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**CANADIAN TRANSPORTATION RESEARCH FORUM**  
**LE GROUPE DE RECHERCHES SUR LES TRANSPORTS AU CANADA**

PROCEEDINGS OF

SEVENTEENTH ANNUAL MEETING

CANADIAN TRANSPORTATION RESEARCH FORUM

Volume 1

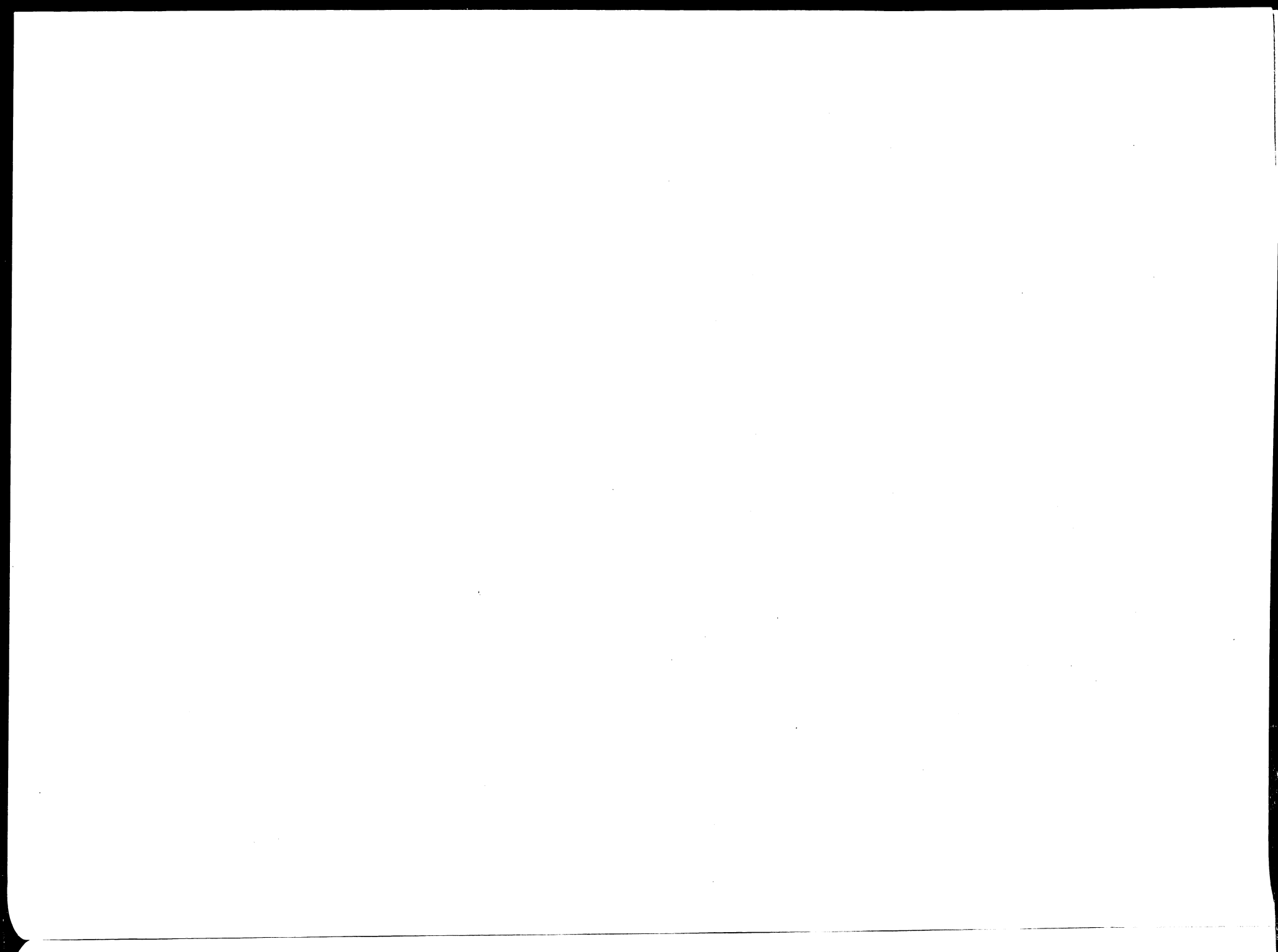
MONTREAL, QUEBEC

MAY 26, 27 & 28, 1982

Compiled by: R. Lande  
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SESSION X

