Centre is Ontario and the East is Quebec and the Maritimes — an approximate one-third/one-third/one-third breakdown in the total population of the country. Even in the last five years, the growth of the country has continued at almost 8 percent, slightly higher in Ontario, with the West about average for the country and the East

slightly lower. Of course, the western growth obscures the fact that the vast amount of that growth is taking place in British Columbia and Alberta while Manitoba and Saskatchewan have a quite low growth rate. In the Centre, growth is primarily in southern Ontario whereas northern Ontario is growing at a much slower rate.

To illustrate the statement that the larger areas are growing the fastest, the six largest metropolitan areas in the country had a growth rate of over 110 percent in the 30 years from 1956 to 1986. The 19 smaller metropolitan areas had a lower growth rate, the other urban areas, lower rates still and the rural, lower still. So that as the urban centre gets larger, the growth rate gets higher. The net effect of that is that the six largest metropolitan areas which accounted for almost 30 percent of the total population in 1956 now account for over 40 percent of the population of the country. In 1991, the shift is still noticeable. The larger areas are growing the fastest, then the smaller metropolitan areas, then all the rest. Concentration is taking place more and more in the large cities of the country.

For example, looking at southern Ontario between 1981 and 1986, one can see a pattern developing where the regions of Durham, York and Peel around Metropolitan Toronto have a considerably higher population increase than anywhere else. That drops off a bit, to the west in Wellington and Waterloo which also have growth rates that are in excess of the provincial average, as does Victoria. Dufferin, Simcoe, Muskoka and Haliburton are at the average. And then as you move further away, growth rates are lower than the provincial average. A similar pattern would be found around the other major growing urban areas in Canada.

In this present system, in addition to the kinds of growth rates that are occurring naturally, planning practice has implications for the type of official plans and zoning bylaws that are developed. Planning practice in this country is primarily driven by a goal of avoiding incompatibility, i.e., the goal of attempting to segregate, pigeon-hole, or order various types of land uses so that there is a minimal amount of adverse effects by one type of use on another use. This leads to large areas of single purpose use, whether those areas are single family housing in one place, a large expanse of industrial activities in another place, or a major shopping centre and shopping concentration somewhere else. All of the uses are spread out. There is very little mixing of uses.

There are very few planners that recommend putting residential activities in an industrial district. Planners have not been pushing residential as part of a shopping centre. Present planners are very concerned about allowing retailing in a residential area. It all must be segregated. The whole push of the planning profession is to move towards separation of land uses.

At the same time, the zoning bylaws become more and more intricate. I have seen thousands of examples of rezoning over the last 20 years . I have never seen one that got a more simplified zoning, a broader category afterwards than there was before. Every rezoning is a little tighter, a little more detailed, a little more specific than what was there before. The whole process is moving

towards a system which is very, very detailed, very difficult to change, more and more finely tuned. This is leading to a situation where even colours of doors and roofs or sometimes sight-line control may be zoned. In fact Burlington, pushed by the citizens, did ask the province to change the Planning Act so as to allow them to control the colours of brick and the colours of buildings. Everything is being controlled; everything is being segregated.

This push also results in social segregation. Because you are controlling the size of lots and the size of houses and creating areas which are for single use type of housing, you tend to get the rich in one area, the middle class in another area, the working class somewhere else. The industrial areas are segregated into heavy industry, light industry, or warehousing. Many municipalities try to prevent retailing from taking place in an industrial district. Everything is segregated into a number of precincts throughout the municipality.

Planners prefer single family homes; they appear to have the least social problems. Not only are single family homes good but the bigger the house and the bigger the lot, the more prestigious is the residential development.

Another concern of planners is parking requirements. Planners will place very very large parking requirements on properties so as to ensure that under almost no circumstances will it be necessary for people to actually have to park their car on the street. Avoiding street parking is one of the driving forces of the planning profession today. More and more of our retail areas have large expanse of parking lots which are difficult and expensive to maintain, and very, very consumptive of land. But at least the cars are not parking on the rights-of-way and on the streets.

In fact, the street right-of-way is getting wider and wider. There was a time when a 60-foot right-of-way was considered wide enough for a concession road. Now you must have at least 80 feet before you can start to do anything and according to some, it would be preferable to have 90, 100, even 120 foot rights-of-way. In this way every one of the underground utility companies can have their own little fiefdom where they can dig their trench without interfering with anybody else and where the traffic engineers have the ability to widen the street to eight lanes if necessary.

So we tend to get wider rights-of-way which consume more land, larger properties which consume more land, more parking lots which consume more land, and a heavier and heavier emphasis on the automobile with its hierarchy of roads. We do not have a fine-grained pattern of arterial roads. We have widely separate expressways, not quite so widely separated arterial roads, and another system of minor arterials and collectors. The hierarchy system tends to encourage the dispersion and the segregation of land uses and it also creates long travel distances and more circuitous drives to get from one land use to the other.

We even get reverse frontages where, having pushed the street forward, the planners then prevent any use abutting that street from having access to the street. Buildings turn their backs to the street which further encourages the development of inward looking enclaves separated by these wide expanses of arterial road. This produces areas without people

which are inhospitable to the pedestrian — exactly the places where the planners then attempt to put a bus service.

I characterized it once as concentration camp design. In Markham, the reverse fences are all concrete. Large arc lamps along the road create a very very bright area. There may be a sidewalk but not always. Rubble is strewn there. These are the places where the buses are supposed to stop and people are supposed to come out and feel comfortable about using public transit.

Municipal preferences are another factor. First of all, we recognize that there is a tendency in many people, as they have more wealth, to want to use the wealth to buy space. Space can be either the size of your lot or the size of your house. But if there is extra money, many people use it to buy themselves space so they are less affected by their neighbours. However, one would have thought that a municipality would see that higher densities and smaller lots was in fact less costly from an infrastructure standpoint. But one of the surprising things is that, almost inevitably, when you have a piece of land going to a municipal council for approval, the municipality will attempt to reduce the density. The tendency of municipalities is always to try for a lower density of development.

I had developments when I was Commissioner of Planning in Scarborough where the council went in and took a plan of subdivision and just reduced the number of lots in half. I was surprised at that time that the developer did not complain. And I spoke to him afterwards and he said, "Why should I complain about this? I sell my lots at so much per foot frontage. I do not care if they want to create half as many 60-foot lots as I had 30-foot lots because I get the same amount of money for it." This rule of thumb states that land is related to its frontage. There is another rule of thumb in the development industry that the price of the house is proportional to the price of the lot, (you double the price of the lot, you put a larger and more expensive house on it). I began to realize that the value of house plus lot is also unaffected by how big the lot is. Two 60-foot lots with two large houses on it would have about the same value as three 40-foot lots with slightly smaller houses or four 30-foot lots with slightly smaller houses. From that, one can almost see that the revenue to the municipality from a given subdivision may be the same regardless of how many lots are in that subdivision.

From the municipality's standpoint, by and large, the revenue that they are going to receive is about the same, whether they have a few large lots or more smaller lots. Their infrastructure costs are about the same in absolute terms. Obviously they are going to be higher on a per household basis if there are fewer households. But if a municipality is assuming on this mythical hundred acres all the roads and services that are in place and maintaining them, the number of miles of linear service remains the same whether the lots beside the streets are 30 foot, 40 foot or 60 foot.

To a municipality, the revenue is the same, the hard surface costs are the same but its people-oriented costs obviously go up as the number of people go up. Given a choice then between having 100 houses of a large size or 200 of a small size, if the revenue and hard costs to the municipality are going to remain the same in

both cases, and yet its social service costs double if there are twice as many people, it is obviously fiscally prudent for a municipality to try to reduce its cost by going for fewer but larger lots and fewer but larger houses.

In actual fact, they have not saved the cost in a total sense because the people that are not housed under the large lot alternative have to be housed somewhere else. But what the municipality has done is to attempt to transfer the social service costs of those additional people on to some other municipality.

Looking at a fixed piece of land, the viewpoint of a municipality is eventually to conclude that the best thing to do is to minimize social service costs by having large lots. From the provincial standpoint where the population is fixed, where the social service costs are the same because the people are there anyways, and you are trying to find the cheapest way of housing people, the way of reducing cost is to consume less land. From the number of people standpoint, you try to get pressure to consume less land. From a land standpoint, you have pressure to try to have fewer people. It is a situation where the taxation system, the revenue system encourages local municipalities to act in a way that is inefficient from the standpoint of the system as a whole.

The fourth factor in all this, after the type of development trends, the planning practices and municipal preferences, are the people that live in the area, the not-in-my-backyard (NIMBY) syndrome. Generally speaking, anybody who has an expensive house — and anybody who has a house believes that they have an expensive house — is going to do anything to try to prevent something happening that would reduce the value of that house. People do not know for sure what the effects of change will be. It might in fact be beneficial. But it also might in fact be detrimental. And while it would be nice to have a beneficial change where your house goes up in value and you have a windfall profit, that niceness is not as great a motivator as the fear that the change may produce a reduction in your house value. In cases of major change, the general tendency of people is to resist a change where they are not certain that the effects of that change would be beneficial to them.

People will resist intensification and redevelopment to higher densities. People will also characterize their resistance as a concern that the parks which they have become used to in the neighbourhood will now become over-utilized if there are more people living there, that the schools will obviously become over-utilized, the traffic on the roads will increase, the on-street parking and hence the congestion will increase.

In addition, new developments, particularly if they are new developments of smaller housing in an area of larger houses, will tend to bring in a different kind of person. This is particularly true in areas where the majority of the resident population has lived there for a number of years. The development will bring in new people at a new age and possibly at a new income level. There is also uncertainty as to what effects the new people will have on the community. The concern about property values also leads to a concern about any large number of new people coming in to the neighbourhood. Obviously, the smaller the change, the less impact it is going to have and the less opposition. The more one tries to move towards

intensification and redevelopment, the more there is a natural tendency on the part of people to resist it for fear of the unknown.

That protectionism even extends to industrial areas. One of the concepts of intensification is to reutilize old industrial areas for new residential development. People have two motivations there. One is that they want to preserve the industrial jobs that remain and do not want to increase land values by bringing in other uses. But there is also a concern that development of the industrial area will also bring new people, new values, new ideas, over-utilization of resources into the community and there may be an adverse effect on their lifestyle or property values. The tendency of the neighbourhoods is to resist change and definitely resist anything that would intensify the level of development.

What is the result of these factors; the development patterns, planning practices, municipal preferences and NIMBY? Everything becomes further from everything else. The only place that you can develop is on the edges. The larger the lots the better. The more segregated the land uses, the wider the rights of way. The total development pattern spreads out at a faster and faster rate as the outskirts of the urban area are developed at lower and lower densities.

It becomes virtually impossible to walk or bike to anything. The road system is not designed for bicycles. The distances are not designed for people walking. The segregation of uses means you do not have a corner store that is in walking distance of your house. You have to use the automobile for almost every activity, with the exception perhaps of visiting your neighbour, or possibly taking your children to school. Going to work, going to shop, going to entertainment, going to recreation — everything requires the automobile. Everything is further away than it was ten years before.

The auto then becomes the only mechanism to move around. Even if people could walk from a house to a shopping centre, the shopping centre is so designed that the building is in the centre. It is surrounded by acres of parking. If you were foolish enough to actually attempt to walk there after you had crossed the eight-lane arterial, you would then have to walk through a very large and inhospitable parking lot in order to get to the store. The design of the buildings and developments discourage to a very large degree the few people that might try to walk to them. It becomes a more and more difficult operation for people who do not have an automobile. They become forced into the centres of the existing cities and on the periphery, we have greater and greater dispersion. The density gets lower and lower. Intensification becomes increasingly difficult, the segregation of land uses means you have more trips required, you do not have joint activities at one place so you have to make more trips and those trips tend to be longer, require more roads to get to them.

Looking at the greater Toronto area, i.e., the regional government areas of Durham, York, Peel, Halton and Metropolitan Toronto, the core is the city of Toronto and two smaller municipalities — York and East York. The inner suburbs is the rest of Metropolitan Toronto which is Etobicoke, North York and Scarborough and the outer suburbs are the regional government areas of Durham, York, Peel and Halton. The population in 1986 of

those three areas was virtually the same, just 900,000, 1.2 million, and 1.5 million.

The density of development in the core to the outer suburbs ranged from 5,300 persons per square kilometre in the core through 1,780 down to 1,440. The number of vehicles per thousand people increased. Thirty percent of the households in the core can get by without a single car. That drops off to only 1 percent in the outer suburbs. I do not know how that 1 percent lives. The number of households with more than one vehicle increases from 21 percent to 40 percent to 64 percent.

There is a direct relationship between the densities and the need and the reliance upon the private automobile. The number of trips that a person takes per day increases from a little less than two to two and a quarter trips. The percentage by automobile goes up, percentage by transit goes down. The trip length increases as you get further into the outer suburbs both by auto and transit. The total number of kilometres per day per person by automobile goes from 9.4 in the core up to an average of 21.7 in the suburbs. By transit there is a slight increase from the core to the inner suburbs and then that drops off drastically in the outer suburbs. This shows the relationship between the need for roads and the need for car oriented types of activity related to the density of development.

Finally, we look at the relationship between the infrastructure, densities and other aspects of built form. If you want to reduce infrastructure costs for roads, you need to have shorter distances, less reliance on the automobile and therefore less need for wider roads. Density will reduce the length of the roads. Reliance on transit, which also comes about with density, will reduce the need for wider and wider roads. Increasing densities is probably the greatest single means of reducing infrastructure costs. The linear service costs for water and sewer lines likewise decrease as the number of miles of road that have to be serviced by those facilities decreases. The cost of the treatment plants will remain the same based upon the total population but all the linear aspects of the cost will decrease as the densities go up.

Another idea is that the larger the city, the more effective its use of infrastructure. This may be related to the fact that the larger the city is, the denser the core and therefore the higher the use of public transit. There are certain economies of scale that would come about in some facilities so that as the city gets larger, there would tend to be a reduction in the per capita investment in infrastructure cost, particularly the cost associated with roads.

The more that you can have uses mixed together, the more that people can do some of their trips by means other than the private automobile. The more that people can shop for anything other than their weekly grocery shopping by walking to a store, the more it becomes possible for families to only have one car. As you get a mixture of uses and more things within proximity of walking distance, you can reduce the number of cars per household which means you can reduce the amount of land on the lot that is given over to parking lots. You can have more one-car garages rather than double car garages. The more people that walk to a store, the less need there is for that store to provide off-street parking and the higher the density you can get. The mixture of uses also

tends to benefit public transit usage because it gives a greater number of offs and ons and therefore the transit system has a more balanced load. The car is the greatest single infrastructure cost. Increased use of transit which comes about through the density, will help to reduce the road cost.

The single most effective technique of reducing incremental infrastructure cost is to develop more housing and more jobs within the urban envelope where the infrastructure already exists. And there are very, very few places in our cities where the roads are totally at capacity, the sewer lines are totally at capacity, or the schools are just exactly filled. There are generally some aspects of the total infrastructure which are in place, which can be used by the new residents of the area. And even if there has to be a charge against new residents for bringing certain aspects of the infrastructure which are not available up to capacity, that still is cheaper than having the people move to the outskirts where all aspects of the infrastructure have to be built new.

This is particularly the case in the older parts of the cities where there is a need to renew the existing inground plant, where the sewer system has to be dug up and replaced anyways. And that is going to be a cost against the existing people. If a new population, rather than being on the outskirts where they would require brand new facilities, can go in the area where the system is being renewed, then you can simply make the renewed system a little larger. You can handle the new population plus the old population and the total cost is considerably less than doing the two operations differently in different parts of the area.

One of the goals in looking at intensification is either to identify areas within a municipality where the infrastructure has additional capacity or to look at areas where there is going to be a major investment in renewing the sewer system or roads and to suggest that that is the area to intensify because that is the area where, with a little additional cost, you can handle the new population as well.

In fact, the goal is to develop a street pattern and a lifestyle pattern that is reminiscent of the pattern of life that existed between the First and Second World Wars. This is a system of mixture of uses, of intensification along main streets, an ability to use public transit for most of your trips, to be able to walk and shop in many cases. What is now being called a sort of neo-traditional planning, is a return to the grid system of roads, to a finer grid of streets, an attempt to rely less and less on the automobile, and much more on compact growth, higher densities and greater mixture of uses. These are the directions that one needs to look at if we are going to plan our cities in such a way as to reduce the total infrastructure cost.

ROBERT WEBB
MARSHALL MACKLIN MONAGHAN

Today I wish to address a variety of topics related to achieving cost efficiency / effectiveness in infrastructure and in fact, in land. I will present ideas which can be implemented immediately and very quickly and which will show a return to both the community and new home owners. I will speak about development savings in infrastructure and land costs which can be achieved without sacrificing the quality of either an existing community or a new development. A lot of what I will talk about is related to new development but many of the ideas can also be applied through infilling. I have a variety of topics to talk about; land use intensification, subdivision design standards, both planning and engineering, joint use community facilities and the resistance to redevelopment or development or the not-in-my-backyard syndrome. Many of the topics are covered in greater detail in the paper.

It is very interesting to be involved in a process like this. Tom Field spoke earlier about being able to step back from what we do day-to-day and I also find that stimulating. I generally work in the engineering profession but I have had a chance in preparing this to work with some of our planners and to think about broader issues than we normally deal with. Ken said it pretty well: "Intensifying land use whether in new development or in redevelopment of an existing area is the single best method of achieving infrastructure efficiency/effectiveness."

There are a number of themes which come up again and again in this topic. The first is affordable and appropriate standards. In the short term, at the local level, changes can be effected which will result in savings in both land cost and infrastructure. In this regard, as participants in the development process, we all face a serious challenge. By and large we are still dealing with the bigger is better syndrome. Everything we do, we have to do to a higher standard. We need to build a little more infrastructure. Everyone wants a little more land and we get a little more spread out. I guess I blame agencies to some extent for this. We need to be able to convince people that we can develop quality developments with quality infrastructure and build less and have less to maintain.

The second theme is cumulative effect. Most of the changes I will talk about, i.e., the ability to decrease infrastructure and decrease costs, are by themselves pretty insignificant. But when they add up then you can get savings. In environmental circles, the term cumulative effect has become popular as we discuss potential degradation to the ecosystem through a series of events that are, by themselves, arguably insignificant. But when you add them together, they cause a problem. The term 'cumulative effect' applies equally well to what we are trying to do here, i.e., do a lot of little things and be more efficient. I am an advocate of performance specifications, particularly with engineering solutions. I think we are building a lot of things in order to conform to standards and the standards are set to solve problems that have occurred elsewhere. Performance specifications, performance standards, even though a little more complex to administer, result in better solutions with less infrastructure.

The final theme is coordination of planning and engineering efforts. With increased density, it becomes important to have engineering input all the way through the planning process. In low density development, there is lots of room for infrastructure. You do not have to worry about it. But as we get more dense, we need to accommodate infrastructure from the beginning.

In Canada, municipalities are still utilizing relatively conventional or traditional planning approaches. The effort to achieve cost efficiency and effectiveness through alternative planning standards have been examined. I will focus on reducing land area requirements per housing unit in order to realize savings in land and servicing costs and in maintenance. In 1976, the Ontario Ministry of Housing produced a publication called "Urban Development Standards." It was a study that found that per lot savings in servicing and land costs (and infrastructure), resulted primarily from increased housing densities. Higher density or intensification means less infrastructure per person.

The Canadian Urban Institute has identified the following five categories of residential intensification — 1) through a conversion, 2) through infill, 3) redevelopment of existing areas, 4) adaptive re-use, re-using existing forms for uses like housing and 5) suburban densification.

Intensification is about mixed use, it is about low rise, it is about human scale and designs that are complementary to existing development. A well regarded Toronto architect, Jack Diamond, recently said that you can double the density of a single family neighbourhood without changing its character. You can still have single family home dwellings. You just go from a loose arrangement of houses to a tighter arrangement. Clearly, both modified and innovative planning standards are required in order to realize substantial increases in density with low rise residential neighbourhoods, whether in green field situations or in existing communities.

In the course of undertaking our review, specific planning standards related to minimum setbacks, minimum frontages, minimum lot sizes and parking requirements were challenged. Today, our profession and the public recognize that lesser lot frontages and smaller lot areas per dwelling unit will result in lower housing and infrastructure costs. Further, if lot frontage is reduced, the local access road abutting the lot is also reduced and thus the road area and servicing costs associated with each lot is reduced.

We have investigated a number of different lotting scenarios and you will find them in the paper. I will not discuss them in detail but they are all aimed at making housing more compact.

In terms of overall neighbourhood planning, more compact design resulting in smaller private recreation areas makes the provision of park land and open space increasingly important, but this can be established without a requirement for heavy infrastructure. As well, we worry about security in our cities. Our planners are talking about the grid system and neo-classical system which Mr. Whitwell has just spoken to; I think it is important to look to previous applications and apply them in new situations.

I have brought a couple of examples that I think are kind of fun. We worry in our parks about security and yet we have a lot of houses backing on to our parks. Well here is an example in the city of Toronto where the house fronts on to the park and there is in fact not even a road in front of the house. It offers a number of features. There is very little land used to access the house. Security in the park is enhanced by the houses looking on to it. It is a nice vista from the park and a nice vista from the house. We need to look for new ways of doing the old things.

We talked earlier about integrating planning and engineering. One of the easiest ways to intensify is to reduce the face-to-face separation between houses, i.e., from one side of the street to the other. Typically we are required to have setbacks for our houses of about 6 metres, measured from the property line. This provides a place to park the car in front of the house. It provides privacy in the house and, in some people's opinion, a more aesthetic streetscape. But there are other ways of doing it. For example, we can provide a place to park one car outside the garage. We do not have to measure it from the property line; we need to measure it from a real barrier such as a sidewalk or a curb. We should only set the garage back; we do not need to set the entire house back. I think the issue of privacy is really one of perception and there are other ways to deal with that; through architectural treatments, window coverings, etc. House designs with the house more predominant than the garage are, in many people's opinion, more attractive than the current garage predominant designs.

Today, our planning standards call for a fairly nice streetscape of fairly nice houses but a lot of space between the houses and a lot of wasted and under-utilized space. As someone said to me the other day, "What most of these houses have is a place to park one and a half cars in the driveway." Well not many of us have one and a half cars.

To summarize my remarks on intensification, smaller lots and compact housing forms require a more integrated design approach than is necessary with traditional large lots. The planner must work with the engineer and, if possible, the builder to identify areas where additional land must be allocated for grading, drainage and infrastructure and make allowance for them.

The second topic is subdivision design standards and here I will speak primarily of engineering standards and local design standards. Others have already addressed the big picture of treatment and large scale piping. Here we are talking about the local issue. Savings in construction costs also mean savings in infrastructure, maintenance and replacement costs in the future. Subdivision design standards have evolved over the years but they always tend to be increasing. The government environment departments are asking for more; citizens are asking for more. Municipalities, in reaction to a past problem, are asking for more. In virtually all cases, changes have the effect of increasing cost of servicing and of infrastructure.

On the other hand — fortunately there is another hand — innovation has kept the financial impact of these changes in check. Contractors, material manufacturers, and I

would like to think engineers, have in the past found, and will continue to find solutions. Regarding infrastructure and municipal standards, people often talk about gold plating the things we build.

I do not dispute that they need to last. What I question and think may be inappropriate is the amount of things we are building. I think we are building too much infrastructure and thus causing ourselves to have too much to maintain. We have looked at southern Ontario land development costs over 15 years and we have compared that to the Consumer Price Index. I was quite surprised to find that they track quite closely together. Development costs are not going up from a construction point of view or an infrastructure point of view relative to CPI.

In our report, we talked about the forces that impact on servicing costs and others have talked a little bit about this as well. The factors that are causing the prices to go up, typically, are higher standards — things like additional water main requirements, curb and gutter instead of curb, looping of water systems, higher standards of basement protection from flooding. But, fortunately, we have some things keeping costs down such as use of plastic pipe and greater use of precast products. If we could just be working more efficiently and not increasing the standards we could actually be bringing costs down and we could be building less things to maintain in the future.

It is important to know what goes in the right-of-way of a typical road. Typically in a 66-foot road allowance, we have 8.5 metres of pavement, 28 feet of pavement. We have one or two sidewalks. We have sanitary sewers, storm sewers, water, utilities, Hydro, Bell, Gas, shade trees, and then the above ground features like the light poles, hydrants, and so on. In short, the right-of-way is the lifeline of the community.