"GOVERNMENT/INDUSTRY/UNIVERSITY  
INTERFACE"



## WHAT HAVE WE LEARNED FROM TRANSPORT STUDIES?

by

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Canadian Transportation Research Forum

Montreal, 1982

1

## WHAT HAVE WE LEARNED FROM TRANSPORT STUDIES?

## 1. Introduction

The present contribution represents an attempt by a practitioner to take stock of the progress in his field. I propose to deal with the policy directed transport studies, thus excluding transport research aimed at the methodological progress or at the general understanding of the working of the transport system. By excluding these areas I do not want to imply that they are less important; on the contrary, I firmly believe that any progress in "practical applications" must be based on the advancement of theory.

## 2. Earlier Contributions to Transport Studies

Although the last quarter of the century witnessed an explosive growth of transport studies, developments of new techniques and experimentation with new approaches to transport policy and transport analysis, this progress has been based on long intellectual development starting with D. Lardner's Railway Economy published in 1850. Transport problems often had been the major policy problems in most countries, and the analysis of transport problems had been both intellectually challenging and of great practical importance. It is worth noting that among the important early contributors to transport economics were the recognized greats of economics, for example Barone, Pigon, Taussig, Hotelling, Sax and Predoehl.<sup>1</sup> However, the progress of transport economics was mostly due not to the transitory interests of the greats notwithstanding their illuminating and important contributions but to the dedicated work of many transport specialists whose contributions are worthy of an extensive review. At a risk of committing a misleading oversimplification, one can summarize major contributions of earlier transport studies as follows:

- a) Introduction of contemporary techniques of economic analysis to transport. This may appear trivial today, but in fact it was a great achievement which took place over a long period of time.<sup>2</sup> The appreciation that there are no separate and distinct "transport laws" but only specific applications of economic analysis was the essential prerequisite for future progress.<sup>2</sup>

- b) Introduction of quantification to the study of transport phenomena, both to the analysis of cost structure of transport enterprises as well as the demand analysis.
- c) The focus of interest was largely on the problems of competition/integration/regulation, i.e. the interface between the public policy and the functioning of transport systems. To a very large extent this work anticipated and provided the foundations for "the great deregulation debate" of the recent years.
- d) The subject of transport pricing had received extensive attention in early transport studies which included important contributions to the analysis of pricing of transport enterprises (tariff setting) as well as pricing of infrastructure ("user charges").

### 3. The Recent Explosion

Of course, no clear division line exists between the "earlier" and the "modern" transport studies. The changes which have taken place have been largely evolutionary, but the evolution was generally accelerated by the massive post-war entry of well trained professionals. The establishment of numerous analytical units in governments<sup>3</sup> and in transport enterprises and the creation of transport research centres. Also important was the role of the International Bank for Reconstruction and Development in pioneering and enforcing the discipline of project evaluation in transport investment planning. The scientific output has multiplied, new journals devoted to transport studies have been born; their formidable output has been further augmented by research reports published by numerous institutions and research centres. Furthermore, one should note a flood of 'sponsored research' or consultants' studies, many of which contain important methodological advances, which penetrated into the "main stream" via articles in the journals or papers of the Transportation Research Forum, proceedings of International Transportation Research Conferences or reports of the Transportation Research Board.

The most important thrusts of these activities appear to be:

- a) Methodological contributions: these can be roughly divided into (i) "comprehensive system models"<sup>5</sup> (ii) transport demand models<sup>6</sup> (iii) estimations of production and cost functions.
- b) Transport policy analysis related to the interface between the government and the carriers. The main focus has been on regulation-deregulation issue.
- c) Transport investment analysis, with the main focus on transport project evaluation.

In this paper I shall concentrate on the last two thrusts.

### 4. Studies of the Interface between the Government and Transport

Transport industries have been traditionally influenced by government policies. The objectives of the government intervention can be either related to the functioning of the transport system (transport enterprises, infrastructure) or to the use of transport as an instrument of national policies (e.g. regional development, delivery of social services, etc).<sup>7</sup>

Given the importance of transport policies, transport problems have been considered extensively both by major inquiries and in numerous specialized studies.

In Canada, the major transport inquiries in the post war era were: Turgeon Royal Commission, on Transportation, Gordon Royal Commission on Canada's Economic Prospects, particularly a special study on transportation by J.C. Lessard, and the MacPherson Royal Commission. Turgeon Commission concentrated on the railway rates issue, analysing the problem largely from the point of view of a "classic" public utility doctrine.

The Lessard report for the Gordon Royal Commission introduced a breath of modern analysis and realism into transport policies - it posed frankly the problem of a possibility or even inevitability of railway subsidies unless the regulatory regime is changed; it discussed the competitive issues and the impacts of government investments in different transport modes; it dealt explicitly with the user charges and alleged competitive non neutrality of public policies vis a vis different modes. The analysis of the study was often faulty, many of its quantifications of doubtful validity but it defined the policy problems correctly; unfortunately the report generated virtually no interest and was soon forgotten. The MacPherson Commission, on the other hand, was a success story: it followed a singly major theme single mindedly, it produced an acceptable rationale for the reliance on inter-modal competition within a framework of reserve regulatory powers. The last major inquiry into transport policy was not conducted within the institutional framework: the status of "Davey Task Force" was as uncertain as that of its final product: three volumes on transport policy.\* This document dealt with an important and difficult issue of the relationship between transport policies aimed at the system's efficiency, equity considerations and the scope for government interventions.

The major inquiries aimed at the resolution of major policy issues which often implied a change of the legislative framework. They tried to affect the change through the identification of issues and creating a public consensus. The successful commissions usually selected a consistent policy theme which permitted to present a persuasive argument without getting tied to a particular analytical scheme. The analytical or research work undertaken

\*The "normal" ways in which policy documents or the findings of inquiries are produced in Canada are: (i) a signed report of the commission of inquiry, (ii) a "white paper" which states the government policy and provides the basis for subsequent legislation, (iii) a "green paper" or a discussion document. The policy document tabled before the Parliament by Hon. J. Marchand, which contained the findings of "Davey Task Force" (after J. Davey's death) was brown covered, briefly discussed (but not in the committee) and followed by a "short transportation bill" which was never passed.

for the commissions had varied in scope, depth and analytical sophistication. Valuable as most of this work was it has usually played a subsidiary role to the formal public inquiry.

Undoubtedly major transport policy inquiries will continue to be undertaken and will range in scope from the examination of major policy issues (such as MacPherson Commission) to more specific ones (such as Hall Commission on grain transportation). The main function of public inquiries, and the reason for their existence, will be, as in the past, the examination of the nature of conflict of interests and search for acceptable solutions. A conflict resolutions function is by its nature a political activity and it implies a political approach. Thus transport research or transport studies must play a subsidiary but an important role in this activity. Their objective is to assist in the identification of issues and to quantify the costs of solutions (or costs of non solutions of the problems).

In addition to the major policy inquiries, many sponsored and independent studies have been produced on a great variety of issues. A major issue, recently extensively debated is the direct regulation of transport industries and the relationships between regulation and market performance;<sup>8</sup> in general, an anti-regulatory consensus has emerged among academic economists. The recent deregulation policy in the United States helped to generate interest in deregulation in Canada; it will also provide a useful case study provided that premature generalizations are avoided - it will take few years before the final effects of many forces will become fully apparent. As far as the analysis of the effects of American de-regulation is concerned, the most apparent lessons are that mis-applications of theory of monopolistic competition are dangerous, and that there is no substitution for thorough empirical work based on the respect for reality and not on ideology.