Notwithstanding the importance of the right-of-way, there are opportunities to reduce it. We can reduce the number of sidewalks. We typically have two sidewalks on each street. On some streets, that is not necessary. Sidewalks take quite a bit of space. I think that we should allow for sidewalks and plan for them at the draft plan stage and set housing, lot sizes and right-of-way widths according to sidewalk requirements. Again it needs integration. Where we do have sidewalks, there is no need to have sidewalks with their own exclusive location. There is no reason that they cannot be over top of utilities. To dig up the sidewalk in the future is not a big issue.

It is possible to reduce pavement widths. Historically, on local roads we build 8.5 metres of pavement, 28 feet wide. By reducing the pavement width, only slightly, say to 8 metres, we build less, we take up less space and we have less to maintain in the future.

Water mains are typically built in the boulevard. That is not necessary. Water mains can be built under the road. In the 1960s and '70s, Hydro, Bell and cable TV were built on light poles or poles in rear yards on easements. More recently we have moved away from that. We have felt that was aesthetically unacceptable and have put them underground. It costs a lot of money to put them underground and I think it probably costs a lot of money to maintain them.

If we continue to go with underground utilities, I think we have to find a way to make them more compact. Right now, utilities each get a location within the right-of-way but they build in a common trench. There are three locations on each side of the road yet utilities are installed in a common trench and there is a lot of space left over. We should plan to build them together from the beginning.

People working in the right-of-way, the utility companies and so on, have a vested interest. They want lots of space to be able to work and in the past they have proven to be not very receptive to changes that would allow us to reduce the right-of-way. It is necessary to work with the municipality and to get them on side, to sell them on the idea and then to have the municipality deal with the senior people at the utility. At the utility companies, we need a municipal champion to help us through the process, to help us reduce the right-of-way.

The municipalities of Ottawa-Carleton were faced with pressures to increase the right-of-way from 20 to 23 metres. They got together, worked with everybody involved and have now, on an experimental basis at least, found a way to get the right-of-way down to 16 metres. It still contains everything I have talked about but in less space. There is less for the municipality to look after, less infrastructure to maintain in the long run.

I would like to speak for just a moment about general issues related to municipal standards. I think it is more appropriate to develop a series of guidelines against which the standards and rules can be tested. In our paper, we have developed some questions to test the standards and to aim us more towards performance standards. Performance standards are key. Reducing rights-of-way or removing sidewalks are also key. It should be possible to achieve savings of up to 10 percent at least with efficient, effective standards and using performance specifications.

Let me now talk about an example of joint use community facilities. This is a facility in the City of Scarborough. There was a church on this site, a single church on a large site, quite appropriate for the kind of development that occurred in Scarborough in the 1950s and '60s. They have torn down that church. The church has now a number of other uses incorporated into the site. They have social housing, they have added a daycare, they have incorporated community facilities to make it a more friendly place for pedestrians and they have even incorporated a pedestrian waiting area for the bus. Here is another example, an efficient use of land through schools and parks being put together in a campus type setting.

Implementation requires work on everyone's part to change planning standards and to be more efficient from an infrastructure point of view. At the federal level we need to do things such as this conference. We need to have federal government agencies and organizations getting people together to talk about it. Provincially, we need clear policy statements. We need to support the policy statements with official plan and draft plan approval processes that are rapid. The Municipal Board needs to be directed to speedily look at these kinds of things. At the local level, organizations, lobby groups and corporations need to promote products. They need to put forward products that, in fact, support these goals and local government needs to approve plans quickly.

Benefits of individual changes in land use intensification, innovative planning and engineering standards or joint use community facilities may not seem significant but the cumulative effect of their implementation will be significant. We have demonstrated savings with respect to capital, maintenance, operating and land cost that will in turn provide an opportunity for more affordable housing and less infrastructure. Today more than ever, there is an opportunity to go beyond the studies and begin to effect change in the way we develop land. A coordinated effort by all levels of government, proponents and interest groups will ensure that these objectives are achieved.

In summary, we need to intensify; we need reasonable standards; we need to work together; we need to remember that little changes will help and we need to be broad-minded in looking at solutions, particularly when people are trying to do something in our backyards.

PANEL DISCUSSION

MARNI CAPPE
REGIONAL MUNICIPALITY OF OTTAWA-CARLETON

I came here prepared to suggest that I wanted to change some of the viewpoints of the engineers but I also wanted to take some of the responsibility as a planner for contributing to the urban form and the problems that we are now facing. I do not know if I want to take as much responsibility as Ken did as a planner and attribute all the ills that we now face to planners. But I strongly agree that a lot of the planning that we have done and all the planning I was taught was all premised on the notion that segregating uses was the way to go and that is really what our whole zoning system is based on. However, I think there are changes coming in the future. We do see a commitment to more mixed use development.

Ottawa-Carleton has had some experience in working with a committee of engineers, representatives of utility companies and municipal planners in examining the planning and engineering standards that are currently in use. We came at this from a slightly different tack. My interest is in housing policy and in Ottawa-Carleton, our efforts were directed to implementing a government of Ontario policy which was announced a couple of years ago.

We proceeded to develop some standards to achieve more affordable housing in our region. We started out quite plainly and drew up some regulations and it was not long before representatives of the Home Builders' Association came forward and said, "You know, we're really regulated to death." All this was

also happening at the same time that Bill 20, the Development Charges Act was being promoted and municipalities were looking towards significant increases in their development charges. So we agreed with the Home Builders to sit down and look at ways that municipalities could provide incentives to allow affordable housing to be built, not simply to rely on the private sector to deliver the affordable home ownership product.

The result was this committee that has been alluded to. It was a very satisfying process for me. The engineers on our committee were great. They were enthusiastic. At the first meeting, everyone rolled up their sleeves, sat down, drawing boards were out and we started to identify the standards that we thought needed to be reviewed to help achieve some cost savings in the production of housing. The central feature of our work relied on reducing the right of way width. At the same time, we also looked at planning standards relating to lot frontage, lot size and yard requirements. We also examined other engineering standards such as the possible elimination of curbs although not the elimination of the storm water system as we know it.

I just wanted to point out a couple of issues that have arisen since we circulated our draft report last fall. There are some concerns which ought to be aired here. One of the important issues that has arisen for us and it will arise for anyone planning in Ontario is the issue of the Ministry of Transportation of Ontario who are responsible for providing subsidies for road maintenance. Currently, in the Municipal Act, there is a policy which suggests that 20 metres is the appropriate right-of-way for a local road.

When we came out with our recommendation that 16 metres could safely accommodate all the utilities and all the underground services, it did certainly attract the attention of the Ministry. And although we do not normally require their approval for new roads on plans of subdivision they did dangle the threat that if they did not consider the reduced right-of-way width to be appropriate, it may mean a reduction in subsidies down the road for the municipality.

This was something that was obviously quite alarming for everyone. We knew that unless we sorted that issue out, we were not going to convert many municipal engineers to recommending 16 metre rights-of-way even under certain conditions. And I guess I should emphasize, our whole report was fashioned on the basis that 16 metre rights-of-way on local roads would be appropriate under certain conditions. We were not suggesting that municipalities replace their current standards holus-bolus. We recognized there would be need for 20-metre rights-of-way on streets that led to schools or parks, for example. We have spent many meetings with the Ministry of Transportation. We have made some progress and I think that with our second iteration of this report we will be able to address that head on.

I would pick up on comments that were made earlier this morning by Mr. Field, that there is a challenge to engineers and to planners to think about why we do the things that we do and not to just take it for granted. In the case of the Ministry of Transportation, their standards are, in some cases, 20 to 25 years old. They recommend a certain pavement width based on a car which is no longer being built. It is based

on a car that was popular 20 years ago; this is much larger than a car we see now. When they are talking about passing lanes and parking spaces, they are already assuming a car that we no longer see. Planners also need to meet this challenge and I think question why some of our zoning standards are in place. We have a sort of formal opportunity to do that now through the Sewell Commission where all of planning is now under the microscope.

Another important issue that arose through our work was the issue regarding the design and aesthetics of a compact community. After we, as engineers and planners, came up with the standards, the question had to be asked, "Are we possibly suggesting a community that nobody would ever really want to live in?". This was a big concern, the concern about the importance of the public realm as you reduce the private space, the concern about the dominance of the automobile as something that has to be reckoned with. We had to provide parking on site, we have to provide a certain amount of on-street parking. Usually it means garages. Do we really want a lot of dominant front-facing garages in a denser community?

Another set of concerns which has come up all morning is the issue of maintenance costs. In Ottawa-Carleton, snow removal and snow storage was a big issue. That is, if you reduce the right-of-way and at the same time reduce the frontage, there was a concern that over the winter, as snow accumulates, you are creating higher and higher banks because you have less area in which to store the snow on each lot. That was an issue which we obviously took to heart. We have incredibly snowy winter months, so the issue came up time and again.

We have had a consultant do some work for us and the conclusion from our consultant was that if you are talking about compact development with smaller single detached homes and smaller lots, there is no worse effect with regards to snow removal than you have under current standards for single family housing. One of the reasons is that single family housing that, typically, is now built involves a double driveway. So you are already eliminating a large amount of space on which you can store snow. Our scenario involved a small single with a single car garage and in fact there was a slight increase in the amount of snow storage ability.

There is a problem with snow storage on streets with street townhouses whether or not you have a 16 metre right-of-way or a 20 metre right-of-way. That was an interesting finding. It was not news to a lot of the municipalities in our area who noted that they were having to start to think about hauling snow away once or twice a winter in areas where there were street townhouses. But again, would you be worse off with a 16 metre right-of-way? Not really.

I want to talk about some of the obstacles that we are facing in trying to push forward this idea. The first three I wrote down was engineers, engineers, and engineers. We have been having a lot of difficulty with engineers, particularly on the operational side of things in municipalities, trying to get them to be more broad-minded about changing the standards. As Bob Webb has noted, high standards are good. We are not suggesting that we sacrifice levels of service or sacrifice performance. But we are saying that we think there is an alternative and still the basic issues of safety can be met. Not everyone in Bob Webb's

profession, as he said, is really convinced that there are benefits to compact development.

We also have to combat a prevailing attitude in our suburban municipalities which is expressed by local politicians as well as their constituents, at least in Ottawa-Carleton. These suburban areas have a large amount of land already designated for residential development and they do not really see any benefit to trying to squeeze together, as they would put it. They already have enough land; that is how they want to accommodate their growth. This is a difficult attitude to combat. A lot of the local politicians truly believe that they are representing their constituency when they say that they do not want to see intensification in their municipalities.

Another obstacle I have identified harks back to the consumer and that is their expectations regarding levels of service. Would they be willing to accept fewer passes of the snow plough each winter if necessary? That is something that I think requires some education and a lot of work to try to make the consumer, the residents, understand that there is a connection between their demands for higher level of service and the taxes that they are going to have to pay.

Since we have prepared our first draft, we have done a fair bit of work to try to address these concerns. One of the first things we did in February was to host a design charette which was really a weekend brainstorming with pencils and pens and crayons and all that. We invited architects, landscape architects, planners and developers to come together to test out some of the standards that we came forward with and to help us answer those questions about what this community will look like. We invited engineers; in fact they co-sponsored the event with the Region and the Ontario Planners Institute. It was very successful. We have some very creative wonderful ideas. Certainly the issues that we raised are still issues of concern but we did find out there are ways to accommodate the automobile and still recognize that people in suburban locations are going to be relying on that as their principal form of transportation. So we felt very satisfied with the results of the charette and we have just completed a catalogue of some of those ideas.

In general what we tried to do is survey the eleven municipalities in our region. Not all of them are urban but we asked them to provide us with some information on maintenance costs of their urban road system. And I think some of the papers that I have read have already addressed this; the whole issue of linear costs decreasing as development becomes more compact.

One of the points that has to be made is that we have to distinguish between services that are provided on a municipal-wide basis and those services which are provided on a neighbourhood basis. The whole message of developing more compactly is that it is an alternative way to accommodate the growth the municipality is planning for. We are not suggesting that a more compact neighbourhood is going to mean an absolute increase in the total population in your municipality but that we are just accommodating that population in a different way. So that services that are provided on a municipal-wide level should not experience an increase. What you might experience is a need for more smaller parks to

accommodate the density rather than one large municipal-wide park.

We are trying to strengthen the message that affordable housing can also result as a consequence of reduced standards or alternative standards — the term that we prefer to use. Not only are we talking about smaller lots, reduced infrastructure costs, we are also suggesting that smaller houses are going to go on these smaller lots which will mean a lower construction cost.

We are also trying, through a public relations effort, to ride the environmental wave. There are good and strong connections to be made between the benefits of compact development and what I think is a fairly strong grass roots message now that people are more energy conscious and environmentally aware. Yet I do not think that the same people who might compost and save their lawn clippings would necessarily agree that an infill project is a good thing for their neighbourhood. We have to make those connections.

We have been working on arrangements to do a demonstration project to test out our standards. We have been working hard with the development industry and with some of our municipalities. We are about 80 percent of the way towards finalizing a site in one of our suburban municipalities and we are hoping to do another project within the city of Ottawa. It is taking quite a lot of effort. The path is not a smooth one but we feel confident that something will be built to that end.

The last thing I want to mention is the issue of addressing the demand for this form of housing. We will be undertaking a marketing study and a small house design study over the summer to try to gauge consumer preferences. Some of the work that the architects have done or will be doing for us will be used in a consumer survey to compare conventional houses and houses built on alternative standards. Just a final message. I want to echo what Mr. Webb has said. It is very important that planners and engineers coordinate development right from the very beginning. That message came out loud and clear from the meetings that we had in our region and I am quite certain that it is relevant everywhere.

WILLIAM CODE
UNIVERSITY OF WESTERN ONTARIO

It is very important that we step back and contemplate these essential issues in planning. And while I agree with many of the goals espoused by our speakers, I think that in some cases there are problems with the essential logic and in others, with the degree of emphasis upon the significance of containment / intensification and so on.

In listening to some of the discussions through the day, I must confess I had a distinct sense of déjà vu. For the strategies that we are talking about now are not that dissimilar from those that we were talking about in the '50s and '60s and '70s, excepting many of the values inherent in neo-traditional planning. In terms of intensification, in terms of the importance of density, of infilling, of mass transit and so on, I do not think the discussion today is terribly new.

In the '60s and '70s we were espousing the advantages of contiguous development. Indeed, if you look at this ideal typical town of London, if you go and look at densities, you can begin to see the impact of this attempt at infilling. If you look at the subdivision plans and plot the densities from the 1920s on right up through the '80s, you see an interesting thing. The lowest densities in this town are actually those that one finds built in the 1930s and the 1950s. Then you get much higher densities being built as the Planning Act began to have its effect in the 1960s and 1970s and 1980s.

There really are some very important issues involved in this strategy of containment and intensification that we need to very carefully examine — before we all hang our heads, murmuring mea culpas and follow the Sewell Commission headlong into its mandatory world of high density aluminized row houses.

What are some of the problems with the logic of intensification and containment? Well, first of all I think there is an essential philosophical problem which has afflicted the strategy from the very beginning. It reflects a terribly narrow value set which is largely focused on efficiency and indeed municipal efficiency and cost minimization. It has a rather narrow conceptualization of environmental impact. And, in effect, the strategy could have a significant negative impact on many other values which people sometimes hold dear such as equality and liberty.

Secondly, this whole strategy of intensification and containment is viewing the problem with much too narrow a focus, focusing on municipal cost. In many ways it is ignoring some of the complexities of urban land economics. And most importantly, going back to something that Richard Kirwan suggested in his discussion this morning, it ignores the nature of the demand. It ignores the nature of the market preference for housing within the city.

We all assume that we could lead this great unwashed population with great ease into whatever kind of row house structure we want to put them in. I do not think it is that easy. And in the process, we are ignoring our own experience in this province and in particular in the GTA, where we have managed to engender in the post-war period, two of the most extreme residential price bubbles to occur on this

continent, with Draconian impact on many segments of our population, particularly the poor and the young.

Some of the intensity of those price bubbles can be traced back — not in all but in certain elements of it — back to the attempts at containment and intensification and the implementation of the Planning Act coming at the wrong time, the wrong demographic moment.

Another essential problem with the containment / intensification strategy is rooted in the continuance in most political forums of outdated paradigms of urbanism itself. Most of the models that we have been brought up on are the classical gradient models of the city, the density gradient models of the city — Burgess and Hoyt and so on, all of them presupposing that cities have centres. Well, that is not a bad idea when you are talking about New York. It is not a bad idea when you talk about Chicago and it is not a bad idea when you are talking about even Toronto with its large financial community. But it really becomes a silly idea when you are talking about many other cities — places like London, Ontario, for example.

There are other models of the city that are much more appropriate. I think the best one is James Vance's City of Realms, the idea of a policentric, polinucleate city. Much of the logic that is involved in analyzing the efficiency of cities is really rooted in some underlying assumptions of whether cities have centres or whether they are indeed evolving into a multicentric or policentric form. Ken Whitwell alluded to this situation in his talk.

Fourthly, there is an unwillingness to deal with the term sprawl. We all throw that word around. What is it? Is it a few houses scattered along rural roads? Is it non-contiguous development? Is it low density development? There are at least a dozen different definitions of sprawl and we keep sliding back and forth between whatever it is we are talking about. Half of the discussions of sprawl would apply in this city most appropriately to the inner city, not to the suburbs.

We need to keep in mind that the strategy of excessive and inflexible densification, as I fear is coming out of the Sewell Commission for the GTA, could well have very severe costs. Much of my fears are rooted in a fine work, a very intensely researched piece done by William Michaelson quite a while ago now, in the mid-1970s. But there has been no research done since which would counter the essential findings of William Michaelson in environmental choice, human behaviour and residential choice.

His findings were that there was an incredible power in the single family house on at least reasonable sized lots, an incredible market demand for that. If you ignore it, you will have a tendency to drive single family housing prices up and up and up to very high levels. We have already seen that happen in the early '70s and again in the second price bubbles of the '80s. It is very important that we go back and we continue to take a look at what William Michaelson found in that very valuable work of his because if we start containing and we start intensifying, we indeed run the risk of having significant housing price impacts with the consequence of significant wealth transfers from the poor and the young to the affluent or at least those owning large lot single-family

housing. We also run the risk of inducing the leap-frogging effect.

You could see the beginnings in those very interesting maps which Ken Whitwell showed earlier. As the price bubble of Toronto developed in the late '80s, you could begin to see the consequences. People were willing to go to Lindsay to live in order to get a reasonably priced house. You look at school data, demographic data all around that outer fringe and you can see evidence of actually inducing inefficiencies in the city through strategies of containment as it might affect the housing market.

In conclusion, I would suggest that cost efficiency through planning should really not be taken as an unequivocal good. I do not question that we should always have some pressure in that direction but we need to be very careful. When, as is often the case, we get efficiency in conflict with other values, I think we may have to face the fact that cost efficiency may well have to be sacrificed. When we are planning for efficiency and promoting containment and infilling, the activities of the land market may actually increase total housing costs and, in whole or part, begin to negate the benefits of the servicing efficiency. It may induce social inequality and it may also induce a spreading city, the very long range commute which we see not only in the greater Toronto area but in cities like San Francisco and many other American cities.

BRYAN JOHNSTONE
TOWNSHIP OF CUMBERLAND

I am employed by a municipality that is relatively young and growing. Many of the concepts that one might have read in the report put forward by Marshall Macklin and Monaghan with respect to joint use facilities are already in place in Cumberland. Like other newer and fast growing towns and cities, we have been very fortunate in that we have been able to draw from the experience of others and either avoid the pitfalls or incorporate the good things into our planning and construction.

Joint use of all kinds of facilities and services is almost a way of life in Cumberland. Community centres, aquatic facilities, libraries, gymnasiums, meeting rooms, fitness rooms, arts and cultural facilities and even nature trails and storm water management areas fall under agreements or use guidelines of one sort or another be it with a church, a school board, a private corporation or whatever. The community has benefitted, it pays less taxes and there is less duplication of facilities.

In newer communities, joint use facilities and agreements can be easily negotiated and developed and should be. The concept of doing more for less has to become a part of the early planning process and not an after-thought or a result of previously poor planning policies or practices.

The real challenge, that I think all of us face, is to figure out how to deal with the existing scenarios all over Canada in the larger, older urban areas. What planning is being done there? How do we get politicians, planners, trustees in a community to initiate innovative

approaches to realize joint use of existing facilities in these older communities? When a community's make-up changes and a school, for example, is no longer a viable operation, what should be done with that facility? The same can be arranged for a factory or other facility that has outgrown its original intended use.

The growth of crime and youth violence in our inner cities has some relation to the lack of community programs and recreational opportunities for kids and teens in the areas they reside in. They too should be part of the infrastructure renewal process. Some focus must be put on developing the same strategies concerning joint use facilities for the older urbanized neighbourhoods.

One of the results of intensification, especially in new neighbourhoods, is school portables. And school portables on park land are probably viewed as a real negative in almost every community. In our community it is just not allowed. However, we understand the space requirements of both the school and the community and we are looking at taking new approaches to satisfy both segments' needs. We are presently developing two scenarios with a local school board, one that would result in additional park land coming on-stream at no cost to the municipal taxpayer and another that would result in portables being retrofitted into useful recreation facilities at a later date. Both projects are in the concept or preliminary stage but could get underway for the coming school year. Various Ontario ministries have been approached and have been encouraged to provide funding for local initiatives that will provide services at less initial cost and can reduce operating and replacement costs down the road.

Many of us will remember that some years ago, recreation and leisure services were mostly delivered from non-recreational facilities such as schools, churches and so on. We moved away from that over the '60s through the '80s and in all likelihood will be forced back to it over the '90s. Please keep in mind that recreation, leisure, art and culture, fitness and so on are, have been, and always will be an integral facet of the infrastructure of any urban, suburban or rural area.

DISCUSSION PERIOD

Richard Kirwan registered his concern that the main thrust of the discussions on intensification has been a manifestation of 'supply-side-ism'. He took issue with Bill Code's definition of efficiency because efficiency is not cost minimization. It is net benefit maximization. And he noted that we are looking for land use forms that will maximize net benefits. According to Richard Kirwan, the question at issue is, "How far is intensification part and parcel of that and if it is, how do we bring it about?"

Richard Kirwan pointed out that we must get over the misconception that because the capital outlays for infrastructure are different in any period of time, the underlying costs are different. He went on to explain that we should be comparing costs on the basis of a real rate of return on the replacement cost of the assets. If we have a system of financing in which the up front costs can be borne by willing lenders, then that is not a cost to society and it is an open question whether or not the replacement costs at the periphery in green field sites are higher or lower than the replacement costs within existing areas. But we must make that comparison on a like with like basis.

In response to Bill Code, Richard Kirwan suggested a definition of sprawl. "I would suggest there is one that says that one is occupying land, let us say for residential purposes, that is basically non-economically used for that purpose. What happens so often, is that land is occupied for residential purpose first and the demand for infrastructure comes later but it is a political demand that cannot be denied. So in fact, the cost to society is retro-servicing land which has already been subdivided progressively. That is the sort of sprawl that I think is inefficient and which points again to the need for the intensification."

Regarding Ken Whitwell's point about the need for flexibility in land use zoning, Richard Kirwan noted that planning vacillates over time, with respect to the mix of land uses. He also said, "We are a long way yet from getting that productive dialogue between the needs of infrastructure, (particularly who's going to pay for it) and its implications for planning."

By way of example, Richard Kirwan described a state in Australia where they removed all the land use planning constraints so everything was zoned mixed uses. At the same time, they decided that the best way to finance the infrastructure was to sell planning variations. Unfortunately, there was nothing left to vary because they had given it all away in opening up the land use planning categories. He went on to suggest that if density is the answer, the question is, how do we change the density, the intensity of use of land? And the answer to that is pricing.

"We cannot prejudge that the intensification of land use is the right outcome. What we have to do is set the price signals right," he said, and noted that we use this density variable to explain what is going on in cities when it is really the outcome of what is going on and we should be looking at the underlying price structures. He suggested that the difficulty is that the processes which would normally lead to the intensification of land use have often been undermined in the industrial countries in

this last decade. They have been undermined by those failures of the tax system which have actually reduced the incentive for willing sellers of land. The result is that land is being consumed at below its present development potential. The real problem has been that there is very little incentive to release land from its present intensity of use into higher intensity of uses. This lack of incentive has led those who are looking to build housing (or developers acting as their proxies) to search for raw land, instead.

Richard Kirwan remarked that, in some cases it is possible for planning to achieve an intensification of land use. He cited an example in Sydney, Australia where a local council which was elected on a NIMBY platform succeeded in bringing about the largest intensification of land use that had been seen in the previous 20 years. This was achieved through significant deliberation, and by involving their community and the developers.

Alluding to the findings of a study by William Michealson, Pierre Letartre inquired whether the consumer is looking for maximization of net benefits, not necessarily the minimization of cost. Is it possible that even with the right pricing system, we would have sprawl anyway?

William Code responded that there would still be sprawl but not as much as we are now witnessing in the GTA i.e., the incredible commute from Port Hope, Guelph and so on.

Ken Whitwell noted that if each land owner had to pay the full price of the services they were consuming, in fact, there would be a greater intensity of land use. The way we set up our system now, people who live in apartments pay much more, compared to their demands on the social system and on the infrastructure system, than do people in single family homes. Single family homes are subsidized by higher intensity types of development. He went on to say that if everybody had to pay what they actually cost the municipality, there would be a substantial increase in the taxes on single family homes and a net reduction in the taxes on multiples. That would not mean that everybody would stop living in single family homes. However, it might shift a certain proportion of the population to either opt for a more intensive type of single family home or a certain proportion would go into apartments and other forms of multiple housing.

Ken Whitwell continued: "If every type of land use paid its share of the cost that it created for society as a whole, then I think there would be a greater utilization of land in an intense way than is presently occurring. I am not suggesting that one should arbitrarily put in rules that would prevent people from having large lots in the suburbs, as long as the price that is caused by a large lot does not require a subsidization from anyone else to handle the additional cost. If the individual or the household is prepared to pay the price, that is fine. The pricing has to be such that it relates to what the costs are to society as a whole. Our present system distorts the land use patterns by the implicit subsidization of single family homes."

Robert Webb responded that the question is how to increase efficiency of infrastructure. He noted that it is clear that you have less infrastructure per unit with greater density.

Marni Cappe suggested that there are other things that are not being taken into account, such as taxes for pollution from the automobile being used to drive from the suburbs into the city. She noted that in Ottawa, they approached it from the issue of more affordable housing. "Because the price of land was rising so quickly, as was the cost of developing that land, it became clear that the greatest benefit would be realizing a higher yield of housing on the net hectarage of land being proposed for development." Marni Cappe also commented on the issue of demand for single family houses and the power of a single family house. She pointed out that Mr. Michaelson's work was done in the '70s. There has been a significant change in the demographics between the '70s and the '90s. The baby boom which drove the demand for single family housing in the '70s and '80s are going to be in a vastly different position in the '90s and into the next century. Marni Cappe predicted that the demand will be for smaller houses, maybe some smaller singles, but a housing more suited to an aging population.

William Code agreed with Marni Cappe on the underlying demographics but suggested that the underlying preference structure that was seen in Michaelson still expressed as a conception of the ideal, the single family house. He suggested that there is not much evidence in the nature of the markets to indicate that there has been a significant shift in that value system since.

A participant noted that even though people are willing to pay dearly for their preferences, we have to realize that preferences are not immutable. The whole environmental movement, in large part, is about changing preferences. Participation is about changing preferences. Advertising is about changing preferences. One of the things we should be looking at is whether or not there is good reason for trying to change preferences. "Maybe people do not want to spend 11 hours a day working and driving. Maybe they do not want to spend 20 years never seeing their kids as the kids grow up. Those are the kinds of outcomes that occur when you have suburban sprawl. Maybe if people start talking about those kinds of things their preferences will change and they will decide whether they really need a 4,000 square foot single family home."

Martyn Phillips commented on intensifying land use, using an example of a new town in England. It is a brand new city of about a hundred thousand people built on North American lines. It was very well laid out, with wide primary roads, little community centres, leisure trails and bicycle paths all around it. You could go to the city centre without going on a bus, without taking your car. But Mr. Phillips reported that in some of the locations, it was very badly intensified. Even though the houses were very large, easily as large as many of the North American houses, the streets were so narrow that it was very difficult for two cars to pass, and most of the streets had only one sidewalk. "As a home owner and particularly a parent, I found that devastating. People would drive around these very tight corners and right past the entrance to a driveway where my kids would be running out at high speed. That horrified me. To me, that sort of thing has to be taken into account. One person said that doubling the density of single family neighbourhoods does not change the character. I think it does."

Martyn Phillips voiced his concern, as an engineer, about common trench construction, and asked Mr. Whitwell to comment on the accuracy of the predictions about infrastructure costs.

He also commented on the Edmonton experience. Edmonton went through major annexation in 1982. This annexation coincided with the downturn of the economy. Depending on the distance to various elements of the existing infrastructure, one of two things happened. One; leap-frogging occurred. Or two; due to their distance from the existing infrastructure, people just inside the new city boundaries were left with land that is unlikely to be serviced for many years. In 1988, Edmonton suffered 12,500 basement floodings. This precipitated a lot of tension between the development industry and the existing home owners and the city administration. As a result of all this, there was an embargo put on future development and this embargo resulted in a fresh look at all servicing standards. The decision making involved two sorts of committees. A public advisory group commented on aspirations and master planning and a technical review committee from the administration commented on levels of service and technical improvements. The whole exercise was chaired by the chairman of the Civil Engineering department of the university. Martyn Phillips reported that, as a result, some standards have been accepted by council and a lot of pressure has been released from the whole issue.

Bob Webb responded that three services in a common trench is the standard of the day. We allow for each to be in its own location, but then hire one contractor to put all their services in, together.

Regarding sidewalks and road widths, Bob Webb pointed out that the speakers were referring to only slight reductions in pavement widths (about two less feet on the road) particularly in places where people are not allowing parking on the street. He pointed out that reducing the number of sidewalks would not apply where you increase the density; "What I was really keen on doing was getting the sidewalk as close as possible to the curb to allow other uses for the rest of the right-of-way."

Kenneth Whitwell commented on the question about the accuracy of the infrastructure costs. He suggested they are probably grossly exaggerated for a number of reasons. Infrastructure is generally over-built. Planners always err on the side of caution, of having redundancy. Secondly, many agencies over-estimate construction costs so that no matter how long or difficult it is, you always come in under budget. And thirdly, when municipalities ask senior levels of government for money, they exaggerate the costs so that if they only get half of what they ask for, it is still enough to do what they want to in the first place.

Amrik Rakhra commented on consumer preferences, expressing confidence in the rationality of the consumer. Mr. Rakhra noted that traditionally a house is a very differentiated product, very customized from one city to another city, from one consumer to another consumer. The consumer is concerned with satisfaction as defined by price, quality and service. But the consumer is rational, and if they see their needs met by a more homogeneous product, their preferences will change. If we do not change our methods of construction and

production in Canada then global firms will enter Canada, and capture the domestic construction market.

John Bassel commented that he had not yet heard a response to the question, "Is neglect affecting Canada's infrastructure system?" He said that he also hoped to hear about those Canadian cities that have exemplary infrastructure policies and practices. Mr. Bassel went on to say that policies with regard to new infrastructure have caused severe economic harm in this country. For example, in Victoria and Vancouver, there is a complete shortage of serviced and serviceable land, and land prices are escalating. Toronto land prices for multi-family housing have gone from less than $10,000 a unit to over $100,000 a unit because of certain policies. Single family house lots have gone from $40,000 to well over $250,000.

John Bassel had two comments on intensification. Firstly, unbridled intensification can be negative because the cost of infrastructure is not the only cost that goes into the provision of housing. Secondly, he agreed that if there is no market for multiple family product, it will not be built. But he pointed out that some of the country's 250,000 immigrants may prefer higher density housing.

In closing, John Bassel asked what was wrong with Don Mills which had open ditches for storm water management, no curbs and no sidewalks.

Kenneth Whitwell responded that not much is wrong with Don Mills. There is nothing wrong with having storm ditches as opposed to sewers. "I would agree with others who have suggested we are perhaps over-servicing our areas."

Regarding the question of neglect, Kenneth Whitwell noted that the underlying argument from the Federation of Canadian Municipalities is that the lack of maintenance is affecting the system. Kenneth Whitwell added that various people who are responsible for road maintenance in Metro have indicated that the entire budget would be more than consumed on simply trying to maintain the existing infrastructure. Every year that insufficient maintenance is put in, you carry that amount of money as a deficit into the future and the roads then become even worse. "I would say that, in fact, neglect is affecting the system; others have predicted that some time in the next decade, there is going to be a real collapse when systems begin to malfunction all over the place."

KennethWhitwell went on to note that the central cities tend to be much more interested in mixed use and intensification. The inner suburbs perhaps will allow some amounts of high rise. But opposition to transit and an attempt to differentiate themselves from cities is prevalent on the outskirts. He suggested that perhaps the solution is in a city like London, when you have a single administration that is handling both the central city and the areas of growth, then you have a better balance in looking at the densities that take place. He suggested that some of this infrastructure decision making in densities and land use requirements should be done either through an amalgamation of cities which in Toronto's case would probably be too big or a regional type of government.

Kenneth Whitwell commented that Metro Toronto, as a regional government, should have been expanded to include the areas that are presently developing in the same way that it expanded to cover developing areas in the '50s and '60s. "When you separate the municipalities in a large urban area and they begin to compete with each other and try to get more than their share of the rich people and try to pass off the poor on to the central city, maybe that is what the problem is. "

Mel Poucher asked Bob Webb about the chart showing construction costs tracking the CPI. He asked, "If it is possible to have the construction costs on a long term basis fall below the CPI; does this in fact save money which can be put towards solving some of the problems mentioned here today? If so, how can the construction costs be reduced?"

Bob Webb responded that the costs on that chart were very specific land development costs in new land development areas. The cost for renewing infrastructure is very different. Bob Webb commented that there is a lot of social cost associated with renewing infrastructure. He noted that one of the things he finds frustrating working for both private developers and the public side is that they always seem to be competing. Bob Webb suggested that a useful way to manage our infrastructure and work towards rehabilitating some of it would be to work with reserves and not spend so much on the public side in the years of economic activity when construction costs are high but spend it in years like this when we can get more renewal for the amount of money spent.

Tom Field commented on the situation in Edmonton where 12,000 homes were flooded in one year. He pointed out that these were homes in newer developed areas where the infrastructure planning had not taken place properly, and the actual operation of infrastructure systems had not been fully understood. He noted this as an example of what happens when there is stress on the system, a major growth period and improper attention is paid to the planning process.

Tom Field pointed out that we are basing all our planning for growth and for developments on the automobile. He noted that many people are rethinking the use of the automobile from a lifestyle aspect and also from a cost aspect. Mr. Field also noted that we have to look at the intangible environmental cost, an emerging issue in large urban centres and in particular, in areas like Vancouver where the automobile is the major cause of air pollution. Tom Field reported that some studies are now being done and policy frameworks being put in place which will severely impair the use of the automobile in that urban centre.

Kenneth Whitwell commented that changes in attitudes towards the automobile are emerging. Many younger people do not have cars. He noted that two things have happened. One is that automobiles no longer provide freedom, they simply provide unbelievable frustration sitting in traffic. Secondly, people are more environmentally concerned, not just because they are environmentally aware but because more cars have produced pollution levels which are quite noticeable. From this, he concluded that the automobile will not be anywhere near as important an element in the future in the big cities as it has been in the past. "In the smaller cities the automobile will continue to be the major means of

transportation. But in the large cities, which is where the growth is taking place, I would say that the automobile will be less and less used. That then requires that we begin to design cities so that they may also function for those people that do not have automobiles."

Kenneth Whitwell went on to explain that in the suburban areas it is very, very difficult for the senior citizens to stay in their own houses and be able to shop, to do things without the automobile. While the central cities may be aware of the need for transit orientation, the problem is that in the outlying suburbs they are designing the suburbs today so that they are very difficult to service by transit. The roads are curvilinear and the transit vehicles cannot get through. The areas that are the least in tune with future demands are the very areas which are growing the fastest today.

Marni Capp commented that we have to give people a viable alternative to the automobile, and that there are many things a planner can do to make an environment where dependency on the automobile may be reduced. She suggested that encouraging more mixed use developments is first and foremost. She also suggested that pricing policy is important and that we have a lot of work to do to make it more attractive to leave your car at home.

Marni Cappe pointed out that there are planning initiatives for households who do not rely on cars. For example, one of the initiatives that is quite popular in the Toronto area is to develop more housing along the main streets. She noted that this serves several purposes. One is encouraging mixed use. Another is recognizing that the people who may choose to live on main streets do not necessarily have a car. She concluded by saying that, "There are things we can do but we are a long way from being able to design communities that still are not auto-dependent."

In response to Kenneth Whitwell's comments about exaggerated estimates, Larry Draho noted that both engineers and planners put "fudge factors" in their estimates. "You can see how the standards grew," he added.

Larry Draho expressed his concern that even if intensification really is the most single, most effective way of reducing infrastructure cost, you have to be able to achieve it in a society that has a very strong traditional, single-family, auto-oriented mentality. He asked the panel if there are any concrete recommendations as to how we can educate the public, and deal with the single family, auto mentality related to intensification.

Kenneth Whitwell responded that an educational campaign is necessary. In places where intensification has been looked at, it has been necessary to reassure people that the intensification will not destabilize their neighbourhoods.

KennethWhitwell noted that one of the directions in both Vancouver and Toronto is the emphasis on main streets. Retailers are generally crying that there is not enough business, so a bit more development will provide some additional market for them. The main streets generally tend to be where the buses are already running and therefore a few more people can then be on the buses, slightly increasing the revenues and the service levels of the transportation system. And if the development is restricted to the main streets

and people are assured of that, then there is not the same resistance from the internal neighbourhood. Having development on the main streets takes the pressure off of redevelopment of neighbourhoods. It prevents block busting because it provides an outlet for that redevelopment. He concluded that what you have to do is design a type of mainstreet intensification which has height limits, density limits, and which is going to reassure the rest of the population that it is not going to cause a problem for them.

Marni Capp commented that demographics are very important. She noted the levels of immigration, and that we are no longer dominated by the traditional family model of two parents, two children. There are many reasons why housing forms other than single family will be the housing form of choice. She suggested that if we look at statistics on how many new single family homes were sold in 1991 and even maybe 1990 we are starting to see quite a different shift in what consumers are choosing.

Andy Sancton commented that figures derived from development charges include all kinds of costs. He commented on the idea of amalgamating municipalities as a solution. If municipalities in the Metro Toronto area had been merged into one tier a long time ago as Mr. Whitwell was suggesting, the good things about the city of Toronto, the residential neighbourhoods, the absence of major arteries cutting through many of those areas would not exist.

Kathy Thompson pointed out that the estimated costs for renewing Canada's infrastructure were based on extensive research. She also reported that recent surveys of members assessed municipal infrastructure priorities and needs. The priority is still infrastructure although it has shifted from roads to sewer and water.

Kathy Thompson asked Marni Cappe if their study indicated the social impacts of intensification. Marni Cappe replied that their study did not look at the issue of social impact. The study on the issue of alternative standards was just one aspect of a policy to encourage intensification.

Kathy Thompson commented that municipal elected officials are going to be reluctant to support intensification until they know what the impacts are going to be on their neighbourhoods in terms of urban safety and crime prevention.

Marni Cappe responded that planners are not suggesting that intensification is the only way for a municipality to accommodate growth. She explained that in the Ottawa-Carleton region, intensification is one of the options and that the types of housing you can generate through intensification would give people more choices.

Dorothy Wabisca commented that southern solutions, in most cases, do not work in the north. For example, automobiles are a necessity there. She noted that northern communities have unique infrastructure problems such as dealing with permafrost.

DAY TWO

ALAN DAVENPORT
UNIVERSITY OF WESTERN ONTARIO

I will try to recall some of the things which were said yesterday so that you can build on them today. I found the ideas extremely challenging. Steve Janes clearly indicated that the health of the patient that we were dealing with was not exactly ideal, and he was calling it a sick patient.

What is the starting point? I offer this suggestion: I think the common thread that runs through all of this is the search for quality. That does not mean to say high cost. It just means that we are looking for better value. We are trying to do a tightrope act. We have, as someone said yesterday, one of the highest single family dwelling ratios anywhere in the world. We are also a country which is colossally in debt. This search for value, for quality, for improved competitiveness and for remedy of some of our real financial problems are driving forces which, I think, are particularly relevant to this industry, the construction industry, which by some counts and by some measures is the largest in Canada.

There was one or two things that I found extremely disturbing. One is how little we spend on research. Laverne Palmer offered the figure of 1 per cent as being the amount which is spent on research. I have heard this in other contexts of the construction industry. He was talking about the infrastructure end. I have heard it used to describe what we spend on research on wood-frame housing. It comes up again in how much we spend on concrete, and other areas of the construction industry. This search for quality, I suspect, is strongly linked to our willingness to do research, the inquisitiveness of our thoughts and the ability to apply these new ideas. It was very reassuring, for instance, that Tom Field pointed out that there were techniques available which would improve the quality of how we handle our sick patient. Monitoring systems which would enhance the utilization, ways in which you could do much more with less, and all of this is terribly relevant. But we need research at different levels. We need research over the long term horizon. We need it in the medium term to take existing ideas and put them into practice. We also need research to do problem solving on things actually going on right now, but not going on the right way.

The question of the quality of things reappeared no matter what we were talking about; the quality of the infrastructure, the quality of our housing, the quality of our lifestyle, the quality of our planning, and the quality of our legislation. This endless search for quality is impacting not only on the engineering end of things, the actual hardware, but it is impacting on the planning end of things and also on the financial side. We heard yesterday that we are trying to maximize the benefits, not necessarily just to reduce costs, and that is what we are after.

It seemed to me that there were a lot of things which are going on which are sort of half-baked – a lack of depth in the research. I have heard several times, for example, that curbs and gutters were not answers to problems. They made some things worse, they increase the rate

of runoff, they increase the demand on storm sewers, they load it up with pollutants more quickly. Now, I am not an expert in this field, and maybe the people I was talking to were dealing with a different climate, but we heard that Don Mills does not have curbs and gutters. Yet an awful lot of people are scurrying around London, getting terribly anxious because they do not have curbs and gutters. What is the answer here? Who is looking at this problem in a systematic and definable way? Jack Diamond has said that we could do just as well with half as much land. We saw some wonderful examples of explorations of new housing systems and there are lots on the go.

I heard some of the remarks the other day by Andres Duany, who was talking on a similar theme about the great successes that they have had with new kinds of living accommodations. My suspicion is that people are prepared to deal with changes. What is going to happen when the electric car really hits the automobile driver in 5-10 years' time? The improvement in batteries is certainly stupendous and there are some absolutely wonderful little cars coming. Honda will have a few on the road very soon. What is the impact of that going to be on our philosophy in the city? What is the impact of telecommunications and so on? The debate needs to go on with much more intensity. We are doing far too little research. Laverne Palmer talked yesterday about the desperate shortage of people who are educated in these fields. To achieve quality, requires a serious commitment to research, to evaluating ideas for their long term benefit and not just the short term.

FINANCING MUNICIPAL INFRASTRUCTURE: ALTERNATIVE METHODS

BY CARL SONNEN
INFORMETRICA

After our discussion yesterday, it might be useful to get a sense about where municipalities are spending their money — whether municipalities spend a lot, or provinces spend a lot, or the federal government does. In the final analysis, I want to explore the question of whether we really know if we have too little infrastructure or too much. The economist would say if you do not charge the right price, you put a lot of funds in support of development which people will overuse. The former Soviet Union and China are very capital-intensive societies because they did not give the right price signals. We know from the discussion that we had yesterday that we did not tie the price system to a lot of our capital stock, so we know that people have demanded a lot of it.

Figure 1 shows the value of investment averaged for various years, as a percent of GDP or total output in the economy for the federal government, the provincial governments and local governments.

Figure 1.

VALUE OF NEW CONSTRUCTION BY LEVEL OF GOVERNMENT
(PERCENT OF NOMINAL GDP)

	Average			
	1970-75	1976-80	1981-85	1986-90
Federal Government				
Total Value of Construction	.38	.24	.21	.18
Highways	.06	.04	.04	.03
Other Engineering *	.12	.07	.06	.05
Buildings **	.20	.13	.12	.10
Provincial Government				
Total Value of Construction	1.26	1.00	.85	.67
Highways	.86	.63	.54	.42
Other Engineering	.13	.14	.09	.05
Buildings	.27	.23	.21	.19
Local Government				
Total Value of Construction	1.34	1.13	.99	.94
Highways	.40	.39	.33	.36
Other Engineering	.39	.44	.39	.29
Buildings	.55	.30	.27	.29
Hospitals				
Total Value of Construction	.15	.11	.13	.11
Buildings	.15	.11	.13	.11

Sources: Statistics Canada and Informetrica Limited.

* essentially water works and waste treatment facilities.

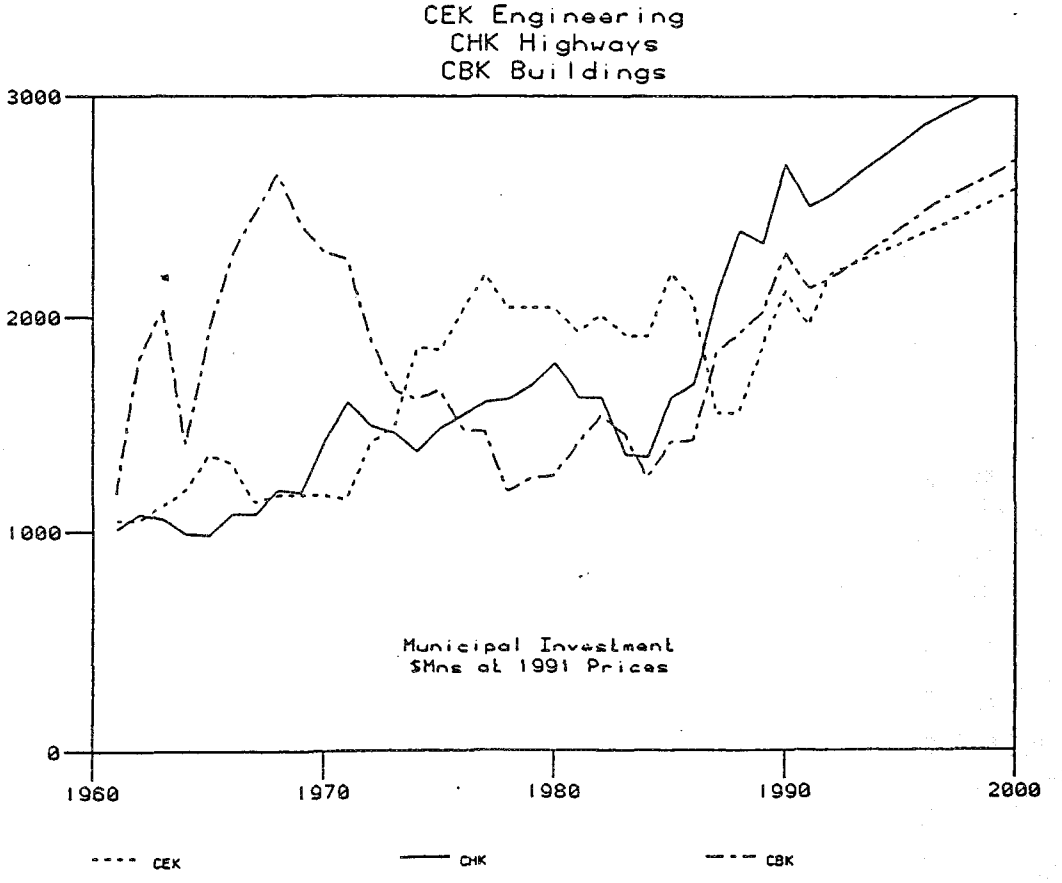
** administration buildings, fire stations, schools, etc.

Since all the figures are referenced to gross domestic product, you can see that the flow of investment spending from the federal government is very small. Basically, the federal government builds structures to house its military and civil servants, and it builds structures and has some equipment related to its obligations under the Constitution to our aboriginal peoples. But as you can see, these are very small shares. The big spenders are the provincial governments and the local governments. Over time, the provincial governments' average share of spending fell from about 1.25 to 1, to .85, to .67 per cent. In short, there is a decay in the annual spending relative to the size of the economy. If I were to show you this relative to the size of business investment, then you would see an even sharper decay over time.

The provincial governments spend most of their money on highways, i.e., the TransCanada Highway system. The provinces' other engineering would also include some waterworks. In Ontario, for example, the provincial government is responsible for delivery of a lot of the water and waste treatment systems outside the major urban centres, and of course they build some buildings as well. Local governments spend about 1 per cent of gross domestic product on the street system. That would also include the structures in the mass transit or the urban transit systems but not the equipment portion of the urban transit system.

Figure 2 shows a history of the levels of spending. At the beginning of the '70s, there was a big jump in the amount of roadworks being

Figure 2.



put into place. Beginning in the mid-1970s, there was a hiatus for some period of time, and as you can see in the mid-1980s, there was a drop from a peak of about 1.5 billion dollars a year, to 1.2 billion in the mid-1980s. Since then, there was a substantial jump. We think it likely that this set of numbers will continue to rise.