Except in the context of the deregulation debate, relatively little empirical work has been done on the actual behaviour of transport enterprises, their cost structure and the influence of different forms of government intervention of the long term performance of transport industry. In view of a

wide range of government policy instruments (of which direct regulation is only one) this work should be of great potential importance.

The studies of the effectiveness of the use of transport as an instrument of regional development suffer from the inherent difficulty of the subject.<sup>9</sup> It is doubtful whether valid generalizations in this area can be made and whether the issues can be meaningfully discussed without direct reference to a particular region, type of production and a specific stage of economic development. One should note, here useful empirical studies made in the context of feasibility studies of a particular transport facility (development highways, local rural or access roads, etc.). This work naturally evolves into "area development studies" which relate the development potential of an area to a program of mutually supportive investments.

##### 5. Infrastructure Policy Studies

Infrastructure policy studies can be divided into (i) studies dealing with the planning, expansion or modernization of infrastructure, and (ii) pricing of infrastructure ("user charge" policy). Ideally, the two should be integrated, in practice they tend to develop separately. However, in considering the major current transport issue in Canada - the railway capacity problem in the West - the inter-relationship between capacity and pricing problems (statutory rates) is fully recognized.

The perceived need for substantial expansion of transport infrastructure provided the rationale for major investment studies.

An early example of a transport study undertaken as a part of a major infrastructure expansion program was Ontario "Highway Needs Study".<sup>10</sup> The nature and the methodology of the study can be summarized as follows: expected traffic growth was translated into a roughly quantified geographical flow patterns; the existing and prospective traffic flows were compared with the then existing highway capacities; a desired network which would accommodate the expected traffic and the functional design standards were specified. In a way, the result was a consistent shopping list.

Today, the methodology of the study appears primitive: it lacks a coherent analytical forecasting methodology; it neglects local development/traffic generation links and transport facilities development - local development - traffic feedbacks; the functional classification and design standards were not based on explicit investment criteria and embraced uncritically the doctrine that supply of transport infrastructure should always follow the expected unconstrained growth of demand.

Nonetheless, from the point of view of effectiveness the study was a success: it produced a coherent blueprint of a highway development program, and the program was realized gradually and systematically well within the planning horizon.

Many similar studies or long term development programs have been undertaken in the industrialized countries. The shift of emphasis came with the conscious desire to affect the modal split, by reallocating the investment effort from private (automobile to public transport).

The "new wave" of transport thinking is well represented by the famous "Boston-Washington" corridor study. Theoretically impressive transport demand analysis methodology was developed, or its development accelerated.\*

Alternative technologies, including feasible future technologies were examined in some detail. The objective was to direct future supply pattern and technological developments to manage the demand growth and affect the inter-modal shift. In somewhat different and more modest form "corridor studies" were important in the seventies, and are still being conducted in the context of some corridors.

\*It would not be correct to state that the corridor project gave birth to the "abstract mode" demand models, but it provided funds and interest for the development of demand models of this types with the focus on modal choice.



In spite of the sophistication of the methodology, the effectiveness of such studies has not been overwhelming. Part of the reason is, of course, the realization of the investment capital constraints, which were predictable in the early seventies but fully realized in the second part of the last decade.

The "corridor systems" which were to emerge required large lumpy investments concentrated within a limited period of time - "transport mega projects" - they could not be gradually phased in and by their very nature became an "all-or-nothing" proposition. Given the investment constraints they tended, in the majority of cases, such "all-or-nothing" propositions led to "nothing" solutions.\*

Furthermore, the superimposition of a new system over the existing well functioning autonomous systems which developed gradually in response to market mechanism appeared to many as a "solution in search of the problem". The institutional framework or structure to create a new system was absent and in the absence of a "corridor transport authority" the only viable option was to incrementally manage the existing systems in a decentralized manner.

The important issue of user charges or infrastructure pricing has received some attention among research economists both within and outside the government. One should note here pioneer work of the late A. Jaworski<sup>11</sup> on airport and air navigation charges and S. Haritos<sup>12</sup> contribution to road user charges. The above noted contributions were policy directed and based on extensive cost investigations. There had been also a number of noteworthy contributions by academic economists.<sup>13</sup>

\*French Paris-Lyon very high speed train system was a notable exception. A centralized state and the will to realize a large advanced technology project were the necessary conditions to make it happen. Whether that impressive technological achievement had been economically justified is a different problem...

## 6. Transport Development Studies

International and bilateral aid for economic development, and in particular numerous projects and programs aimed at the development of transport infrastructure gave rise to numerous transport studies.

During the early stage of the international development activities a number of 'economic survey missions' had been undertaken. The objective was to prepare a 'general map' of development opportunities and problems. As a rule, these missions included transport specialists and "transportation chapters of the development survey reports attempted to outline the general characteristics and priorities of transport programs. By today's standards the methodologies were not sophisticated, but the survey reports had a supreme virtue of treating all aspects of development as well as the institutional and economic constraints in a comprehensive manner. The successors of these surveys have been staff surveys, of more modest scope, usually prepared for the internal use. The purpose of this work is to put the sectoral programs into a more general context of the economic position of a particular country.

At the same time many "national transport plans", have been undertaken by different national authorities with the professional and financial aid of IBRD, regional development banks or bilateral aid agencies (US AID, CIDA etc) on studies conducted by foreign consultants (or, in some cases by a group of consulting firms).

Some of such plans were based on explicit, comprehensive transport models, of which the most famous and intellectually influential was the Harvard Model. This was an ambitious attempt to combine an economic model of the economy with a transport network model. Following the Harvard model, fully closed formal models have been replaced by simplified versions, capable of accepting more eclectic inputs. To a large extent, the more eclectic and the pragmatic the model formulation, the more usable the results became. The obvious practical problem which comprehensive formal models had to

face was imperfect availability of data. A comprehensive model is a glutton for data, and what is even more important, it also suffers from two basic weaknesses: (i) it needs data of a predesigned characteristic which often cannot be generated by "standard" or "operations oriented" information systems; (ii) it does not discriminate between problems of practical, immediate importance - which may require special in depth investigations - and general problems.

At the same time, the "project approach" gained the overwhelming acceptance; it represented the ultimate in concentration of study resources on specific fundable projects. The focus of interest of this work was on project evaluation; which is natural if one considers a single major investment decision and has to determine the justification of this specific use of scarce resources. Given the inadequacy of transport infrastructure and the shortage of investment finance, transport developments in the Third World countries has been much more affected by the discipline of project evaluation than investment planning in advanced industrialized nations.<sup>15</sup>

The fact that the project approach (and thus the project evaluation) is a matter of key importance and produces worth while discipline in the public sector should not blind us to the limitations of project evaluation methodology. The total impact of a set of projects may be different than the simple summing up of the impacts of individual projects. Logically, this should lead us to the program approach; although interesting pioneer work has been done in this field<sup>16</sup> the "program approach", or impact analysis has not gained general acceptance.

Properly defined and designed transport survey or policy reviews can play an important role in identifying problem areas, better understanding of inter-dependencies and fitting potential projects into a coherent overall context. One should also help that more attention will be paid to the analysis of long-term (often implicit but real) commitments inherent in different transport investments policies, as well as the capacity to meet such commitments over

a longer period of time. The world wide phenomenon of deterioration of transport infrastructure and disinvestment of equipment, which produces serious system rehabilitation problems, strongly indicate the importance of meeting (or not meeting) commitments to maintain the system intact. This, in turn, leads us back to the importance of the question of institutional and economic capacity to "maintain the system intact" which should be examined as a part of any major new investment program.