In the buildings sector, there has been a drop of about 400 - 500,000 students in the school system, and the requirement to build more buildings fell off. We know that the women of the baby boom have delayed their child bearing. We think that we are now going to see a baby boomlet in the 1990s, with an increase of 300,000 in the number of children in the school systems.

Assuming that the Municipal Industrial Strategy for Abatement, The Green Plan and those sort of programs do not really have an impact, spending would rise slowly in the future. Do we have an infrastructure problem? The tabulations in Figure 3 are drawn from a federal-provincial study on the cost of government and expenditure management released two weeks ago by the Department of Finance. This shows not the investment flows that are going on each year, but a measure of the stock of public infrastructure owned by the provincial and local and hospital systems. It shows the average age of that capital stock, and the stock as a share of GDP in 1975, and again in 1989.

The age of the capital stock has systematically increased; there are only one, maybe two provinces where that has not occurred. When you look through this carefully, you will find that Alberta's decay problem is much softer than anybody else's owing to the OPEC price shock, and the building in Calgary during that period. The engineers' view is that if you delay the repair and maintenance long enough, you get an exponential growth in the costs of repair. Do we have this bomb ticking away? Well, the age of the capital stock *is* beginning to lengthen.

Let me translate some of those percentages into dollars. Figure 4 shows total value of new construction by level of government. The total dollars put into infrastructure for all levels of government was $13 billion in 1991. Of this total, the federal government spent a billion dollars. The provinces spent $4.5 billion and the local governments spent $6.6 billion.

When we talk about financing, when we try to link buyers with suppliers through the price system, in some cases it is pretty easy to do, e.g., on the water side, we can get pretty close to saying, you use it — you pay for it. But if we go to a lighthouse, it is pretty hard to get somebody to pay for so called public goods. Similarly, in the case of highways, it becomes somewhat more difficult to figure out how to charge people for things.

Figure 3.

PROVINCIAL-LOCAL-HOSPITAL CAPITAL STOCK
NATIONAL BALANCE SHEET BASIS

	1975 Capital Stock % of Average		1989 Capital Stock % of Average	
	GDP	Age	GDP	Age
Nfld	88.7	13.0	72.2	17.5
PEI	100.5	15.3	73.0	19.0
NS	67.7	14.1	47.3	18.1
NB	81.2	14.0	68.7	16.6
Que	50.1	13.2	40.7	17.5
Ont	41.0	14.1	27.4	18.2
Man	54.1	14.9	41.4	19.1
Sask	56.5	14.5	61.0	17.5
Alb	45.5	14.8	54.6	14.8
BC	42.7	14.1	34.3	17.0
Yuk	81.1	5.1	100.0	7.7
NWT	71.8	16.3	81.8	15.1
TOTAL PLH	47.2	13.9	37.9	17.2

Source: Federal-Provincial Study of the Cost of Government and Expenditure Management.

Figure 4.

TOTAL VALUE OF NEW CONSTRUCTION BY LEVEL OF GOVERNMENT
(IN MILLIONS OF 1991 DOLLARS)

	1991	1992-1995 Average	1996-2000
TOTAL, ALL GOVERNMENT	13274	14054	15276
Federal Government			
Total Value of Construction	1233	1264	1407
Highways	186	178	194
Other Engineering	343	329	355
Buildings	704	757	858
Provincial Government			
Total Value of Construction	4667	4740	4949
Highways	2883	2983	3152
Other Engineering	370	315	291
Buildings	1414	1442	1506
Local Government			
Total Value of Construction	6602	7238	8063
Highways	2503	2674	2982
Other Engineering	1967	2271	2483
Buildings	2132	2293	2597
Hospitals			
Total Value of Construction	771	812	857
Buildings	771	812	857

Sources: Statistics Canada and Informetrica Limited

Figures 5 and 6 show municipal revenues as a percent of gross domestic product. There is a view that municipalities have a big financial problem on their hands. It is contended that they do not get enough money, or that while they used to get a lot of money, now they do not. In fact, what has happened is that the gross revenues available to municipalities have grown from a little less than 7 per cent of total output in the economy in 1961 to a little more than 8 per cent in 1975, and basically that share has not changed much since then.

Maybe municipalities have more requirements, but basically they have the same amount of income that they used to have. Municipalities' funds are split between revenues and fees. Revenues are basically property taxes and transfers from the senior levels of government to the municipalities. What has happened is that we have moved from revenues to fees. If you add the two numbers across time, what you find is a high degree of stability. There has been a slight erosion in provincial transfers which grew rapidly in the '60s to the '70s. Since 1975, there has been some erosion in the transfers from the provincial governments down to the municipalities. The federal government has never been a major source of revenues for the municipalities. By and large, the federal government provides tax points and transfer systems to the provinces to guarantee delivery of social goods, social services, current expenses, education, the health system and equality of opportunity through tax equalization agreements. A problem frequently pointed to is that property taxes are regressive, i.e., not necessarily tied very well to ability to pay.

Figure 5.

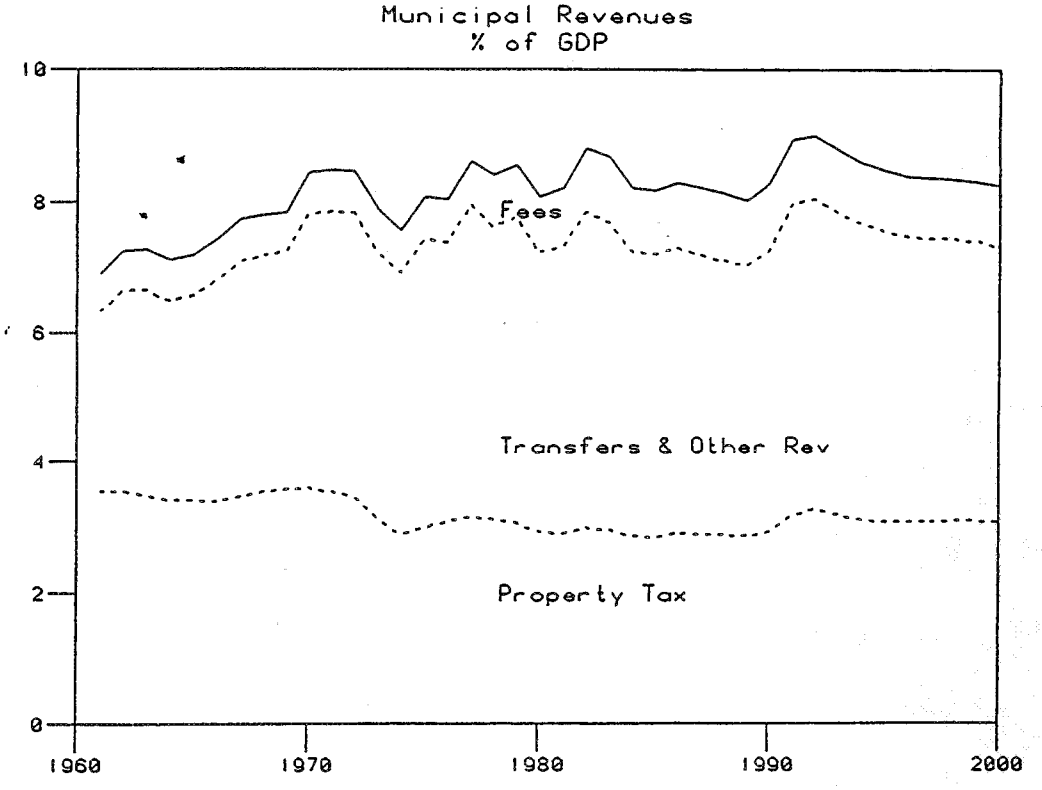


Figure 6.

LOCAL GOVERNMENT REVENUES, BALANCES, CREDIT DEMANDS
(PERCENT OF GROSS DOMESTIC PRODUCT)

	1961	1975	1985	1990
Revenues Plus Fees	6.9	8.1	8.2	8.3
Revenues	6.3	7.5	7.2	7.3
of which:				
Property Tax	3.5	3.0	2.8	2.9
Prov. Transfers	2.1	3.9	3.7	3.6
Federal Transfers	0.1	0.1	0.1	0.1
Fees	0.6	0.6	0.9	1.0
Current Expenses	6.1	7.7	7.9	7.9
Current Balance	0.8	0.4	0.3	0.4
Investment	1.7	1.4	1.1	1.2
Credit Demand	0.9	1.0	0.8	0.8
Memo Item:				
Expenditures on Goods and Services (in constant $'s)	8.4	8.7	6.9	6.8

Well, transfers from senior levels of government down to the municipalities give them a window back to that fairer system, where taxes are progressively oriented such as corporate taxes and direct income taxes.

How do municipalities use their money? Current expenses for municipalities grew from '75 to '85, when everybody else is fairly restrained. These are expenses for the school system, welfare payments and so on. In fact, municipalities are not the main financier and deliverer of welfare services. The provinces are the main actors there. The big item for municipalities is public administration, i.e., the fire department's operation, fire stations, the public libraries, operation of the streets and depreciation on the streets, and so on. On average, provinces have surpluses, but those surpluses are being eroded. With a squeeze on the current expenditures side, the battle for infrastructure is a battle for funds.

I want to point out a couple of other things. When you set standards, and tell manufacturers to operate closed manufacturing systems, you are moving the responsibility from government to the private sector. We do not really know what infrastructure is available because we are shifting the responsibility to others. For example, developers do not get compensated for development charges, they simply bring it into their accounts, but we do not measure any of that information. Essentially, there are two problems. One, can we connect people to the service that they get? In most of the services that are delivered by the public sector, we can do that more or less but we need to find various little mechanisms to get that done. Secondly, a lot of the people who look at this worry about equity or fairness. The question is, where is it appropriate to deal with the equity issue. I do not want the bus driver to decide when I get on the bus whether I am rich or poor.

In 1991 dollar terms, we will spend $175 billion for infrastructure across those four levels of government in the next ten years. In the last ten years, the capital stock has begun to erode. The finance ministers have said that if we were to go back to 1975 levels of infrastructure, we would have to spend $175 billion. So there are large dollars involved. Part of that is going to go into the environment. Economists are going to say you have to recognize externalities or what the lawyers call a spill-over effect. When you evaluate these issues, you have to bring social benefits and costs to bear on deciding what to do. I object to thinking that the environment is the only thing where externalities are involved. If we do not educate our children properly, then we have an externality problem on our hands. It affects the libraries, it affects the school system. If we do not feed our children properly, there is an externality. The objection I have is to thinking that says environment has pride of place. It is a much more complicated problem. There are some other agendas going on against which criteria have to be laid, e.g., the prosperity initiative, regulatory review and deregulation.

We have to have a policy framework. People in the transportation business are going to build highways, because they have put a policy framework together. They have gone through it systematically and their case is being made. My recommendation is that we had better get the policy framework together.

We need to put together some kind of institutionalized process. We probably ought to

have some discussion about what the mission of a policy statement is, and how it links to these broader issues. How is the infrastructure to be managed? There are tough federal-provincial issues involved. What level of government should be involved, whether the private sector gets directly involved, and whether private sector financing will be part of it; these questions need addressing. I am really talking about re-creating the ministry of state for urban affairs, but under another name, under different ownership and under different senses of who has control.

PANEL DISCUSSION

MIKE FORTIN
ECOLOGISTICS, LTD.

Carl Sonnen said we need a policy framework. Over the course of the sessions yesterday, we talked about a number of themes: pricing, incentives, the need for innovation, the need to find money to finance new or replacement infrastructure. What I will be speaking about are utility services, in particular private goods delivered by municipal government or by local authority. Private goods are defined as goods where if I use it, you cannot use it, and where my use can be measured and I can be charged for that use. Water, waste water, storm water, and parking are examples of private goods.

There are two questions when we talk about how to finance the replacement and the maintenance of infrastructure. First of all, who is going to pay. Is it the user? Is it the ratepayer? Is it the general public through income taxes or corporate taxes? Or is it a subsector of the public, e.g., a population like a neighbourhood through a special area assessment, or developers through the development charge, or home builders, if the developers can pass on the development charge to the home buyers? That is the important question, who pays. The other question is how do we make them pay. Do we make them pay now, up front, for services, using reserves, or do we make them pay as they use the service and finance the up front construction?

I would like to look at how we make them pay, whether up front, or as we go, and tie that to some of the structural and policy issues at the local level. Carl Sonnen was talking about

policy issues at the senior government level. There are parallel and significant policy questions at the local level that need to be addressed. They deal with the structure of the utility or the structure of the authority that delivers the services. Regarding who pays, 'innovative financing techniques' means finding new or more accessible sources of funding.

The development charge is an example. The people who are paying are new home owners; not yet part of the political jurisdiction. It is a relatively easy pocket to pick, unless you end up at the Ontario Municipal Board (OMB). Taxes and user charges on the other hand, have a high degree of accountability. Through the vote, the individual paying is directly tied to the individual who is making him pay. So there is a problem of accountability with development charges. We saw yesterday that there are also issues with the arbitrariness of the development charge, e.g., whether or not a new information system for a library gets lumped into the development charge or not. We had that same problem with user charges. The structure of user charges across the province is highly arbitrary. There are very few guidelines saying this is the best way to do it.

There is another problem with development charges that speaks directly to what we are trying to do here. When we are building new infrastructure, development charges allow us to pay for that infrastructure. Once we have paid for the infrastructure and put it in place, we can go merrily on our way charging user rates or taxes that do not reflect capital costs. They are still too low. And 10, 20, 50 years down the road, when you have to replace that infrastructure, you have the same problem again, i.e., how do you pay for it, because we have not been paying for it all along. In the private sector, you have user charges, i.e.; prices. In the private sector though, prices are enough to cover the operating costs, the maintenance and repair of infrastructure, of capital, and to build new capital when you need it. When the municipality or the local authority is delivering private goods, because there is a natural monopoly in the delivery of those goods, it should structure the organization that delivers those goods in the same way. It should set the charge, or price, to cover the operating cost, the cost of building the infrastructure, the cost of maintaining and repairing the infrastructure, and the cost of replacing that infrastructure.

What does that mean? That means that you have to reflect those costs in your accounts and you have to reflect those costs in the rate base that is used to set the charges. But now, one whole side of the equation is not reflected in the accounts unless your local authority structure is the utility. Municipal governments, municipal departments do not keep a record of their fixed assets. By and large, they have fund based accounting. All of their capital costs are either expensed or they appear in the accounts as debenture and interest fees. You can interpret the job of the directors of a corporation as being to protect the value of the assets of the owners of that corporation. I want the directors of my municipal corporation, my council, to protect the value of the municipal assets, the public assets that are their charge, but they do not know what those assets are. They have no idea what the value of those assets are because they do not keep track of them in their accounts. Yesterday, we talked about the need physically to have a good inventory of our infrastructure, to know how

many kilometers of pipes of different sizes we have in the ground, to know how many kilometers of road we have, and so on. We need the same information on the financial side. If council is going to protect the assets, we need to establish fixed asset accounting at the municipal level, or at least at the utility level. Let's make sure that our local authorities have the right information so that they know what they are dealing with in terms of the economics.

Once we have the right information, i.e., a good chart of accounts that reflects both line items and assets, then let's make sure that we allow them to include depreciation and a return on equity in the rate base. Let them make a profit on their assets. They are pulling money out of the private sector. If that money stays in the private sector, it earns 10% or 20%. The only reason why it should be pulled into the public sector is if it can earn a similar amount. And when it is providing private goods in the public sector, then we should allow them explicitly to make that return. If we set up utilities, we need to regulate them, and there are two ways to do this. One way is the regulatory commission; we can regulate the rate of return, the prices they charge, the service standards that they need, or we can be a bit more subtle and look at a number of these things. There is another way to regulate them, and that is to let the private sector in, through contracting, through franchise operations, and through that mechanism to establish a benchmark based on competitive pressures that will tell us how low the cost can be pushed, how efficiently the services can be delivered. The Ontario Sewer and Water Corporation could be an exciting opportunity for opening up some of the ways that we organize our municipal services. It is a potential foot in the door for new financing techniques, but in particular for some private sector involvement in the delivery of utility services. And that gives us probably one of our most effective and powerful sources of finance, that is, reducing costs.

RICHARD KIRWAN
URBAN POLICY ASSOCIATES
PTY LIMITED

Price is obviously important and it relates to financing, but I have to stress that it is the demand conditions for intensification which are receiving too little attention, and demand will continue to be and always has been affected by the combination of price and location. But we also need to disabuse ourselves from the notion that the only way in which the stock adapts and can be made to adapt to changing demand conditions is through intensification of land use. We know perfectly well that stocks of housing adapt themselves to changing demand conditions very dramatically through processes like disinvestment, or gentrification and households adapt themselves to the available housing stock. For example, there are houses in London, England, which were originally built for the middle-middle classes, but they could not afford them, so affordability was achieved by filling them up with lodgers. Then they moved to an income bracket in which they could afford the houses, and the lodgers were shifted out and they became single family houses. And then the middle classes moved out, and they were broken up into apartments for relatively low income groups. Then they were gentrified and reconverted into single family houses, and then people stopped having any children and along came the Yuppies, and they were redivided up into apartments for Yuppies. The point is that the stock adapts, and I do not accept that the North American or Australian single family house is intrinsically unadaptable. It depends on market conditions and planning barriers and so on.

We do have to ask ourselves why there has not been more intensification. This is a very important issue. Certainly part of that is the lack of price incentives, the lack of price which is equal to the cost of infrastructure at the periphery. That has set up relative affordability conditions which reduce the effective demand for living within the existing area. I have also mentioned the problem which occurs in most countries, i.e., excessive tax incentives to retain owner-occupied housing in its present state. This leads to under-occupancy and is the barrier to the market response to increased demand and rising prices in existing built-up areas and prevents a conversion to a higher intensity of land use. There are also planning and community resistances. But, if intensification is the agenda, it is very important that we should concentrate on why, and under what conditions that supply response is going to be larger. I certainly am very sensitive to the home builder's concern expressed in a large number of countries, that if in fact through price or other means, peripheral expansion opportunities are cut off or reduced, then there will not be an adequate supply response within existing built-up areas. Unless we address that, we are missing an important agenda item.

Financing is, at the same time, pricing, and we do not want to divorce those two issues. From the point of view of the need for infrastructure, the question that people ask is how is it going to be financed. But from the point of view of the effects it is going to have on land use, land use form and the development process, any form of financing is at the same time a form of pricing. We want to satisfy the need for infrastructure, but do that in a way that flows

from a pricing structure which gives the right signals.

I am here to represent the foreign experience, so I thought it would be my job to summarize findings of the international study that I was involved in and in which Canada played an important role. There is nobody who clearly has "the right answer." Different countries, because of their institutional legal frameworks, have adopted different approaches, although virtually every country faces similar problems. In Germany, for example, the emphasis is still on, what seems to many in the English-speaking world, a rather old-fashioned concept of municipal enterprise, with a heavy emphasis on cross subsidies between infrastructure categories, bond financing and relatively little privatization.

Perhaps the most interesting part of the French situation is Versement Transport, the highly specific, earmarked, subsidy system for public transit, which has delivered billions of dollars of funds to enrich the public transit system to a very intense degree. It could be seen in political terms to be the quid pro quo for requiring people to live at extraordinarily high densities and for pursuing a very tough containment policy. But it has delivered a very rich public transit system. The French have depended very strongly on negotiated agreements. In these agreements, the local municipalities and the communes (the provincial governments) get together with private developers and negotiate a sharing of the infrastructure finance which is then embodied in a legally binding document. In delivery of infrastructure, they have also gone very strongly for the franchising of private companies. This is not just contracting out operational services. It is also taken to the extent of putting a duty on those private companies to maintain existing capital stock and come up with the capital to amplify the systems. But it is less than full privatization.

The U.K. is notable for much more extensive privatization, for example in the field of water. The U.K. has now introduced the concept of developer exactions in the privatization legislation. Japan is still very heavily dependent on earmarked taxes and much more dependent on grants from higher levels of government than many countries. The U.S.A. has its well-known litany of impact fees and benefit districts, special assessments and revenue bonds, which together have provided a package which has seemed to be able to carry it through more difficult fiscal times and deliver the goods. In many people's opinion, it has delivered efficiency gains too. From the Australian context, I would simply draw attention to a recent initiative of the government for privately financed infrastructure. This was an initiative to resist the demands by private corporations that there should be changes to the tax code to make it easier to get tax offsets during the long lead time for major infrastructure investments. Instead of doing that, Australia has introduced a new instrument, limited to infrastructure, in which private lenders can lend to private borrowers. The private lenders will not be taxed on their interest income, but the private borrowers are not allowed to make that a tax deductible charge.

When we are talking about financing, we have to distinguish between the source of funds and what I call the burden of cost. The critical distinction about the source of funds is whether

or not you borrow for capital works, and which form of substitute for borrowing you actually rely on. Some sort of development exaction, development fee or privatization is obviously attractive to those who do not want to borrow. But in country after country there is a propensity at the lowest levels of government to fund capital formation out of current revenues. Carl Sonnen showed us specific figures, which indicate that it clearly happens here, as elsewhere. But the burden of cost is different from the source of the funds, and we still have to talk about the classic distinctions about whether we are using a user pay system or whether it is a burden to general taxation, or that somewhat unclear middle ground, the earmarked taxes, and whether the burden is now or in the future. Communists have always argued in favour of a user pay, beneficiary pay type of system, where the burden of cost is distributed into the future over the life of the asset. But I am very sensitive, coming from an economics background, that we have to understand why populations don't seem to like that. What they actually like is paying here and now, and if not out of revenue, then the next best thing is earmarked taxes if they do not want to use general taxes. Jerry Rothenberg, of course, has put up the thesis that, in fact, the defining characteristic of the public sector, is that people actually want to bear the burden now for the sake of future generations, and that is very basic. That flies in the face of the traditional economics approach.

How do we relate the perceived neglect to arrangements for financing? If you choose the pay as you go approach, i.e., you fund your capital formation out of current revenues, and if there are constraints on current revenues and competing uses, then capital works are the victims. Throughout the 1980s, that has been the case in country after country. But we still have to face the question of why there is not more borrowing for what is fundamentally an asset that is going to deliver its benefits over its useful life. It has elements that we can understand quite clearly, like the cost of capital. The public sector did suffer from the fact that if you have high nominal rates of interest with a high inflationary component, then the real burden of cost is distributed, very adversely over time, and that represents a high burden of real debt service in the early years. We know that local governments particularly dislike the fact that debt service consumes a large amount, and it seemed at times a growing amount of their current revenues. But now that nominal interest rates are coming down, maybe the opportunity for borrowing will open up.

The important thing is to remember the American evidence, at least as adduced by George Peterson at the Urban Institute in Washington. In the United States, where they have frequently used voter referenda to control expenditure, nonetheless the voters have in fact voted for maintaining and improving infrastructure. The notion that the populations are against that is not consistent with the evidence emerging from the United States, which is that the majorities are typically around the 70% level on direct voter referenda. The condition is that the finance should then be earmarked for the purpose. Maybe accounting will also have a similar effect in encouraging people to spend more on declining depreciating assets. Certainly every level of government in Australia is now required to institute a proper balance sheet accounting system in which we are supposed to learn each year how much our

assets are actually depreciating and what we are doing about that. There is room for some skepticism about whether the public sector will ever learn new tricks and whether that is enough to ensure that resources are not directed elsewhere when there are more pressing agendas, but, that is possibly one way.

The inter-generational equity issue is key. Why is it that people seem willing to, and prefer to, bear the burden of cost now for providing something that is going to deliver its benefit over a period of time, than to have it paid by subsequent generations? There is something very basic there, that needs more investigation. Time and again, we see the emergence of the double payment problem, where people whose properties have been levied a capital up front fee subsequently have to pay a current local or other tax which funds other people's infrastructure. That could be sorted out with modern accounting techniques, but to do so would require a prior decision about identifying the class of payers who were appropriate to pay for each particular asset. You could then bill people for their assets, and everybody should be charged replacement cost pricing. But if you have already made your payment in a capitalized form, or the developer has on your behalf, you will be credited with a refund for a finite number of years, and then you would flip back into the system. One can see the political problems of that, but technically, it should be possible if the accountancy was done. And so removal of the double payment problem hinges on the prior acceptance of a beneficiary or a user pay principle.

There is concern in many countries that if you introduce higher prices for peripheral land development, that will create windfall gains for existing land owners. But, of course, that should not be the case if the existing land owners were also being charged the correct price for the infrastructure. If everybody was being charged a real rate of return on the replacement cost of those assets, then, in fact, there would be no particular reason why that price charged on development at the periphery would lead to an increase in land values in other areas. But undoubtedly that concern is voiced time and again.