Another area which should be a matter of serious concern relates to the functioning of transport industry, i.e. "direct carriers" or transport enterprises as well as "indirect carriers" and suppliers of related services (eg. freight forwarders, insurance and financing services etc). The effectiveness of infrastructure investments as well as the efficiency of transport system and the distribution of benefits from transport investment depends, of course, on the efficiency of direct and indirect carriers as well as of the whole complex of related services.

Recently one may note a growing trend to focus interests on institutional or semi-institutional issues. Of course, institutional issues have always been considered important, and the strengthening of transport planning instrumentalities has always been a major objective in the development work.\* However, there are important reasons why the stress on the organizational and institutional factors has been increased and the importance of "planning from above" is being slowly recognized. These reasons are:

- a) the urgent need for reconstruction and rehabilitation of may transport systems, largely due to the past neglect of maintenance and absence of gradual modernization;

\* Another important aspect of the developmental work, related to the strengthening of the institutions relates to training of professionals and future manager.<sup>17</sup>

- b) resource scarcity, growing balance of payments problems and internal disequilibria which led to the starving of transport systems with the consequent inefficiencies, high costs and deferral of maintenance and modernization.
- c) institutional or organizational weaknesses which manifested themselves in absence of realistic planning or systems management, inability of scaling down of programs to meet the more stringent resource constraints, and lack of setting of clear management objectives for public sector instrumentalities.

There is an increasingly recognized need to address those problems. The manifestation of the recognition of such needs are the technical assistance programs and programs directed towards the upgrading of the maintenance of the system. Although, we may still prefer to use the term "project" when we deal with the rehabilitation and maintenance program, the program approach is necessary.

#### 7. Urban Transport Studies

During the post war era, urban transport studies evolve from dealing with a reasonably straightforward problem of how to move a growing volume of increasingly motorized traffic to attaching the bewildering array of imperfectly specified and ever changing issues. This corresponded to a change from a clearly defined area of handling traffic and increasing the potential for mobility of urban population to a great number of mutually contradictory objectives.

In modern economics the search for and tendency to achieve an equilibrium dominates the model building. The reality of modern cities, contradicts the assumed tendency towards the equilibrium. The time lags and adjusting

periods are painfully long; at a very respectable rate of increase of new construction, (2.5% per annum) it takes a modern city between 17 and 18 years to increase its housing stock by 50%, or in other words, even in fast growing cities two thirds of the housing stock is between fifteen and twenty years old; and most of the street pattern is even older. At the same time social and economic patterns of the city life change quite rapidly and the social aspirations even faster. Furthermore, we have a bewildering phenomenon of a contradiction between the collective and individual preferences - the collective view is in favor of public transport, in favor of preservation of the existing urban environment, in favor of the increase of general urban amenities; however, the members of the same urban community, by their own individual behaviour express preference for individual transport and "modern" living facilities. Having declared war on automobile and love for mass transit, having put all possible obstacles for the change in the character of neighbourhoods the same citizens opt privately for a greater use of automobile, radically changed lifestyles etc. Having expressed themselves strongly for energy conservations, the city dwellers go on demanding four way stop signs and all other possible devices to slow traffic and increase fuel consumption.

Urban transport studies reflect these changes. Even if the resolutions of urban transport problems are outside the feasible range of the results which one could expect from economic or engineering analysis, considerable progress was made towards the assessment of costs of alternative solutions and the understanding of the nature of demand for urban transport which provides the basis for informed choices. However the inherently political nature of solutions of urban transport problems should be kept in mind.

Although the work on the "value of time" is relevant both for urban and inter-urban modal choice analysis, most of the empirical studies of the problem have been done in the context of urban transport. In this field considerable empirical material has been accumulated and the limitations of simple - or simplistic - approaches better understood. Also serious work has been done to provide theoretical foundations for value of time analysis.<sup>18</sup>

Curiously enough, the most interesting progress towards the management of urban transport problem has been made in the Third World countries. The "Singapore solution" of a positive restraint on automobile is being widely studied, even if its direct applications appear to be limited. Buenos Aires having discarded a single, deficit ridden public bus system now enjoys efficient decentralized bus operations. Also Buenos Aires has demonstrated that at a certain level of urban density, traffic problems of a large, modern, prosperous metropolis are virtually unsolvable in spite of an efficient bus system, subways, expressway constructions and closing the business centre to private automobile. Many of the Third World cities provide useful examples of para transit solutions. Alan Walters' work at the World Bank - although one may, and should, disagree with the details of his findings - is having a profound influence on the questioning of the centralized public transit system approach. In many respects this supplements and makes more relevant reputable work by Noortman (of the Netherlands Transport Institute) on the diseconomies of scale in public transit operations.