The equity issues are difficult, but one can go back and ask what are the benefits from the absence of a proper, cost recovery type of approach to infrastructure. Time and again, it is the better off who benefit from the absence of that type of pricing. The figures that Steve Janes gave us yesterday would precisely go along with that, i.e., you are not shifting that full cost back to the larger lots. People go on and on about the affordability issue, and of course the price of land is going to go up if we have to charge more for the true cost of providing environmentally sound infrastructure. But that does not mean that there won't be dwellings that people can afford. They will be dwellings that take a different form, that look different, but that are still affordable. Countries have been through great waves of changes in housing form without changing the fundamental affordability. A moment of change is very difficult because you have expectations about the type of housing that you think you can buy. I would certainly not want to say that price is going to be the only solution to the financing. But I think that price still does have an important role to play in creating first, the funding that we need to provide the infrastructure that people are

asking for and an infrastructure that is environmentally sensitive, and secondly, the price signals which will lead to the land use arrangements, the land use forms, the changes in the intensity of use in existing areas which we are looking for. As an economist, I would say we need to understand why populations at large do not always see it in those terms, and they seem to come out with answers that tell us something quite different.

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We have been talking at this conference about the need for spending on infrastructure, and that has been well documented. What we are trying to do in this session is focus on where we are going to get the money. Historically, how did we finance infrastructure? Well, capital expenditures by local governments were financed from property taxes and user fees, federal government grants to some extent, provincial grants, and municipalities used borrowing. More recently, federal grants have not been very large, and as Carl Sonnen pointed out, provincial grants are falling. There is a lot of pressure at the municipal level to keep property taxes down, and there is a great reluctance to borrow. Carl Sonnen's table showed that property taxes relative to GNP have actually fallen. The problem with the property tax is that it is a very visible tax. People write cheques to the government, they know what their property taxes are, and they always think they are going up. In fact, in real terms, they are not. But there is pressure to keep property taxes down and there is a reluctance to borrow. So municipalities are looking for new sources of revenue, or "innovative financing". Governments love to use this term.

One of the things that municipalities are doing is turning to the private sector to pay for a lot of these infrastructure costs. Carl Sonnen's paper talks about many different ways of financing infrastructure. I would like to focus on four; two that are private sector initiatives i.e., development charges and public/private partnerships, and then I would like to finish with two more. I call them more traditional

sources of municipal revenues, i.e., borrowing and user fees. My theme is that it is not just getting the money, it is the way we get the money that is going to determine all kinds of other things, such as what kind of infrastructure we have and how our cities look.

Development charges are charges levied per lot, in the case of residential property, to finance the off-site costs of development. They are used in Ontario, British Columbia, and Alberta. Historically, they have been used to finance water, sewer, and road infrastructure. More recently, they are being expanded to include daycare centres, libraries, city halls, recreation centres, etc. This is an important source of revenue to municipalities, but there are some problems. Michael Fortin talked about accountability, but you cannot vote against development charges, you have already paid them before you have the right to vote. In Ontario and British Columbia, you are allowed to levy on a development by development basis, or you can set a uniform levy across the municipality. And here is an example where the kind of levy you use is going to affect the way your municipality looks. If you levy on a development by development basis, you say this is the cost of water infrastructure in this development. You are far away from existing services, and you are doing a low density development. This is what it is going to cost, this is the development charge. Most municipalities in Ontario use what I call average cost pricing. They say this is the cost of infrastructure, the growth related costs, capital costs of infrastructure in the whole municipality. Divide that by the number of lots, we have a price per lot. It does not matter if you are far away from existing services, it does not matter if you are a low density neighbourhood or high density, or close to services, you are paying the same amount. I do not have to tell you what incentives that creates. If you have average cost pricing, you are not providing a disincentive to urban sprawl, in fact, you may be providing an incentive to urban sprawl. So the nature of the charge is going to affect the kind of infrastructure you need and the land use patterns in your municipality.

The second issue is who bears the burden. The bulk of the literature suggests that it is really passed on to the new home buyer. We have one branch of government that says you have to have affordable housing, and we have another branch levying development charges. How do we reconcile the two? If you believe that it is being borne by the new home buyer in the price of the house that they purchase, how are we going to have affordable housing? Incidentally, if you levy a development charge and it is reflected in the price of new housing to the extent that old housing and new housing are substitutes for each other, what does that mean? Well, it means that people in existing dwellings enjoy a windfall gain because the price of their houses goes up as well. Is that what we really want to do?

The third issue is that of inter-generational equity. The development charge covers the capital costs of development that you are in. You move in and you pay property taxes. Where are your property taxes going? Part of your property taxes are going to pay off the debt from past capital spending, part of your property taxes are being put into reserves for future capital spending. So there you are, you have paid for the capital that you have necessitated, but you are also paying for

previous generations and future generations. This is what Richard Kirwan called double charging or double taxation. In Ontario, it is not required by legislation, but a lot of municipalities are actually putting a rebate into the development charge to account for this double taxation. However, they do not have the sophisticated accounting systems that are recommended. They just say well, 5% or 10% of your development charge is going to be reduced to account for the property tax, for the debt service in the property tax.

One of the other issues is that development charges are an alternative to borrowing. In fact, it is borrowing, it is just by other people. In one case, the municipality borrows the money and it builds the bridge or the road. In the other case, it levies a development charge. With the development charge, either the developer is borrowing the money or the new home buyer is borrowing the money. In other words, they are increasing their mortgage to pay for this. Which is more efficient, to have municipalities borrow the money or new home buyers borrow the money?

The last point that I want to raise on development charges is the amount of money they bring in. They only apply to growth related costs in new developments. They are very good for building infrastructure in a new development, but you cannot use them for other things. Under the new legislation in Ontario that was passed at the end of 1989, you have to be very explicit about where this money is going, and prove that it is growth related. This can be challenged at the Ontario Municipal Board. In British Columbia, each municipality has to have their by-law approved by the provincial inspector of municipalities. The other problem is that sometimes development booms and sometimes it does not. If you are a municipality waiting for development charges, they are a very volatile source of revenue. There is potential in development charges, but there are some problems with them as well. The most important one is what these charges are doing to our cities. What are our cities going to look like if we use development charges instead of the alternatives, such as property taxes or borrowing?

One of the new buzzwords seems to be public/private partnerships. I would define it as the direct participation of one sector in a venture controlled by another sector. Usually it is private participation in a public facility, but it can take many different forms. We have a number of examples in the U.S. of public/private partnerships, but not too many in Canada. Terminal 3 at Toronto Airport, and the SkyDome Stadium are examples. We do have a fair bit of contracting out in Ontario, where we contract out garbage collection, for example. The problem with the studies that have been done on public/private partnerships is that everything is lumped together, all the different kinds of arrangements, all the different things that have been financed, and it is very hard to sort through it all to see what is going on.

We have to start with a service by service kind of analysis. The way we finance roads is going to be different than the way we finance social services. They are all different services, and as Carl Sonnen said, we have private goods here such as water, which is pretty straightforward. I use the water; I pay for it. You can identify the beneficiary; you can exclude me if I do not pay for it. There may be

reasons why the public sector is involved, but it is largely a private good, and it could be provided by the private sector. On the other hand, you cannot charge me for a lighthouse, you will never get me to pay. It is a public good, a collective good. The kinds of arrangements we have for financing lighthouses and financing water and sewers have to be quite different.

We have to start by asking what is the nature of the service we are trying to provide. Then we can ask whether it is more logically provided in the private sector or more logically provided in the public sector. And then the next question is what kind of arrangement are we going to have? Is it going to be provided by the public sector and contracted out, or is it going to be franchised? What kind of arrangement are we going to make? And then we have to look at issues of equity and efficiency and so on. But we have to be very careful when we look at the costs and benefits of any of these public/private partnerships. There have been a lot of studies on contracting out, and I am very nervous about them because they tend to compare apples and oranges. They tend to look at the costs of private sector provision of water versus public sector provision of water, and when they look at the private sector, they do not include the costs of regulation, and they conclude that it is cheaper to provide it in the private sector.

Let me go back to more traditional ways of financing infrastructure, and those are borrowing and user fees.

All of the speakers have talked about the reluctance of municipalities to borrow. I went back to the 1989 Ontario budget, which had a figure of debt charges relative to operating expenditures. In 1982, debt charges were 7.1 percent of operating expenditures. In 1987, they were 6.4 percent of operating expenditures. The amount of borrowing is declining. The Ontario Municipal Guidelines say that debt charges relative to operating expenses, can go as high as 20 percent. There are a couple of municipalities up there, but most of them are not. There is a great reluctance to borrow in Ontario. That is not true across the country. This reluctance to borrow is not necessarily nationwide, although it is certainly true in Ontario and in other parts of the country. In British Columbia, municipalities do borrow. As a matter of fact, there is something called the B.C. Municipal Finance Authority which helps them borrow. This authority borrows on behalf of the smaller municipalities, where it would be very expensive to go and borrow on their own behalf; the authority can get lower rates. There are advantages to borrowing. The benefits of infrastructure are enjoyed over the next 25 years. Why should the people who are enjoying those benefits over the next 25 years not pay the costs? Economists have been saying this for years, municipalities think that it is bad management, and I do not know how we can reconcile the two.

The last thing I want to talk about is user fees. Carl Sonnen's paper talks about user fees to curb demand. If we priced infrastructure properly, we could curb the demand, we would not need the infrastructure investment, not as quickly, not as much. But in order for that to be true, we need some form of marginal cost pricing. Economists have been saying this for years. It is not being done, and maybe we should do more work on the gap between what economists say and what municipalities do. I have looked at

reviews of water pricing in Canada, and of course you need to have metering to ensure that you are covering your marginal costs. In 1989, the Canadian Waterworks Association did a survey of municipalities with population greater than 1,000. Of these, 27 percent of municipalities were fully metered, 21 per cent were partially metered, and 52 per cent were not metered at all. We economists are talking about marginal cost pricing, and there are not even meters out there. Now, a lot of those 52 per cent that are not metered were small municipalities, but in the City of Toronto, which is not a small municipality, the water is not metered. We can talk about marginal cost pricing, we can talk about user fees, but it is not happening very quickly. In the area of garbage collection, people are starting to suggest that fees be charged for garbage collection, which could reduce the amount of garbage.

Another aspect of user fees is that depreciation is seldom included. If we are not including the annual cost of the capital resources that we are using up when we are delivering a service, there is not going to be any money left for rehabilitation, and that is what is happening. Where we do charge for water, we have not included depreciation in the price. When the facility is used up and we have to build another one, we still do not have any money. There are two aspects to user fees. One, we have to price correctly to curb demand, but the other is we have to price correctly so that we have accumulated some money to rehabilitate our facilities when they wear out.

Let me just finish where I started and say again it is not just finding the money to build the infrastructure. How we get that money, the source of revenue we use is going to affect the kind of infrastructure we can build, where we are going to build it and how our cities are going to look. So let's not just look at the quantity of money, let's look at the kind of money that we are raising.

DISCUSSION PERIOD

Andy Sancton asked if there really is a lack of data? He noted that Carl Sonnen had figures that showed the fixed assets of municipalities, yet Michael Fortin commented that we simply do not have that information.

Carl Sonnen replied that his figures were from Construction in Canada, and the figures have only been out for a couple of weeks. The depreciation rules which are used in estimating some of the private capital stocks and those which are used in estimating the public capital stocks are different, and it is not clear what rules they applied. Carl Sonnen concluded that it comes back to the lack of continuing commitment to resolve a lot of these difficult problems, among which are included measurement problems.

Michael Fortin responded that the data are available. Statistics Canada collects investment information and constructs an asset series from that for the private and public sector. The data are there, but municipalities do not have that information in a form that is of use to them. They need the kind of information that the private sector uses to manage its assets, and Statistics Canada does not generate that information for them.

Micheal Fortin said that, depending on what your public policy purpose is, you may, or may not, want what we call a universal great giant machine that has every little municipality's balance sheet in it or not. We do not use sampling procedures enough e.g., to access performance measurement data for the roads, data which is scattered around among various municipalities, held by various disciplines for various research or operational purposes.

Pierre Letartre commented that the idea of pricing public goods has been around for more than 20 years, yet we have so little pricing now. The only reason given is that we do not have the information structure. He asked, "Don't you think there is another problem?"

Michael Fortin replied that the idea of cost pricing actually goes back to the turn of the century. A French engineer named Dupuis came out with the idea in 1898. The reason why we have not bought into it is that in Canada, there is a history of provision of private goods through public service, and the revenue collection instruments were property taxes. User charges have only developed subsequently. Part of it is just a basic lack of insight on the part of municipal councils, such as distinctions between public and private goods, understanding of accounts, understanding of financial management, and understanding of demand and supply management.

Pierre Letartre asked why we reversed that tendency to user charges?

Carl Sonnen suggested that the pendulum swings between equity and efficiency, and we swung to some notion of equity that said everybody should have access to these services and not be charged for them. The feeling was there should be equal access to everything. The pendulum is swinging back again to efficiency, and that is why we are talking about pricing again.

Pierre Letartre repeated Richard Kirwan's point that the absence of pricing is more inequitable than the presence of pricing.

Carl Sonnen responded that it is true in reality, but the perception is that pricing is not fair.

Richard Kirwan commented that people often think in terms of a duality between regulation and prices. Economists usually argue that pricing would be the better way out. It is more flexible and allows proper adjustments, but very often people like regulation.

He pointed out that economists argued we should use short run, marginal cost pricing for indivisible assets. In many countries, the swing back to efficiency is driven by the financing problem because you actually cannot raise the finance unless you are prepared to use one of these ways which requires that you have a price. Now we get the worst of all possible worlds emerging in the short run. He noted in New South Wales, Australia, for example, the additions to the road system in the metropolitan areas have been privatized, which requires a toll. Now there are roads that are tolled and roads that are untolled, and not surprisingly there are immense political objections because there is no consistency and there is no perceived equity. Richard Kirwan said, "One would have to hand it to the French. Although tolling their longest road system was unpopular, it was consistent. They developed a long distance road system of high quality in the 1950s by tolling. We have to bring together some sense of efficient pricing with some sense of an equitable and consistent treatment which can be seen to be legitimate and fair."

Looking to the future, Richard Kirwan suggested that there is not a conflict between allocation questions and fairness. In fact he suggested they are going to complement the need for pricing in the future, partly for the reason that Enid Slack raised, which is that prices are probably the fairest mechanism for getting the signals out as well as being efficient. In this country since the end of the war, on average and with few interruptions, we have had an increase in disposable income per household in real terms. The allocation decisions we use in private purchasing decisions are essentially pricing systems. And since there is some difficulty in distinguishing whether things delivered by the public sector are private or public goods, there is a confusion about whether prices should be used in one case or not. Remember, right now about a third of the revenues which are acquired by the municipalities on their own account are now pricing system revenues, they are fees.

Richard Kirwan also pointed out that we face a legacy problem. Interest rates in real terms are not coming down, so all this talk about interest rates being solved, is not true. In real terms, we still have a big problem on our hands. The debt problem, especially with high real interest rates, means that we are almost certainly going to see no increase in real income per household over the next decade. This is going to be unprecedented in two generations. And where, in the past, we had to fight about allocation of growth and pieces of new pie, we are now going to be fighting about the existing pie. And in that world, the need to get the fairness decision right and the need to get the allocation decision right are going to become very intense. He concluded by suggesting that we are going to

see a lot of pressure to have pricing put into place for very fundamental, good reasons.

A participant noted that when the Ontario government introduced the Development Charges Act, the debate raged across Ontario, as to whether or not development charges were an appropriate way of financing infrastructure for new growth. He asked for some comment from the economists on the appropriateness of development charges as a way to finance growth.

Richard Kirwan responded that economists have been consistent in saying that the best way of funding infrastructure is borrowing, and you can distribute the burden of cost over the life of the asset. But in many countries, there can be a reluctance to borrow and a conception that public borrowing has a large economic cost and that there is a shadow price to public borrowing. In some countries, that reluctance is represented quite explicitly through macroeconomically driven controls on the volume of public borrowing. If for one reason or another, borrowing is seen as a problem, and borrowing has a cost to the public sector, that there is a shadow price to public borrowing, then you have to look for substitutes for borrowing. Richard Kirwan pointed out, "We don't ask ourselves in a pure world whether development charges are ideal, we ask ourselves in an impure world, if we are not prepared to borrow, what are the possible mechanisms, and how can we make them equitable."

On the subject of development charges levied on land, Richard Kirwan said he is less concerned that the future user is not there to vote, because the developer acts through the market place as a representative for that future user. The equity issue depends on whether the new development is disadvantaged, compared with the treatment of all existing developments. The double charging problem, and the issue of windfall gains could be sorted out. Richard Kirwan expressed his disappointment that Ontario people want to sort it out by reducing the development charge to compensate for the subsequent payment of a rate or a tax or a property tax, rather than reducing the property tax because you have paid the up front charge. He agreed there should be some balancing between those two. There is nothing wrong in distributing to future land use the cost of providing the infrastructure. Whether you distribute it to that future land use in a capitalized form or as a burden of recurrent cost will be dictated by these broader issues of the constraints on public borrowing, the reluctance to borrow publicly because that is bad for the economy as a shadow price, and so on. There is nothing intrinsically wrong with development charges, but there is great potential for inequity unless you have an accounting framework which makes sure that everybody is being treated in the same way and making the same contribution in the end to the life long cost of the infrastructure that they benefit from.

Enid Slack noted that in a second best world, we can justify all kinds of things we do not like. She agreed that there are some problems with development charges, and noted that she had listed some in her presentation. "I would add to that the problem of the way cities develop, depending on the way the charge is levied. "

Don Tate introduced the concept of resource conservation into the discussion. He reported on work at Environment Canada on water

efficiency audits in public buildings. "If the results of our audits are any indication,", he said, "there are some very significant payoffs to be had. We audited ten buildings of a fairly diverse nature, and found that the retrofit cost for water efficiency was about $250,000. That resulted in annual savings of $400,000 and a payback period of less than a year. If that $400,000 is taken out over 20 years and brought back to present value terms, it amounts to 5 million dollars. That is a cost effectiveness ratio of 20 to 1, which is unheard of for public projects." Don Tate suggested that if those figures are any indication of what can be done, then perhaps we should start looking at some of these conservation mechanisms to help us with our financial problems. He asked for the panel's comments.

A panelist agreed that there are some very significant paybacks that can be achieved if we start looking at water conservation, energy conservation and so on. He noted that pricing alone is an incomplete strategy, because the pricing rules often do not work, and he reported on some work that is now being done in the region of Waterloo. "They have a fellow in charge of the water conservation program who is very proactive, very aggressive. He is a senior engineer and he knows how to talk to plant managers. Plant managers in the region of Waterloo have had pricing for a long time now. The rates are up. He is going to these people, working with staff or encouraging them to work with their staff, to identify opportunities for water savings. They are identifying opportunities for savings that have payback periods in the same order i.e., six months, a year, two years on investments. We re not talking about major investments, just better housekeeping. The plant manager is trying to make beer, or he is trying to make sausage. He is not particularly concerned with the water, as long as the water comes in and it leaves, and he makes his beer effectively. You can give him the pricing but, at the same time, you have to give him some additional information to say there are things that you can do to react to this. Pricing by itself is an incomplete strategy."

A participant commented that efficiency is not the golden key to the future and that efficiency dividends are not going to go on inexhaustibly.

John Bassel commented on the importance of timing. He noted that in the deterioration of reinforced concrete, delay becomes extremely expensive and suggested that delay in fixing other kinds of infrastructure can be equally disastrous. John Bassel said there is a real national interest in trying to assess the prioritization of the repair of our existing infrastructure, and to somehow find the money to make sure that it is not going to cost us a lot more because of delays. Secondly, John Bassel expressed his concern whether development charges are the right place to start in creating new infrastructures. "If it was," said he said, "we would not have had the wild escalation in land values in certain parts of our country." He suggested that when you are trying to assess the cost of providing a new infrastructure, you should look a lot further than the cost of actually putting it in. The timing of when it goes in is probably four times as important, maybe more, than the cost of putting it in. "We must prioritize and plan strategically for our growth, find the money, have an inventory of future infrastructure, and collect it back from those that use it when they use it." John Bassel suggested that we need a strategic plan.

Carl Sonnen agreed. He added that we need a strategic plan, but it must be expressed in the level of detail at which decision makers operate. Another aspect is the information base for the strategic plan and the way or process in which that plan is refreshed. Strategic plans are predicated on information infrastructure. One of the things that needs to get sorted out is what are the boundaries for the strategic plan. There is a temptation, for example, for the environment to be everything. Yet there is a need to link a strategic plan of infrastructure to other important issues of the day.

Richard Kirwan commented that in the United States and Australia, challengeability is the basic constraint on abuse of the development charge system, and the timing of investment is one of the challengeable items. For example, there is a very simple analysis which shows that if local government is going to build assets in advance, they have only a single window of opportunity to recoup the cost i.e., through a development charge, when the development occurs. This analysis shows that in some cases, the municipality would have to charge two and a half times the apparently simple apportionment of the initial cost. But if the cost of an asset is let's say $1,000 per lot, and you come up with a charge which is $2,500, the developer is rightly going to challenge. Richard Kirwan noted that the cost is a direct function of the timing, that is, when you are undertaking that asset investment relative to the development path. He suggested that if you have a good case from a municipal point of view, you can say that is right, we are doing it at the right time, and hence it is quite appropriate to charge people $2,500 for something which has actually got a simple cost of $1,000 per lot. There has to be a forum in which that can be challenged because there is no doubt that development charges can be abused if there are not appropriate fora.

John Bassel responded that he was referring to the timing of actually doing the work. "We have certain centres in this country of ours where the infrastructure was not available and land values rose substantially. There are many people who bought houses that regret the losses of 100 or 150,000 dollars on their units because of the bad timing. The real cost to our society is immense. If we are to be competitive in a world environment, we must make sure that our people are not going to have to pay 300, 400 or 500 thousand dollars for a simple home."

John Hartman explained that his association, the Transportation Association of Canada, put the national highway policy study together and lobbied governments for three or four years, to get some of the money for highway infrastructure. He reported that TAC is sponsoring seven different councils; one of them is an urban transportation council made up of planning commissioners and transport commissioners from the big cities in Canada, plus some developers, transit operators, truckers and so on. Using two examples, he reported on some of their experience in terms of public/private cooperation and the question of privatization.

"In one case, in Metro Toronto a major development was going in with retail shopping space and office buildings and so forth. The developer had put all his plans together, and was ready to go through the normal approval process. No consideration had been given to transit up to that point. So the Metro planning

people got together with the developer and with the transit operator, who wanted to put a rapid transit link, with two stations, into that development. Unfortunately, the way the development had been set up, it would be impossible to physically build those two stations, but they all got together and they did some horse trading. The developer gave some land to the municipality so the two transit stations could be put in. He also put in land for park and ride facilities to enhance the transit ridership. The municipality gave back to the developer other lands which he could then use to do certain things to round out his development, and it was a situation where everybody came out ahead."

"Another case is Edmonton Transit, which was running specialized services for disabled people for many years, and they were not doing very well, losing money, and not really serving the disabled community, until they got the idea of contracting that service out to a private operator. Since that time, the cost to the municipality of providing the service has gone down, the private operator is making a reasonable profit, the level of service to the disabled community has increased, and ridership on the service, in a period of about 5 years, increased about 80 percent. That was another situation where everyone came out ahead."

John Hartman pointed out that one important lesson from these examples is that when the public and private sectors are going to work together in nontraditional ways, it is not easy to do. A lot of work has to go into it, somebody has to think of the idea to do this in the first place, and because we do not have a long-standing tradition of this sort of thing in Canada, the people who are doing it are pretty much writing the book as they go along.

He described another lesson from their experience. "With urban transportation, there is a whole shopping list of all sorts of solutions to urban transit problems, how to decrease congestion and increase mobility. There are demand management techniques and enhanced transit and traffic management, land use planning policies. There are all sorts of different ways of paying for all this, and every one of these things is in use in some country in the world. The very first time the council met, I expected they would go down a list like this and say, let's start a car pool demonstration project in Hamilton, or let's do this kind of thing or that. It turned out they were not interested in the technology. They said we know about all of this stuff, we have a staff of 20 or 30 people that tell us about this. We have plans for our own town, we know what to put in, what will best work for us, how much it would cost, how we would phase it in. We even know where the money would come from. The problem is we cannot get the commitment from the politicians to commit that money to this kind of project. That is where the problem is. In other words, within 10 minutes of the first meeting, they threw out all of this nifty techno-scientific stuff, which I as an engineer think is really important, and got down to the guts of the problem, which is an institutional problem. Those of us who are working and trying to improve urban transportation are smack up against the institutional problem, which is a people problem. In our case, it is a problem of educating the public to put the pressure on the politicians to generate the political will to fund the necessary infrastructure and service level improvements.

And it strikes me that sort of thinking that the urban council went through is paralleled a little bit in the last two days in some of the things that some of the speakers have been talking about here. "

Tom Cochren noted that in the discussion on marginal pricing or user fees, no one mentioned the use of local improvement taxes. He recalled those as being a very visible and quantified tax for replacement of infrastructure, and asked if they are still being used by municipalities across the country, or elsewhere if that is a viable means of financing infrastructure.

Carl Sonnen responded that local improvement taxes are still used in Canada. We tend to focus on infrastructure in new developments, and local improvement levies are ways of paying for infrastructure or rehabilitating infrastructure in existing developments. They are not a major source of revenue, but they do exist in Canadian cities.

Another panelist pointed out that with some services e.g., water and waste water, the local improvement tax is just for the local infrastructure, and it does not cover the cost of replacing the trunk system or the major arteries. In that sense, the local infrastructure in water and waste water is basically insensitive to demand. You need pipes of a certain size based on firefighting requirements in the case of water. So it does not factor into marginal cost. The local improvement tax is a fine instrument for recovering those costs and for maintaining that local infrastructure, but it does not feed into the marginal costs and it should not feed into the price.

Enid Slack added that local improvement taxes are billed with the property taxes. There is resistance to increased property taxes. That is one of the reasons they are not a large source of revenue.

George Mierzynski inquired whether it is more or less efficient if the homeowners borrow to pay for infrastructure as part of their mortgage.

Enid Slack responded that municipalities can borrow at a lower rate of interest than you as a home owner can, and that this is what is meant by efficiency.

REINVESTING IN INFRASTRUCTURE FOR ECONOMIC GROWTH

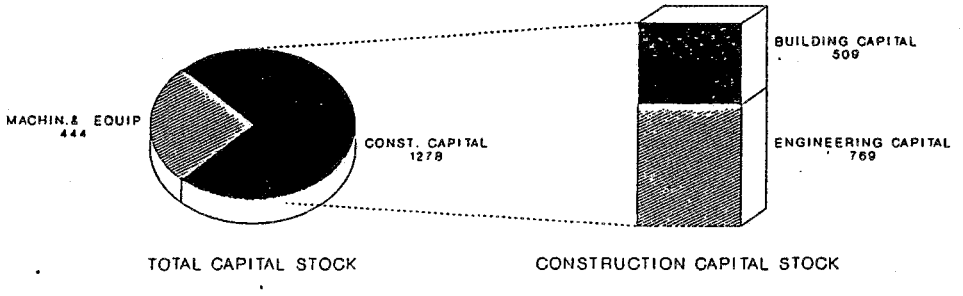
BY AMRIK RAKHRA
INDUSTRY, SCIENCE AND TECHNOLOGY CANADA

Economists have been traditionally concerned with investment in infrastructure in terms of employment. They are never really concerned with the aftermath effect i.e., how the buildings affect the performance of the economy after they are put in place. There are three reasons why we are suddenly concerned with infrastructure. The first one is the need for infrastructure investment. The second is the feeling among various economists and non-economists that the investment efforts and infrastructure are related to productivity growth. The third one is the Keynesian approach which predicates that perhaps we can reduce the pain of the current recession by spending money on infrastructure.

There are four parts to my presentation. First, I will give an overview of the trends of public investment in infrastructure. Secondly, I will deal with the impact of public infrastructure on the economy at the national, regional and local level. Thirdly, I will try to link infrastructure investment to quality of life. In the fourth part, I will present a summary and conclusions.

How large is the investment in public infrastructure in Canada? As shown in Figure 1, in 1991 dollars, excluding housing, we have roughly $1,700 billion of capital stock in machinery are equipment. Of that, $440 billions represents investment in machinery and

FIG 1 CANADIAN CAPITAL STOCK(excludes housing) BILLIONS OF DOLLARS, 1991



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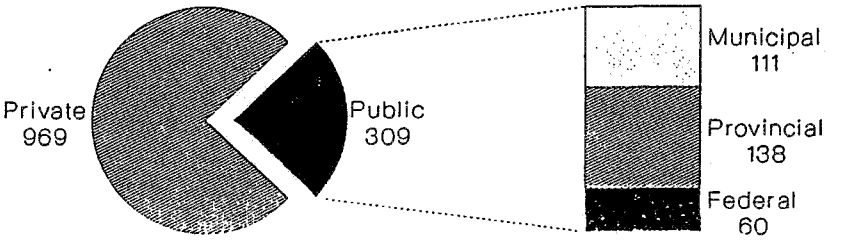
equipment, and the remaining $1,278 billions is in the construction category. The construction category is divided into building and engineering. To give you an idea of size, the current Gross Domestic Product of Canada is about $700 billion, and our capital stock is more than double that. It is 2.5 times current GDP. So if we can do something more efficient or improve the working of our current infrastructure, we can gain a lot of savings, and those savings can perhaps be used for further financing or upgrading the current infrastructure.

Figure 2 shows a breakdown between private and public capital stock, and in the public sector, between municipal, provincial and federal stock. The federal share is very, very small. Core infrastructure includes investment in the water system, sewage system, streetlights, roads, highways and subway systems.

Figure 3 shows the trend in 1986 dollars for core infrastructure as a percentage of GDP. Over the last 20 years, this percentage has been declining from 3.5 per cent in 1971 to roughly 2.2 per cent in 1990.

Figure 4 shows that public investment in core infrastructure increased in the '60s until the mid-'70s, and after that it became stagnant in real terms. There was a similar trend in public investment in social infrastructure, which includes hospitals, schools, fire stations, and recreation facilities. On the other hand, it is interesting to note that total construction investment has been going up. Core infrastructure and social infrastructure are not increasing in real dollars, but investment in construction is rising.

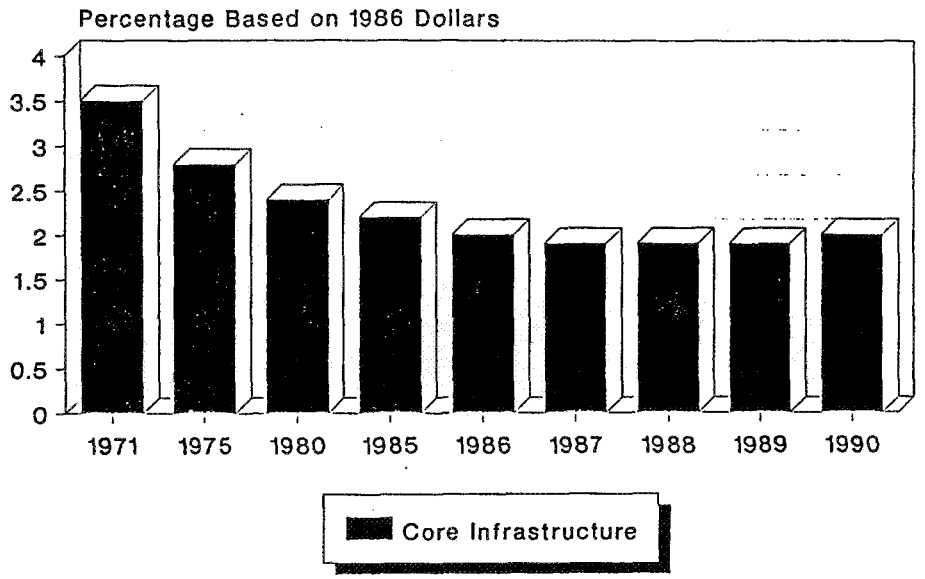
FIG 2 Public and Private Construction Capital Stock in Billions of 1991 Dollars



Public Investment includes only Governemnt Department Investment

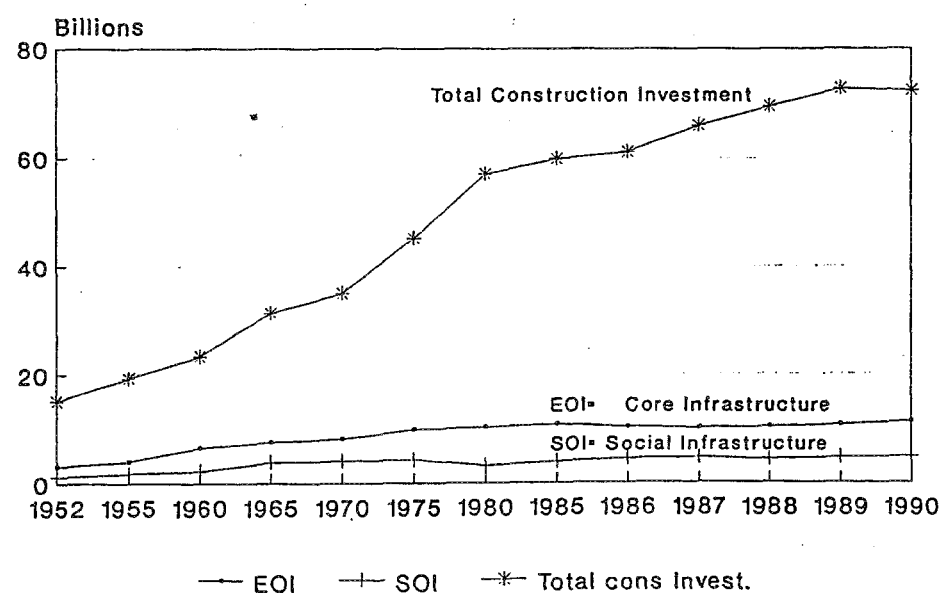
Statistics Canada

FIG 3 Core Infrastructure Investement as Percentage of GDP, 1971-1990



Caculated From StasCan Data

FIG 4 Trends of Core Infrastructure By Type In Billions of 1986 Dollars

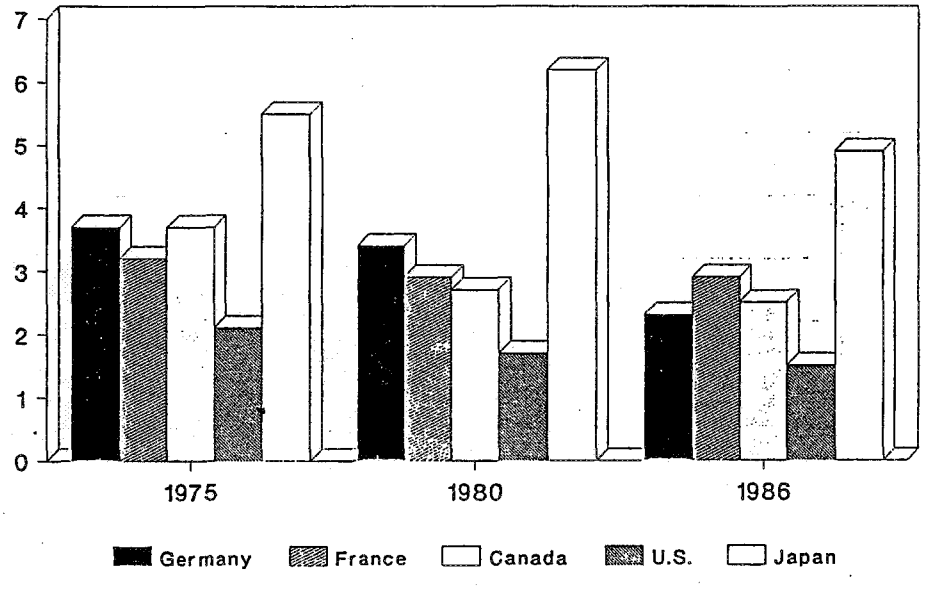


Statistics Canada and Informetrica Ltd.

Figure 5 shows what is happening in other countries. It demonstrates that Canada is not the only country where investment in core infrastructure as a percentage of GDP is declining. With the exception of Japan, all other countries are having the same problem. Japan's development is perhaps not at the same level as the North American economy. Where the American economy is called a mature economy, the Japanese economy is still developing in some ways. So it is not really fair to compare the Japanese efforts to the North American efforts.

FIG 5

Public Infrastructure Investment As Percentage of GDP, Selected Countries



OECD National Accounts

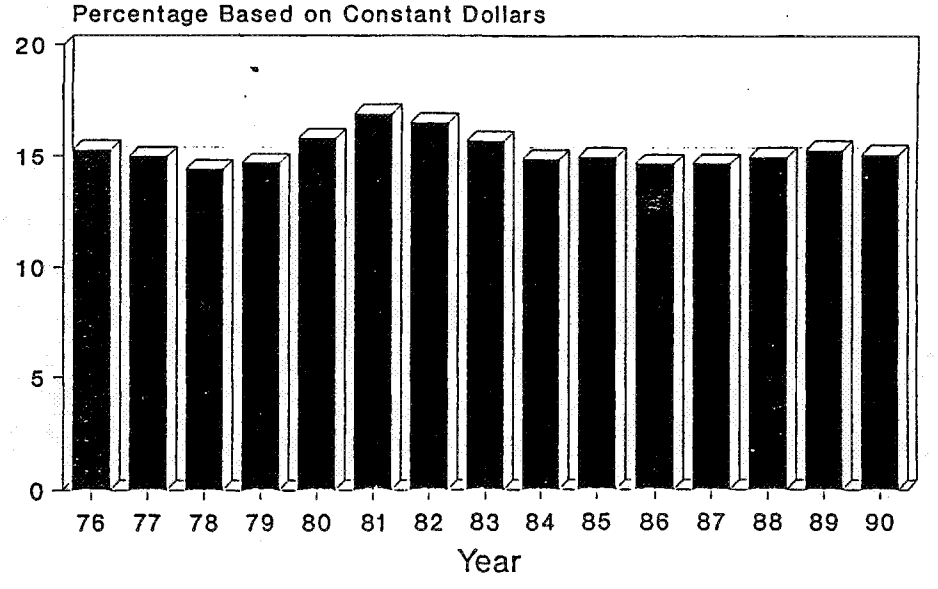
Figure 6 shows what is happening to the construction share of GDP. Construction is really keeping up very well. It is hovering around 15 per cent.

There is a downward trend to investment in infrastructure in Canada. But that does not tell us why it is happening, whether it is due to economic conditions or to the development policy of the various governments. We do not know. There is now some concern that if we do not spend enough on infrastructure, then there may be some adverse effect on the economy.

There are basically two approaches to determine the effect of infrastructure investment on the economy. One is the production function approach; the other is the cost/benefit approach. The production function approach says that a production process is a function of various things; private investment, labour, and public investment. Public investment affects output directly by entering into the production function. There is also a claim that public investment also affects the performance of labour and capital, and the rate of return on private investment.

Studies of these issues indicate firstly, that there is a significant and positive relationship between public infrastructure investment growth and output growth. The second conclusion is that there is positive effect on private investment return. Studies show that if there is a shortage of public investment, the rate of return from private investment also goes down. The third conclusion is that public investment also has a positive effect on labour productivity and total productivity. One study indicated that the impact of infrastructure on

FIG 6 Construction Share of GDP 1976-1990



Statistics Canada Based on Revised Figs.

output is 60 per cent. In other words, for each dollar spent on public investment, its impact on output is 60 cents in the same year. Other studies have estimated the impact to be anywhere between 3 per cent and 40 per cent. Who do we listen to? If there is no consensus, it is very difficult to prescribe for policy purposes. Because the private sector is competing with the public sector, we are very careful not to invest money in public infrastructure unless it is proven without a shadow of doubt that its impact will be much higher than the impact of investing in the private sector. Also, in the public sector, you are raising the money through taxes, and if you spend one dollar in taxes, it costs one dollar and forty-six cents. The private sector is affected adversely by taxes, so therefore we have to be careful when we start saying that we must invest money in the public sector. We do not know whether investment in public infrastructure leads to more output or more output leads to public infrastructure. One flaw in this approach is that if you find a positive relationship between variables, there is nothing to indicate the direction of causality.

Ashauer is considered the father of public infrastructure analysis. He has developed a simulation model to see what happens to the return on private capital, to productivity, to output as a result of investment in public infrastructure. He has shown that if the United States had increased investment in public infrastructure by 1 per cent of private capital, then between 1970 and 1988, the rate of return would have been 9.6 per cent rather than the actual 7.9 per cent. If we had invested more money in public infrastructure, the impact on private capital stock would have also been positive. The actual growth rate in 1970-80 was 3.1 per cent, but if we had spent more on public infrastructure, then that increase in the private capital stock would have been 3.7 per cent. Similarly, growth in productivity would have been 2.1 per cent rather than the actual 1.4 per cent. (Table 2)

Figure 7 relates the increase in GDP and the increase in investment in infrastructure. I assumed that infrastructure is affecting productivity. The data show a positive relation between infrastructure investment and productivity in the case of Canada. A study done by OECD found that in half of the member countries, there is a positive relationship between infrastructure and productivity. However, the results are not very conclusive, because they do not show causality, only a relationship.

The second approach used to determine the effect of infrastructure investment on the economy is through cost/benefit analysis. The cost/benefit approach is based on the assumption that a project is viable if the benefits over the lifetime of a project exceed the cost of that project. Two or three studies of infrastructure investment came to the conclusion that the benefits exceed costs, especially if society invests the money in the highway system. These studies, however, suffer from certain drawbacks. The studies ignore the fact that raising one dollar through taxes, as I mentioned before, costs $1.46. Also, because the product has a lifetime of 30 years, 50 years, or 60 years, one has to blend the values of benefits and costs to the present benefits. To do that, one must use a discount rate and convert the monetary values of all the benefits and costs. But some of the benefits cannot convert easily to

dollars. How does one convert the time gained through an efficient infrastructure system, such as an efficient highway system? Now how does one translate the saving in time into dollars?

A region which has an efficient public infrastructure attracts more firms. Studies has shown that in the regions which have better infrastructure, the wages are lower. People are willing to move to those regions and willing to accept lower wages because the quality of life is better. Yesterday, it was said that if we do not have an infrastructure which is conducive to our health and safety and recreation and economic opportunity, our quality of life will lessen. There is a great deal of controversy as to how we define quality of life. There is really no quantitative study which positively links infrastructure and quality of life.

What are the results from this review of the literature? We know that investment in public infrastructure is declining. The various studies tell us that there is a need to invest more. We have also found that there is a link, though it is not conclusive, between public infrastructure and productivity and employment and income and there is also a link between public infrastructure and competitiveness.

FIG 7 THE INFRASTRUCTURE-PRODUCTIVITY RELATIONSHIP, CANADA.

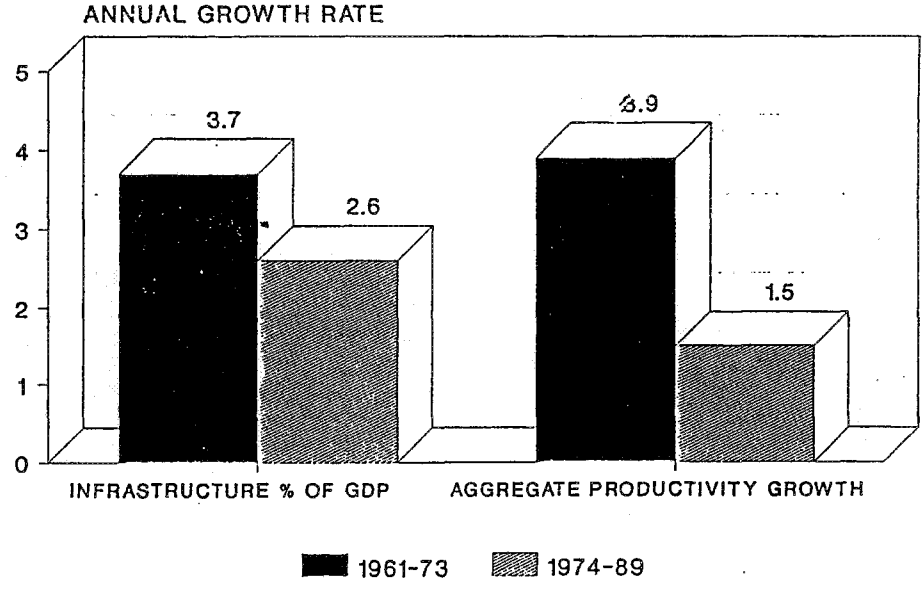


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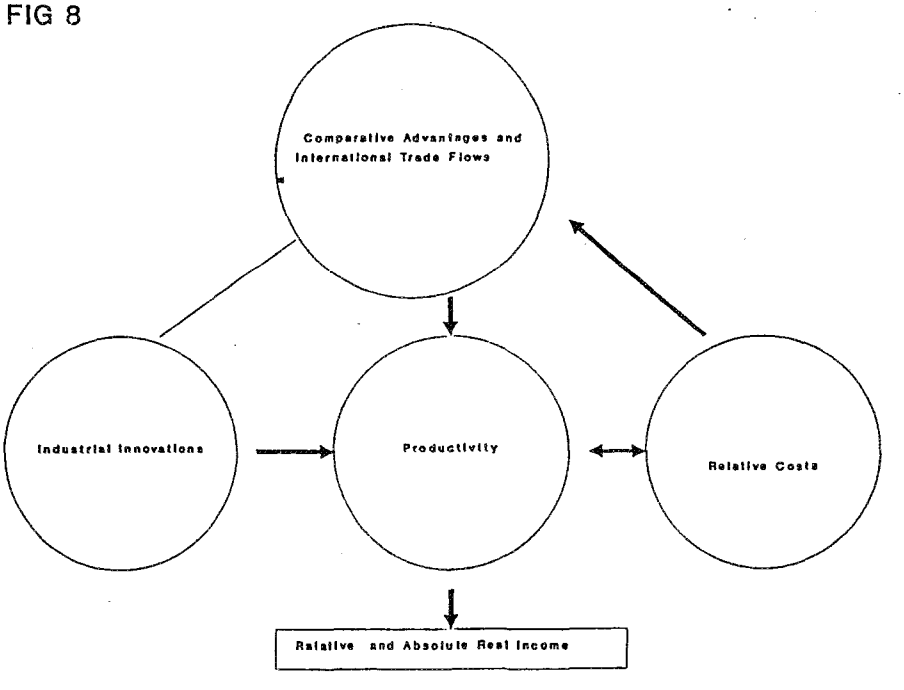
Figure 8 shows that there are four or five factors in international competitiveness. Infrastructure affects productivity. Productivity affects relative cost, and relative cost affects international trade. Industrial innovations also affect international trade. There is a link between public infrastructure and international competitiveness, but it needs to be explored further. Further, we know that there is only a fragile statistical foundation for this positive link. It has been recommended by Professor Bill Jorgenson that we should place more emphasis on cost / benefit studies of various projects and various types of infrastructure. Economists so far have been concerned with macroeconomic analysis, using the production function approach. He is suggesting we should switch our analysis to the micro aspect using cost / benefit analysis. There is also a need to explore the relations between quality of life and investment in public infrastructure.

In conclusion, I would like to make some suggestions. One is that we have to analyze the return on public infrastructure. Second, attention must be paid to the real cost of public investment in infrastructure. Some studies suggest we should spend more on public infrastructure. There is another school of thought led by Professor Winston, and Professor Shois. They argue that we must consider what we have at the moment and see how we can improve the efficiency of our existing system through optimum pricing policy. My third suggestion is that approaches to improve efficiency of existing infrastructure should be examined seriously.

FRAMEWORK FOR COMPETITIVENESS ANALYSIS
FIG 8



Economic Council of Canada

PANEL DISCUSSION

HOWARD ATKINSON
CITY OF LONDON

I will talk about economic development, specifically the questions that I am asked day in and day out from businesses that want to locate in our city. When a business man or woman comes to our office, they do not ask what is your infrastructure like, they accept as given that there is good infrastructure. High quality of life is one of the priorities on everyone's list, and almost everyone has a different definition of quality of life. Some people say London is one of the greatest cities in the world. There are people who cannot live outside of Toronto, and you meet others who cannot live in Toronto.

International competitiveness is a must to survive in the global market place. Whether the business is retail, manufacturing or distributing, the first consideration is location, location, location. If you look at a map of North America, and draw an oblong around Montreal, Toronto, London, Windsor, Detroit, Chicago, St. Louis, Washington, Philadelphia, Baltimore, Boston and Buffalo, about 175 to 180 million people live in that corridor. With free trade, European or Pacific businesses are going to look at the whole North American market. They will look at where the major population, the consuming public, is located.

The following are the questions raised by business people who come to our office.
1.) The first consideration, is location. The key question, of course, is access to the markets they want to sell to, to the suppliers, and to the services that support their business, whether it be a lawyer, an accountant, a custom broker or whatever.

2.) The next item is the cost of land. The cost of an acre of land in London is around $65,000, and it varies all over the market. We heard other people talking about very high price locations. In some cities, an acre of land costs 700 to 800 thousand dollars. When you are building a plant, an acre of land starts to become important if your market can be served from a more economical base.

3.) Labour always comes up, and not so much the cost of labour, but what kind of labour relations there are in the community.

4.) Construction costs in London are not any different than they are in Toronto, once you have purchased all those other things. There is some difference, but not a great deal.

5.) Availability of gas, the utilities, water, and electricity is important. When the Kaiser plant came here, gas was the key question. The quality of water was very important for the process because apparently if you get too much lime in it, it costs them so much to take out that it increases their cost. Availability and dependability are important considerations with services, i.e., will the service be here ten years from now. Of course, the actual cost, and the stability of supply, are very crucial items to the businessman because he wants to know that 10 years from now, that he will still have the resource, and it will be relatively economical. As we all know, we have been fortunate in the last few years, gas has actually gone down.

6.) Work force is a very, very key component. You must have a highly skilled work force in this increasingly competitive world. And one of the things that we are finding as we talk to businesses is that you can be highly skilled, but if you cannot read and understand some of the complexities of computer designed products and processes, you cannot carry on to the next level. And obviously a work force must be available, because otherwise, the cost will go up. Track record is important, and that gets back to strikes, dependability of the employees.

7.) Transportation. A good road system within the city is a must. You need transportation to get supplies in, to get products out. You need railway service for some organizations, not for others. You need waterways. The airline is very important for some firms and not at all for other firms, on both the passenger and the cargo side.

8.) Business climate is much more important as we go along, i.e., the city's attitude to business. Is the city council pro business? Business itself, the business community, are they people that want to get things done?

9.) Labour and the business climate. This is the one area I think that Canada really needs to improve upon, we need to develop a much stronger relationship between labour and management. The adversary approach is still our climate in Canada. A car is not built by labour alone, or by management alone. They have to work together to get that car out. And that is the one thing that we in the Western world have to turn around. It has been proven time and time again, when you talk to the people who are doing the job, they generally have some good ideas.

10.) Communications. Telecommunications, teleconferencing, video conferencing. Those facilities are necessary in the world we live in today, and of course what would we do without the cellular telephone. The fax machine has revolutionized our world. Satellite connections are important for some firms. Obviously you must have a good, strong media. Advertising is also important.

11.) Most firms need banking, finance, insurance, the brokers, the custom brokers, the accountants, lawyers and government services.

There are also personal considerations that business people ask when they are looking at a new location. Commuting time. We heard a few moments ago about the cost inherent in long commuting time. Cultural facilities are also very important. The RCMP spent quite a lot of time talking to me about the cultural aspects. They wanted a city that they would feel comfortable in. It was very simple. They were located in Toronto. Their young officers were living in Oshawa or Burlington, commuting an hour and a quarter every day. So they started to look for a centre where they could get to work in 15 or 20 minutes. Now the Province of Ontario's head office is coming here. One of their criteria was a medium-sized city with reasonable cost of housing. Other factors are educational facilities, because they want staff to go on with their training, and all the other things we take for granted, i.e., the parks, the sports, recreation facilities of all kinds. Housing was very significant to them; good quality, reasonably priced, available in well

planned residential areas. Community groups are important especially as our country brings in immigrants. We have some 27 groups in our community. Shopping — of course variety, quality, availability and cost. Medical facilities of course are very important as well.

I have mentioned education, and there are two special aspects to that. For example, a Japanese firm moved to Ingersol and one of their major concerns was training people who needed to upgrade their English. Secondly, and maybe more importantly, they wanted training for the young children in their heritage language. Educational support of businesses is important. People come here and ask, "What do you have in your university that can help me?" It has become very, very important in the last few years because of families with two working members. They want to know if their spouse can get a job or take this opportunity to improve their education.

Environment is a crucial item. We must try to improve our performance in this area. I am finding businesses are more and more conscious of the environment. The Kaiser aluminum plant meets all the standards of the Province of Ontario, exceeds some and the known ones that are coming. The sister plant is built in the middle of Los Angeles, and if they can get by down there, they can get by anywhere. They tell me the water coming out of that plant will be purer than the water that goes in. The air quality, the water quality, waste management, and the protection of nature are all important factors.

PIERRE LETARTRE
UNIVERSITÉ LAVAL

I will begin with some of the issues raised by the excellent review paper by Amrik Rakra, and then I will share some of my thoughts on the finance aspects of the infrastructure problem. There is no doubt that public infrastructure is fundamental in the efficient working of the production system and the distribution system. The main problem is how to measure its importance. How can we measure the specific contribution of public infrastructure, of the core infrastructure to the economy? As Howard Atkinson has just reminded us, physical infrastructure is only one factor, however important, contributing to productivity and to economic growth. There is also the social infrastructure, all the public goods associated with local soft services, and the expenses in health, education, and housing. There is also the legal infrastructure, essential to business, and to the community in general. And finally there are the human and natural resources as factors of production. The competitiveness of our economy emerged from the individual competitiveness of every factor of production.

Reading Amrik Rakra's paper, one has to understood that it is quite difficult to measure the individual contribution of every factor, starting with the public infrastructure. Establishing causality is the main problem in trying to measure empirically the contribution of public infrastructure to economic growth using the production function approach. Empirical results show a positive relationship between core infrastructure investment and productivity growth, but the relationship could be

coincidental or caused by a third factor or a combination of other factors. Anyone who has been using multiple regression analysis and time series analysis knows that it is sometimes easy to find a good fit for a curve, but the causal theory explaining the result is often lacking. We have difficulties explaining the statistical results we are observing from the macro studies using the production function approach.

This is why microanalysis using cost benefit analysis is more promising. There have been few studies, but in general the causal relationship is clearer, and easier to establish between core infrastructure investment and its contribution to the production and distribution systems. With cost benefit analysis, one can measure the economic impacts of roads and highways in terms of saving in travel time, accessibility to new areas, reduction in transportation costs for the industry, and so on. With cost benefit analysis, one can also measure the distributional impacts of the infrastructure investments so that one can more easily identify who is getting the benefits and who is bearing the costs. This information is essential if one wants to install an efficient and equitable pricing system for the public infrastructure.

The cost benefit approach has other advantages. As you know, capital invested in public infrastructure is taken from capital that could be used for other purposes, private or public. So we face what we call the substitution problem. At the margin, is it better to reinvest in highways or in waste water treatment or in education or in human resource formation, or in private infrastructure? Cost benefit analysis is a tool that can help us make up our mind on this issue.

In trying to answer this question, we face the economic problem of identifying the demand because public infrastructures are what we call public goods, and that characteristic makes them difficult to be offered by the private market.

Not all infrastructures are public goods: some are private goods. The distinction is important because you can have public investments that are essentially private goods, and the policy prescription of course will vary. You often have private goods with externalities, and sometimes you have government intervention because you have economies of scale. But the presence of economies of scale does not preclude the private investor from setting up a system, as you have for example in communications. In communications, you have private systems, private networks, with some regulation by the government. So if you apply that to a municipality, you could have private sewers, or a private network for water with regulation. There is no prerequisite to have state ownership or municipal ownership of several networks that are already in existence. So the problem remains; what kind of intervention and at what level? What are the preferences of the people? How can we reveal preferences for this kind of public investment instead of that one?

This reflection leads me to discuss one major flaw in the pricing approach which is being advocated as a solution to financing our investment in public infrastructure. I agree that it is important to put a price on goods and

services offered by the different levels of government. And, pricing is not incompatible with subsidies to lower income groups. The major flaw comes from the fact that pricing alone is not enough. There is an element missing in the equation. The decision from the user to buy such a level of public infrastructure is missing. Price is a signal in the decision-making process; it is not only a cost being borne after the decision has been made. Often, the pricing structure is set up as a cost to be borne by a user after decisions are being made.

In public finance, there is a principle called fiscal equivalence. I would like today to share this principle with you because I think it may help us understand the dynamics of financing of public goods. This principle establishes a linkage between three fundamental elements in financing public goods. The objective of the principle of fiscal equivalence is to bring back the responsibility of the user, not only the financial responsibility but also the decisional responsibility. In the private sector, the individual is the same person who integrates those three functions, decides what to buy — the quantity and the quality, pays for it, and consumes it. In the public sector, we have a problem every time the pricing system misses the decision of the user. You need this trilogy. We need the user receiving the benefits of consumption of public goods. He or she is the person that will, through the pricing structure, be the payer, taxpayer or user fee payer of public goods, and also he must be the decision maker on quantity and quality of public goods.

The problem is that more often than not, we do not see this relationship. We saw a recent example in Canada with waste water treatment. The level of service often provided answers to the needs as determined by the expert, but not necessarily to the demand. In fact, when the price hits the local tax bill of the user, people are quite upset. They are surprised. So there is a difference between a need analysis and a demand analysis, and too often with public infrastructure and public investment in general, the preferences of the user are analyzed through the preferences of the expert of the private or the public sector, who may have an interest in maximizing budgets. In fact, the supply side defines the demand based on need and not based on demand, hence infrastructures are often offered at a higher level than they would be if the user had to choose himself, given a certain price, and if he could make a real choice between prices and level of outputs.

Every time we break one of these links, we face a potential problem. The fiscal crisis of the federal, provincial and local governments has its roots in the progressive lack of responsibility of the user from a decisional point of view and from a financial point of view. The pricing structure is only part of the equation and part of the solution. The imposition of a pricing structure after the fact, after the investment in the public infrastructure, is possibly one of the reasons why there is no widespread use of the pricing mechanism in the public sector.

In summary, part of the solution to the fiscal crisis in total, and to the infrastructure problem in particular, lies with the application of the principle of fiscal equivalence, and the financial and decisional responsibility of the user.

MARTYN PHILLIPS
DAVID BROMLEY ENGINEERING (1983) LTD.

The words "taken for granted," might well sum up a common perception of our basic infrastructure. Over the last two days, we have touched on planning and intensification, repairs, maintenance and rehabilitation, upgrading for larger demands, public participation in decision making and economics. I would like to briefly add two other considerations. One is the history of massive dereliction and lack of future need due to declining local industries, and secondly that bigger is not always best. The more infrastructure we provide, the more there is to maintain, repair and replace. We need to look at possibilities for reducing demand at source, rather than just increasing pipe sizes, transportation links, and so on.

If we look at the life of a project or series of projects, typically engineers and implementers tend to concentrate on design. As we are getting older, we get used to going back to problem definitions, and we become very cognizant of the need to look further down the road in terms of operations, maintenance, technology changes, repairs and maintenance.

One important thing that is missing from this design, and from much of our work, is long term monitoring. And I would like to add some points. First of all, how long is long enough. I have heard 30-plus years, but perhaps we should be looking maybe 100 years or so into the future.

I should preface the rest of my remarks by confessing my great admiration for mighty castles, majestic cathedrals, major bridges, great ships, and fine government buildings such as the various houses of parliaments and legislatures. What, you might well be asking, is the common thread, and I would reply to you that for the most part, they all last a very, very long time. To a certain extent, each of them was a very early form of basic infrastructure. Society depended on them, on all these things, for their basic needs. We could probably all agree on the magnificence of the examples that I have cited, but I can feel you saying well, they were not cost effective. That may or may not be true.

Affordability would, indeed be at the top of the list of the arguments which we have heard about the last two days. In this regard, I wonder about benefit cost assessments showing greater benefits than costs. I can recall two very recent projects with which I was heavily involved, whereby the calculated benefit cost ratios locally to the project, not in the macro scene, indicated no logical reason at all for proceeding with construction. However, other intangible forces, politics and social needs, which are truly intangible, came into play to dictate approval to proceed with relatively major expenditure.

The key parameters that I would put forward for program and project success in terms of infrastructure would be as follows. Affordability and cost effectiveness, compliance with legislated industry standards, business equity and stakeholder acceptance. Other factors for consideration are the equitable levels of service, design life,

construction standards, public safety and reliability and ease of maintenance. I worked for a while on the extension of the London subway. It was, in fact, the one that may or may not go to Canary Wharf. The initial system for the London underground dates back to 1863, and the very first underground trains were coal fired. Can you just imagine the smoke and soot in those tunnels? Those same tunnels are still there and in use. The so called design life has therefore exceeded 130 years. I wonder if that was intended at the time. I guess we will never know. Certainly the construction standards must have been very high, and considering the incredible peak hour loading, it seems wonderful that such an old system works at all, albeit I can vouch that the level of service or lack of comforts or quality of life leaves very much to be desired. As for safety, remember the King's Cross fire that killed so many fare-paying members of the public. All these things have to be borne in mind.

Going back to the King's Cross incident, which is part of public infrastructure, there was subsequently a great cause for concern over the potential flammability of grease on the escalators. Consequently the use of grease was minimized. The immediate result was that the machinery seized up. Subsequently, twice the number of failed escalators had then to be replaced. On a typical day, 50 escalators are out of use at any one time. Such is the quality of life.

In terms of longevity of current brand-new projects, I had the fortune to visit the channel tunnel. Eight miles under the ocean in the world's largest undersea cavern, I asked what the design life of the project is. I did not get a convincing or quantified answer. I did comment, however, that just up there, is nearby Dover Castle, a structure which is 700 years old. Was that good planning, good maintenance or simply good fortune? On the other hand, you could perhaps euphemistically ask how do you design for minimal design life, like that for an offshore oil rig. They are sure going to be expensive to dismantle when the time comes.

With regard to everyday examples of municipal infrastructure, I can cite another case in the U.K. In the early '70s, there was a publication called Sewers and Waters Mains and National Assessment. Amongst many other things, the following life expectancy figures were quoted. For tunnels, for pipeline related, water and sewer, the life expectancy was 100 years. Pipes, 500 mm. diameter and above, not PVC, were 100 years. Pipes, 250 to 500 mm., again not PVC, 80 years. Pipe, 250 mm. and under, again not PVC, 60 years, and all PVC pipelines, 40 years. These statistics are recommended by the directors of finance for the calculations of depreciation, betterment and deferment of renewal. Certainly I can quote examples, in Edmonton, of pipes that did not last anything like that.

I very recently questioned the rationale for merely designating the design life of two large ocean outfalls at 100 years. I was reviewing the project and the engineers had just decided on a 100 year design life. They did not know why, or how, and could not justify this 100 year figure in terms of protection against the Atlantic storms and corrosion. Nor could they demonstrate how these pipelines, 2 1/2 km. long pipes out into the ocean, were going to be repaired or maintained.

Coming to international competitiveness, I certainly liked what I heard from Howard Atkinson from the city of London. From my perspective, what we need to show is that at home, in our own territory, we can demonstrate state-of-the-art practice, design, construction, maintenance and operational experience, including well maintained, fast transportation links. We need comfortable cities with no obvious environmental and socioeconomic problems, and we need to be attractive to tourists.

I would add that in terms of modus operandi, we need to plan for a range of events and trends. Since things are so cyclical, we need to take into account all possibilities that we can foresee, if we ever can. Wherever possible, I would like to see us build and install in expandable and updatable modules. We should stop building temporary facilities and build permanent installations that actually fit into the long range plan. I have seen some awful examples, I am sure you all have, of so called temporary facilities that actually become permanent, but are of rather dubious construction specification.

As a final point, I wholeheartedly agree about defining performance standards up front for functionality and construction. And I would like to see, rather than just life cycle costing, a detailed lifetime plan for the operation's maintenance and monitoring right from the outset. At a very micro level, I would like to see us enter into contract agreements whereby the client shares the risks and incentives with the contracting and consulting consortium that will design, build and in some cases operate the new facilities. This could be useful for bridges and turnpikes, water systems, stone drainage, utilities, and so on.

How confident are we of our expenditure requirements? How do we know whether the guesses are about right, wildly high or wildly low? I have not seen any evidence to back up the validity of the data. The guesses might be so high as to frighten the decision makers from making any decision other than to defer. Alternatively, the costs may be unrealistic because there are so many other things to add into the equation. Do we have a national, rational and consistent basis for realistic condition assessments of our underground assessments?

A framework for strategic planning should be made up of three parts: policy, a technical document, and the funding. These components should be clear to the people who have to understand and implement it, including the public who have to approve it.

We must define the standards up front, and before any plan is adopted, we are going to have to get stakeholder consultation and not assume that they are just going to buy into it. I have seen projects collapse because the bureaucracy and the engineers assumed that the stakeholders would love it. They did not love it and they brought the project down. Infrastructure upgrading to protect the investment is important. But many municipalities are not particularly keen on protective investment. They are more intent on promoting more development.

Moving back to the costs, when establishing the risk factors in any project, often there is no

database; just opinions. Scheduling, the length of the approval process, the start and finish dates never seem to be as planned. Other variables include cash flows, market forces, supply and labour, safety, security and inevitable changes of heart, and technology changes. Not to forget the environment. Many of these could affect both the construction costs and the ultimate operating costs. Each has a detrimental effect on someone.

The plan is not complete unless there is a commitment package. This should include an action set of items to do now and items to do later. It should itemize the policies required and the types of actions neeed, i.e., preventative, compensating, remedial, accommodating or operational / control actions.

The infrastructure upgrading cycle moves from Systems Evaluation and Master Plan through four steps: conceptualizing the solution, consultation and public participation, design and construction and systems operation. You could manage without a master plan. We frequently do, and the project cycle can go around, but often an essential step is forgotten. To get a whole cycle going, whether for individual projects or a wide range of projects, the only way to go is a master plan that looks after policy, technical considerations and funding.

HARVEY LITHWICK
RAPPORTEUR

I have approached my job as rapporteur as a creator of a giant mosaic. This task has been facilitated by the organizers, who have sketched an outline of what they wanted from the project, and you the participants, who have dropped on us a number of gems, and a few real treasures. In creating this mosaic I have had to be selective. I might even have trimmed a bit around the edges, or even imposed my view of the world. Please forgive me if I do not do you justice.

What were we trying to achieve? I was told that the objective was "to examine economic and social issues related to the state of Canadian infrastructure, its expansion, maintenance and renovation".

We did this from many perspectives and looking at many different dimensions of the problem. What emerged was a family of interrelated concerns. Beyond that objective, in one of the background papers I was told that we should be considering: one, the optimal level of infrastructure investment; two, how to build infrastructure in the most cost effective manner; three, the best ways to finance, and four; the most effective ways to maintain the infrastructure. That is a tall order, as I think we all realize now. Fortunately we were provided with a host of very valuable insights into different aspects of this question.

I am going to try to provide a very simple context; at least, one within which we can identify the various contributions. First, it will provide a framework of what it is we are talking about. Second, it will serve perhaps to identify some conceptual errors that have been identified; a number of them. Third, I hope it will demonstrate gaps that we have yet to cover. And maybe it will also direct our efforts towards the next steps, which John Kenward has asked us to do, moving towards some resolution of these issues. I want to underscore the last point. If we finally agree that we have a problem and what it is, and that it calls for some kind of attention, it is incumbent on us to provide much greater clarity and much more persuasive arguments and much sharper focus than I think we have to date. And so I am going to try to move us in that direction.

Let me try to formulate some of the elements of the problem as I see it. Some see it as simply a revenue shortfall. Everybody seems to have agreed that we need more spending on infrastructure. Much rationale was based on some notion of ideal level of expenditures, either related to a percentage of GDP or to some historical trends or so forth – but that does not motivate me, nor or any politician I know, to do anything. The fact that it was spent before has no implications for its current importance. I am not convinced that we have adequately defined the problem.

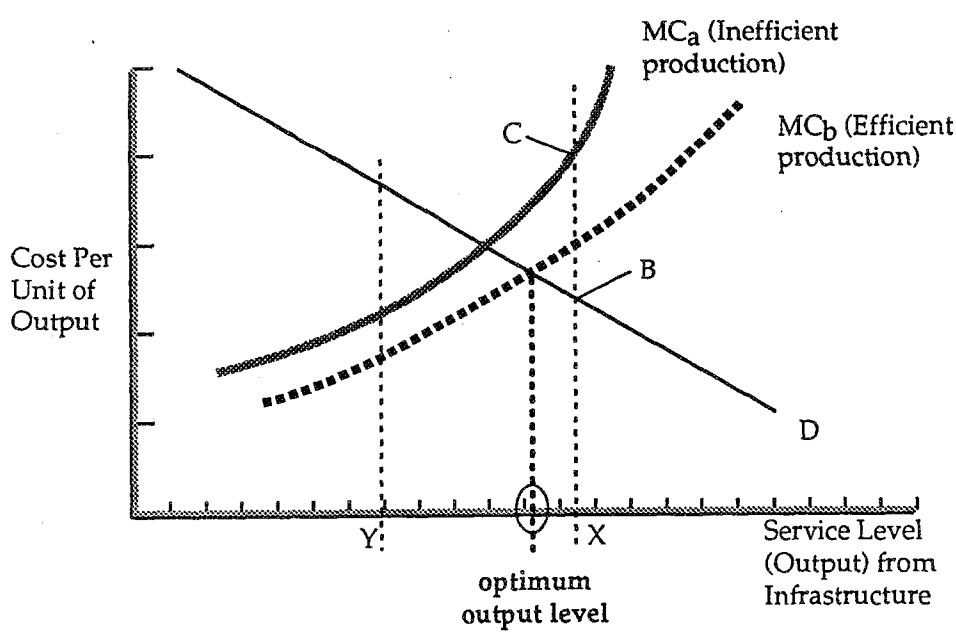
What I would like to know is whether the level of service that is now being provided and will likely be provided in the future meets real needs. I want those needs defined in a way that makes them important to individuals and to society. And I want to examine how efficiently we are meeting those needs.

Let me use a diagram you all hated in Economics 100, but it is still useful. This is a

straightforward diagram that helps illustrate a number of points and its simplicity, I think, is of some value. This is a standard tool to explain allocation of resources and questions of efficiency, questions of demands (if not of needs) and a variety of other things. You should be familiar with it.

Now, I understand the problem as set out by Steve Janes. He said it was the growing gap between what we want and our ability or willingness to pay for it. How can the diagram help explain his point? Well, he talked about the Thornhill experience and he suggested that the level of service provided there, was at X. Someone decided to provide the level of service equal to X, and at that level of service, of course you have a problem. Costs are way above what people are prepared or willing to pay, and there is a real shortfall. Now, how you get to X is debateable. Some felt that consumers' expectations are unrealistic, and that is what drove the system to produce level of service X. An alternative view is that it was driven by suppliers or public servants, politicians or even developers because they had a sense of what was appropriate. That is a very complex debate, and I am not sure I want to enter into it, because it was not resolved in the discussion. But to this problem, the solution is relatively straightforward; reduce service to more optimal levels. And indeed a number of suggestions were made along those lines, a long part of the discussion that we will come back to, momentarily.

However, there is another explanation of what the problem is. This was a discussion that we just heard, saying that in fact, we are at Y; there are a number of potential benefits open to us by expanding service levels. Amrik Rakhra, in his presentation, provided evidence, and all the literature seemed to be suggesting that there are productivity and other economic gains to be realized by society investing more in infrastructure. The evidence is certainly questionable; no one would deny that. And I have some difficulty with one aspect of his



findings that I do not think was stressed in the presentation, but was in his paper, and that is that the benefits appear to be greater at the national than at the regional or local levels. Intuitively, this makes no sense to me .

The differential findings about where the beneficiaries are is important because it throws into sharp relief an implicit question: Who should care about this infrastructure activity? In whose benefit are we pursuing it?

This was explicitly raised by Pierre Letartre and others in their discussion. Whose demand curve is that? If the benefits are largely national, as some of the evidence suggested, then infrastructure must be seen primarily as a national responsibility, at least for financing. I am not worried about service delivery. But if infrastructure has this enormous national payoff, then surely it is in the national interest to invest in it. There would be a high rate of return if it is the best way to spend our investment dollars, but the rate of return on most of these investments seems to be very low indeed. Gary Reardon's call for a national commitment would appear to be highly appropriate.

Also raised were issues of jurisdiction, jurisdictional size, and a number of matters that touch on that question, 'In whose benefit is infrastructure?' An implicit argument surfaced, that relates generally to the question of benefit. There is evidence that the service levels decline as capital stocks age. We also have evidence that the capital stock is aging, and that it is not being maintained, but I still have not seen evidence on service levels or flows that would seem to me to be convincing.

And frankly, again if I were a politician, and you told me that capital stock were aging, I would say "So what – there are countless 50 year old homes that are beautifully maintained." By not investing and maintaining infrastructure, it is running down, but politicians do not know about it. Maybe things were built so well that they will last 100 years, or whatever. You know, you cannot infer anything except the most crude and unpersuasive arguments if you take this kind of approach.

I think the diagram also might help us understand some of the other inputs — arguments for cost reduction, not based on moving along the curve from X or Y, but on shifting the curve up and down. This is a totally different discussion on costs and perhaps of even more relevance because I think we know more about those things. For example, again Steve Janes provided us with data on the costs of servicing, and indicated they were extremely high for the services demanded. In his example, a very high cost function was implied, partly due to excessive inclusion of new items. So it is a bit of a cheat on this diagram because I am adding more service levels. But to the extent that things are being added and costs are being multiplied on the given individual service levels, then of course that would shift the curve up. Alternatively, the curve is already high, and policy ought to be concerned with driving that cost curve down. This isn't an efficient cost curve — a more efficient cost curve is called for.

Steve Janes also suggested that consumers have a degree of unreality, and that there is a huge gap between needs and demands. Fortunately,

Pierre discussed that issue. Demands imply financial committments; what people want is irrelevant unless they are prepared to pay a price to achieve it. This tells us whether they are serious or not (at least, to the extent that the commodities lend themselves to this kind of analysis.) Pierre explained why there are a lot of commodities that do not have those characteristics, but at least nationally we have to deal with demands, not 'what the people would want.' Everyone would ask for everything and not pay a cent for it. An awful lot of trouble results from surveys that query, "And what would you like?" They always want goldplating. And if you ask politicians, they respond in exactly the same way – if they do not have to pay the price.

Tom Field provided a very helpful elaboration on the reasons for the rise in service standards, and he talked about a rise in income elasticity of demand. He spoke also on new elements in the benefit function representing users. He also talked about supply push elements in explaining why we got or why we moved towards X. He then turned to an analysis of current methods used to plan infrastructure, and what he found was very interesting; that these methods intrinsically boosted costs per unit of output. They tend to be static, far removed from the state of the art and he showed a number of examples of innovations that have actually reduced costs. These were clear examples of cost reduction, of pure cost reduction that are available to us. The challenge is to implement these suggestions.

How do you find the right incentive schemes to foster R&D? I stress the D part; what are the applications, the innovations to produce these payoffs? I do not think we know how to do this, and I would suggest that that is the real problem. I view it as a management problem. Finding out what the best techniques are and making sure that they get introduced. The rest I think will look after itself. If that part of the strategic planning gap is closed, the most difficult part (the one we know least well how to succeed in) is behind us. And in particular the public sector, when providing services, tends not to be too concerned about profitability or net benefits in some efficiency sense. It is much more concerned about risk, especially political risk. Given that equation, obviously, the public sector has not traditionally been a great innovator. So if getting innovation into Canadian business mentality has been difficult, getting it into the public sector is at least double the challenge. Fortunately there are some bright spots, and we heard about some of them in our discussions.

Bruce Jank cited currently available examples and possibilities, such as dynamic modeling, auditing, and evaluating techniques and he reinforced the case for technological optimism based on possible cost savings. George Mierzynski gave some examples of where technological opportunities had not been seized, and I think he saw some potential gains from planning and cost effective approaches in these improvements. Laverne Palmer cautioned us against assuming that all technological innovations would achieve efficiency gains; a very important point. Despite the gut feeling that all new technologies are efficient or produce efficiency, it is simply not true. Some technologies are monstrously expensive white elephants and we ought not to be deluded into a technological fix. It is in the interest of the

promoters, but not necessarily that of a community or society, that we adopt all technology. It seems to me that technologies have to prove themselves. However, as Alan Davenport implied, there still exists a great shortfall in research, in human resources being trained, in the knowledge base and in the incentives to use. He argued for cooperative efforts in these domains to remedy the situation. One could argue that unless one has a carefully articulated program, that call for cooperation will fall on as deaf ears as it always has, but I am confident that the issues raised are correct.

The question remains, How much real cost savings, or shift down in the cost curve can be realized? Martyn Phillips, in some comments yesterday, felt that most data on costs were weak. And there is some debate as to whether they overstated or understated the case, which further debilitates the data. Not even knowing which way your biases lean troubles me; not being able to even have that level of generality confirmed in our understanding. Significantly, other elements affecting the true cost were introduced into our discussion. One of the major costs in delivering infrastructure services and in building infrastructures is labour cost, yet nobody talked about labour cost and how to reduce it. There is an issue, as you know, with public sector unions. I am not taking an ideological position, but they do affect costs of providing and creating infrastructure. And indeed, one of the strongest reasons behind privatization is precisely to break the back of unions, public sector unions. And that is a subject I am surprised was left out, but I think we have more of a technological fix here, and maybe wisely omitted it. Another subject I did not hear enough discussion about, is that of alternatives or tradeoffs in reducing costs. The tradeoff, for example, between maintenance and replacement. The rate of return for replacing any particular service, relative to maintaining it. I was taught the economist's view that if you maintain it properly, you do not have to replace it. While it is not true for all systems at all times, it seems to me that depending on technology and economic considerations, one ought to know what these tradeoffs are. And again, I do not see aging per se as necessarily a bad thing, as Carl Sonnen and others suggested.

Also important, I would argue, is the extent to which management of the entire infrastructure process contributes to very significant cost overruns. I think that we have a sense that even the minimally required management tools, such as cost-benefit analysis or strategic planning methods are not being used. One can only shudder at the real costs of poor management, at the fragmentation among departments and so forth. How can you do intelligent management without even basic information on your inventory?

Fortunately, the water system provides a benchmark in terms of what we ought to be looking at in various systems. I heard a lot of discussion on land use and transportation systems. I did not see a lot of hard data, though, on what the coefficients are, how much extra sprawl you get and what the implications are for particular scenarios. The intuitive view is that automobiles spread cities. Sure, but so what? 'By how much,' is the interesting question. And what is it going to cost us to deal with it? And of course other issues arise such as

the impact of political organization and the extent to which this impedes having the right levels of government either properly financed or adequately staffed to do the job.

An additional point raised this morning by John Bassel and still unanswered, is the question of timing and its impact on cost. The longer you wait, the more the ultimate costs will be. I asked him to prove this to me, and I am going to get him or someone to prove this at some point, because I think it is critical. If costs go up less than the rate of interest, then naturally you defer it. It is just a question of quantitative data. You cannot make an intelligent decision based solely on the assumption that costs are going to go up. One needs to know by how much. I think the point is crucial. Finally, of course, one has to be careful about acting too quickly, because even if we agree that the cost is going to go up, if you delay, by acting without doing your homework, the cost can be even higher.

Perhaps the greatest debate about cost savings was triggered yesterday afternoon, by the planners Ken Whitwell and Bob Webb. Ken Whitwell stressed a variety of cost enhancing factors and deterrents to maintaining the stock of infrastructure. He pointed both to forces that push up the cost curve, such as environmental assessments, and to forces that moved us along the cost curve by expanding the quantity of services required, especially for low density developments. Ken Whitwell also talked about how planning practices can influence cost curves. I believe that planning practices pull in different directions; preferring low density, they move us one way, and by not dealing directly with efficiencies they move us in another way. Hopefully, they also move the cost curve downwards. And of course consumer preferences constitute the demand side drive towards X.

We debated preferences and whether they really are authentic. Should we accept a D curve which maybe just reflects ignorance or whatever on the part of consumers? I think Mike Fortin argued for changing preferences, which horrifies me as an economist. It may be just terminology. I think we have to change behaviour in line with social objectives. I have a great deal of difficulty with the notion about not accepting consumer preferences as expressed either through the economic market place or the political market place.

I do not care what the method is, because I do not know what I ought to replace these preferences with. Certainly not with my preferences, and probably not with yours either. Consumer preferences seems to be the best indication we have. If this point is valid, then even if there are cost savings from intensification, we must compare them to what that does to the benefit side. Because if I move down the curve consistent with greater density, and this leads people's preferences to also shift to the left because they are not getting what they want for the particular commodity, it is not clear to me that there is a net benefit. Accordingly, I am not sure why we are doing this. Both Ken Whitwell and Bob Webb indicated that intensification in fact included a large variety of steps from the design of lots to the design of developments, to joint use, mixed uses and so forth. They made the very sensible points, that benefits ought to be the yardstick, and that the best way to actually realize them is from a large number of small changes rather

than a single silver bullet that solves all your problems.

And I think that this is the right way to go. It is not sexy, it is politically hard to sell, but it also probably is the most consistent with maximizing consumers' choice and well being.

Marni Cappe gave a very interesting illustration from Ottawa, based on the RMOC experience, showing that it is possible to do some intensification steps at the planning stage. This calls into question previous views that developers and their affiliates cannot get along with city hall people. They are now going into a marketing study, and the demonstration project's full test should prove instructive. We should monitor this. I think we particularly need to make sure that we do a real study of consumer demand and consumer preferences, and not just a rather simplistic survey, and that from it we try to learn some things about how we feel about intensification.

The optimism about the gains from urban intensification was alluded to by a number of other commentators, but in contrast, I think there were serious reservations on a number of scores. One is the neglect on the demand side. Another is a feeling that Bill Code expressed, citing Michaelson's (perhaps dated) study; that the people really do not want higher density, and the demand curve is pretty elastic. Many people, for reasons that are sensible to them, are prepared to pay a high price for single family homes, and if they are, my own feeling is that you cannot do much about it. And I do not want to make them worse off by telling them to pack up the kids and go live in a denser development. That does not strike me as appropriate public policy.

If you want to update the Michaelson study, fine. My guess is that you will find it still has a lot of relevance, and Richard Kirwan supported the general view that it is a tough one to play on. There was also concern expressed that there may be some confusion between gaining efficiency and providing urban services and overall urban efficiency. We may in fact end up providing very efficient infrastructure, but not very nice cities. Although it has to do with many things and should not be taken too seriously, I note that even in the most beautifully designed suburbs, where you get nice densities, good aesthetics, proper setbacks and meet whatever other criteria, if you ask any teenager if they like living there, they hate it. These poor kids who have to hang out at the mall because there is nothing else to do are telling us something about efficiency defined in a particular way; defined perhaps other than as social optimality. And this should be addressed in our welfare function.

Bill Code also raised the question of the need to define sprawl. We must operationalize urban sprawl to prevent its use as kind of code word for everything bad about the present and everything good about my particular plans, whoever I happen to be. We had some suggestions, again by Richard Kirwan, on a possible definition. Let us use terms, but if we say sprawl is a bad thing, we have to say why it is a bad thing, who is affected, what the costs are. Otherwise I kind of shrug. I heard about the greenbelt being a great device to contain urban sprawl in Ottawa, and it turned

out to be a nightmare in terms of internal land costs and dispersal into the area beyond the greenbelt. The greenbelt is nice, but I do not think it achieved any of the goals it started out to. It achieved this incidental one of parkland, which is nice but quite different.

Richard Kirwan felt that density in fact is a result of price. This is important, and irrefutable; the evidence is overwhelming. It means that ultimately you get the density that reflects the optimal use of space, as called out by the price signals. This is not the easiest and the most sensible way to affect price, and so what you want to do is, to the extent you can, set socially desirable or socially correct prices. I have no problem at all if someone says look, there are social benefits as well, from the infrastructure for a particular type. I will draw my demand curve higher or lower, or call it marginal social benefit, to reflect those things. These factors are not easy to measure, but there is no difficulty in principle with incorporating the issues, and indeed the correct demand curve is the marginal social benefit. Again, I think it is important that we be very clear who the beneficiaries are; often it is not the consumers. It may be some advocate who chooses to use public policy as a way to change things rather than subject them to the test of the market place.

Coming back to the question of socially correct prices, it is quite clear that we do not get socially correct prices in a lot of our activities because the tax system, as was pointed out, seriously distorts prices and hence land use patterns. I would stress that the regulatory system with its zoning or other instruments operates similarly. Ken Whitwell made the point that full costing would shift the demand curve from single family housing to other things. I think he may be right. I do not know how much it would shift. Again, the quantitative issue is really important. Investing a lot in a policy instrument that is not going to move a lot of people around because the demand is inelastic; that may not be the sensible way to deal with the problem. There may be better ways.

John Bassel raised the problem of overservicing reflecting again the problem of pushing too far along that cost curve. This brought back into play the whole question of the nature of demand and whether lower levels of services are acceptable. Larry Draho made an important point about the extent to which infill could effectively reduce costs; what are the numbers, and what are the retrofit costs? Sure, there are schools downtown, but in my experience, the schools downtown are falling apart because they are 80 years old. And if you have to build a new school because the parents who come there are not going to tolerate an old school while their buddies in the suburbs have brand-new schools with all sorts of facilities, then those savings may be mirages indeed.

Finally in the area of cost, Kathy Thompson indicated that the Federation of Canadian Municipalities (FCM) has done work on costs and more recently with surveys. Without being too critical, I think there are really serious problems with the data. I would not use it, and it was done with the best of intentions, but by a lobby group, and the methodology left much to be desired. And unless this is done well, FCM is not going to be taken seriously in terms of having identified the problem.

The whole issue of financing, as was pointed out by a number of people, brings these three issues or elements together. On the one hand, financing is clearly concerned with generating sufficient revenues to cover costs, or cover the total outlays that are required. On the other, it is concerned with influencing demand or being consistent with demand to reflect benefits. Finally, it is concerned with restraining unit costs to keep as low as possible on that cost curve, what we call efficiency. And of course the whole argument for using the price system is that this mechanism can possibly do all three, except in certain cases, where the longer than average cost service is downward sloping. This reduces to another technical phenomena, provided of course that you can meet all the conditions that Pierre Letartre pointed out, which is not easy. For example, they have to be private goods. I think one can actually be creative with semi-public goods, but that is a discussion for another day.

Certainly we were given some examples of where pricing is grossly out of line. One was the water policy issue that Don Tate referred to. Enid Slack made the very telling comment that we do not even have minimal technology to enforce what is an eminently sensible policy. If someone really wanted to assess the benefits and costs of installing meters and examined the return, it would be rather interesting. Though it has probably been done elsewhere, I have not seen a study.

The other issue is that we are going to need public funding for a large number of goods. But how do you do it? We had a long discussion about capital funding, arguments pro and con. You heard them this morning, so I will not repeat them, except the perplexity about debt financing. I am still not sure why businessmen are expected to pay for their capital by borrowing, I am expected to pay for my house by borrowing, but municipalities are not allowed to borrow or do not feel they should borrow when they plan infrastructure for the future. I know the argument about risk, but that is insurable. And since this is the case, I think we are turning ourselves inside out with what I think are very difficult policy instruments from an efficiency point of view. Development charges are an example.

I would underscore points made by Carl Sonnen and by Enid Slack, that you cannot look at financing of services, infrastructure services in the abstract. A nasty facet of capital markets is that they are highly integrated into the rest of the economy, and every time you do something on them to try affect the finance side, the ripples are felt everywhere else. The most important point, to my mind, was the one about equity and the impact on equity. We are terribly concerned about imposing equity on every type of user-pay scheme, which I think is very wrong-headed. The local level is probably the worst level to pursue equity for reasons I need not debate. But anybody who knows the story of New York that vigorously pursued equity via a whole bunch of social policies should be aware of how dangerous it is when there is mobility of labour and capital in the system, to try at a very micro level, even New York level, to deal with equity at that level. It is a serious error. It can be done at other levels. If the other levels do not want to do it, it puts an enormous burden on local governments. I think we have let senior levels of government off the hook far too much by

trying to deal with social welfare and other things through the price system at the local level.

Finally, to summarize... Based on thoughts expressed over the past two days, I think we have a serious infrastructure problem. It is essentially a management problem at this point. I cannot say it is a capital problem, nor can I say it is a needs problem. I cannot say it because I do not know. It seems to me that the benefits from better management at that level are enormous and will accrue in many or at many points of society to individuals, to firms, to all levels of government. And it troubles me that so many of those players have withdrawn, despite the potential gains. A number of speakers have called for activities to move the issue forward. Carl was most explicit, talking about some kind of institutional forum. Others, I think, favour a process that is ill defined.

I am going to be wishy-washy; I think we have to, at least, institutionalize a process to make sure that we get the thing off the ground. I do not care what the ultimate body or thing is, but unless we make a commitment to take at least one step, and I would say the first step is to get data to tell us what we have to know, we are not going to go anywhere and we are going to meet again and everybody will have their own pet prejudices a year and five years from now. The mechanism should definitely not be a federal agency, for all sorts of reasons, nor should it be a strictly municipal agency. My own preference, and my colleagues from the home builders will probably throw something at me, is that a private sector should take the initiative to start the ball rolling. I am genuinely convinced that that is the way it is going to move quickly. The one advantage you have is that if it is in your interest and you want to do it, you will do it, and you do not have to answer to too many people. Of course, you want to involve other stakeholders very quickly. I do not think a lot of money is required at the outset. What you want to do is create a presence that communicates to other people that yes, there is a problem, but you are going to attack it seriously. You must keep moving ahead. My guess is others will buy in. I would like to think that the result of this exercise would be to do for urban infrastructure what Stats Canada did for municipal financial data. It really levelled the field, by bulldozing an awful lot of people at many levels of government into providing us with consistent data, and we now know a great deal about municipal finances. And very few countries in the world can claim that quality of data set. I would like to see the same sort of thing, for infrastructure. There are prototypes; John Hartman's Urban Transportation Council suggests that with the right chemistry, which will be different in each case, very important things can be done. Thank you.

CLOSING REMARKS

JOHN BASSEL
CANADIAN HOME BUILDERS'
ASSOCIATION

I would like to say thank you to everyone who came, everyone who made a presentation and those that responed further. Particularly, I would like to thank Alan Davenport, and the Centre for facilitating and hosting this workshop and I would also like to thank CMHC for their particiation. I think we all owe Gary Reardon a lot of thanks for having had the idea in the first place. The suggestion that there is a need to put the question of infrastructure in a more formal way to all our audiences is important. I would like to commit our organization to take the lead in the next step to achieve that. Infrastructure is important for Canada to become competitive internationally. And, in a time of limited resources, we have to be competitive if we want infrastructure to receive its rightful due.

Appendix A — Workshop Agenda

INFRASTRUCTURE AND HOUSING: CHALLENGES AND OPPORTUNITIES

Hosted by The Centre for Studies in Construction
University of Western Ontario

sponsored by Canada Mortgage and Housing Corporation
and the Canadian Home Builder's Association

JUNE 17

19:00 – 22:00 Reception

JUNE 18

8:30 – 9:00 Opening Remarks
Alan G. Davenport, Centre for Studies in Construction
John Brant, University of Western Ontario
Douglas A. Stewart, Canada Mortgage and Housing Corporation
Gary Reardon, Canadian Home Builders' Association

9:00 – 9:45 Infrastructure Overview

Speaker: Steve Janes, S.H. Janes & Associates Ltd.

- Linear Infrastructure
  Highways/Roads/Sidewalks/Curbs,
  Bridges/Tunnels, Rapid Transit,
  Water/Wastewater Systems, Utilities
- Community Infrastructure
  Schools, Fire/Police, Community Centres,
  Parks/Pools, Day Care, Libraries
- Infrastructure and the Environment
- Infrastructure and Housing Affordability, Quality and Choice
- Infrastructure and Rational Land Use Planning for Quality and Choice
- Infrastructure and Financial Planning
- Infrastructure and International Competitiveness
- Public Awareness of Infrastructure Issues

9:45 – 10:00 Health Break

10:00 – 12:00 The Scope for Achieving Cost Efficiency/Effectiveness Through Technical Innovations

Issues

- Infrastructure Innovation and Technology: Rethinking Alternative Approaches in a Period of Fiscal Restraint.
- Upgrading the Performance of Existing Equipment, Facilities and Processes.

- Demand Management as a Means of Making Better Use of Existing Infrastructure.
- Is Neglect Affecting Canada's Infrastructure System? What Can be Learned from those Canadian Cities that have Exemplary Infrastructure Policies and Practices?

Speaker: Tom Field, CH2M Hill Engineering, Ltd.

Panelists: Bruce Jank, Wastewater Technology Centre
George Mierzynski, Ontario Ministry of the Environment
Laverne Palmer, Institute for Research in Construction

12:30 – 13:30 Lunch

13:30 Achieving Cost Efficiency/Effectiveness Through Alternative Planning Approaches

Issues
- Land Use Intensification as a Means of Achieving Cost Efficiency/Effectiveness.
- What are the Costs of No Growth Policies and Nimbyism?
- Subdivision Design and Standards: Building a Sound Infrastructure at the Lowest Possible Cost.
- Making Maximum Use of Community Infrastructure by Building Multi-purpose Facilities and Through Other Innovative Approaches.

13:30 – 15:00 Presentations

Speakers: Kenneth Whitwell, IBI Group
Robert Webb, Marshall Macklin Monaghan

Panelists: Marni Cappe, Regional Municipality of Ottawa-Carleton
William Code, University of Western Ontario
Bryan Johnstone, Township of Cumberland

15:00 – 15:30 Health Break

15:30 – 17:00 Discussion

17:00 Adjournment

17:00 – 19:00 Reception

JUNE 19

8:45 – 9:00	Opening remarks by the Chairman, Alan G. Davenport
9:00	Financing of Infrastructure Issues • Charging User Fees for Infrastructure Services as a Means of Eliminating Wasteful Consumption and Achieving Cost Efficiency/Effectiveness. • Privatizing Infrastructure Through Contracting Out and Other Approaches: Some Lessons Learned from Previous Experiences and from Other Countries. • Innovative Financing of Municipal Infrastructure. • Infrastructure Financing Alternatives – Effects on Housing Affordability, Quality and Choice.
9:00 – 10:00	Presentations Speaker: Carl Sonnen, Informetrica Panelists: Michael Fortin, Ecologistics Ltd. Richard Kirwan, Urban Policy Associates Pty. Ltd. Enid Slack, Enid Slack Consulting Limited
10:00 – 10:30	Health Break
10:30 – 12:00	Discussion
12:00 – 13:30	Lunch
13:30 – 15:30	Investment in Infrastructure Issues • Importance of a Sound Efficient Infrastructure to the Local, Regional and National Economy. • Municipal Infrastructure, Quality of Life and International Competitiveness. Speaker: Amrik Rakhra, ISTC Panelists: Howard Atkinson, City of London Pierre Letartre, Université Laval Martyn Phillips, David Bromley Engineering (1983) Ltd.
15:30 – 15:45	Health Break
15:45 – 16:30	Wrap-up Session Rapporteur: Harvey Lithwick, Carleton University
16:30 – 16:45	Closing Remarks by the Chairman, Alan G. Davenport
16:45	Adjournment

Appendix B — List of Participants

Name	Organization
Howard Atkinson	City of London
John Bassel	Canadian Home Builders' Association
Marni Cappe	Regional Muncipality of Ottawa-Carleton
Tom Cochren	Canadian Home Builders' Association
William Code	University of Western Ontario
Ed Cuylits	Industry, Science and Technology Canada
Alan G. Davenport	University of Western Ontario
Larry Draho	City of London
Bob Erb	The Coalition to Renew Canada's Infrastructure
Tom Field	CH2M Hill Engineering Ltd.
Michael Fortin	Ecologistics Ltd.
Paul Gravelle	Canadian Home Builders' Association
John Hartman	Transportation Association of Canada
George Huckle	Canada Mortgage and Housing Corporation
Bruce Jank	Wastewater Technology Centre
Steve Janes	S.H. Janes & Associates Ltd.
Stephen Jewczyk	Canadian Institute of Planners
Bryan Johnstone	Township of Cumberland
John Kenward	Canadian Home Builders' Association
Richard Kirwan	Urban Policy Associates Pty. Limited
Norma Laird	Canada Mortgage and Housing Corporation
Pierre A. Letartre	Université Laval
Harvey Lithwick	Carleton University
Sharon Matthews	Canada Mortgage and Housing Corporation
George Mierzynski	Ministry of the Environment of Ontario
Denis Myette	Canada Mortgage and Housing Corporation
Laverne Palmer	National Research Council
Mel Poucher	University of Western Ontario
Martyn R. Phillips	David Bromley Engineering (1983) Ltd.
Amrik Rakhra	Industry, Science and Technology Canada
Judith Ramsay	REIC Ltd.
Gary Reardon	Canadian Home Builders' Association
Andy Sancton	University of Western Ontario
Enid Slack	Enid Slack Consulting Inc.
Carl Sonnen	Informetrica Ltd.
Marilyn Staple	Newfoundland and Labrador Housing Corporation
Sandy Staples	University of Western Ontario
Douglas A. Stewart	Canada Mortgage and Housing Corporation
Bob Stone	Canada Mortgage and Housing Corporation
Bill Strain	Canadian Home Builders' Association
Donald Tate	Environment Canada
Kathy Thompson	Federation of Canadian Municipalities
Dorothy Wabisca	Yukon Housing Corporation
Robert Webb	Marshall Macklin Monaghan
Kenneth Whitwell	IBI Group