It is impossible in this short summary either to give full flavour to this exciting area, nor even begin to guess its future directions.

#### 8. Some Lessons

In view of the wide range of the problems and methodologies any exposition of the intellectual history of transport studies is bound to be superficial and any summary conclusions distressingly subjective. Nonetheless rushing where the wise men would fear to tread, let me attempt to answer the question posed in the title of this paper: what have we learned?

Undoubtedly a great progress has been made by the application of economics and quantitative tools. The danger exists, however, that the application of sophisticated techniques can start being regarded as an end in itself not as a

means for investigating reality. Thus, it appears to me, that the real challenge is becoming the asking the right, or relevant questions rather than providing solutions in search of problems.

A critical, pragmatic and eclectic approach and lack on inhibitions in developing new and unorthodox methodological approaches appears to me necessary.

Regarding transport planning, micro economic, or "planning from below" or "project" approach must be supplemented by the "macro-economic" or "planning from above". This implies greater attention to the "general context" within which transport programs are developed, to overall constraints, long term trends etc.

No transport study can be considered realistic without an understanding of the nature and behaviour of transport enterprises - public or private. In the majority of transport markets oligopoly and monopolistic competition are natural and state owned enterprises are common. These industrial structures are most difficult to study, are most influenced by institutional factors and have most unpredictable behaviour patterns. Thus the study of transport firms in specific institutional environment in which they operate is essential if any realism in transport studies is to be achieved.

Probably the most important developments in the theory of the firm relate to the theory of the growth of a firm and the theory of economics of scope. Economies of scope appear to be a potentially most useful concept in transport, since a large proportion of transport firms are multiple service and multiple market enterprises. From the transport users' point of view, the concept of "service network", or inter connectivity of services, is often crucially important. The "network concept" in a way is parallel, in the demand analysis, to the "economies of scope" concept in the supply analysis, with bulk movements in a well defined market (of passengers or goods) and specialized carriers playing sometimes supplementary sometime competitive role.

In the search for increased system efficiency institutional and organizational factors are particularly important. Leibenstein has persuasively argued that the gains to be achieved by increasing the allocative efficiency tend to be relatively small, while the gains obtainable from organizational or institutional efficiency are much more significant.<sup>19</sup> It appears to me that in transport the efficiency gains from restructuring of subsidies and increasing the efficiency of transport firms and infrastructure operating agencies - especially state owned enterprises in the Third World countries - improving the functioning of inter-carrier or inter-modal network systems are the areas of greatest potential payoffs. Provided, of course, that relevant questions are asked and that the reality of the functioning of transport system is fully respected for "there is little point in rejecting the real world of an abstract theoretical system".<sup>20</sup>

## NOTES

- 1 Enrico Barone, one of the 'fathers' of mathematical economics provided the classic analysis of the problem of joint costs in transport and of the price implication of this phenomenon ("Related Costs in the Economics of Transport," originally published in Italian in 1921, English translation published in International Economic Papers, No. 5) 'Pigou-Taussic controversy' still provides the best statement of the problem of the nature of transport output and economic implications of different approaches to this question (A.C. Pigou, "A Contribution to the Theory of Railway Rates, Quarterly Journal of Economics 1891, and The Economics of Welfare, London: MacMillan, 1948, pp 274-317; P.W. Taussig, "The Theory of Railway Rates Once More", Quarterly Journal of Economics, 1933) H. Hotelling's contribution, "The General Welfare in Relation to Problems of Taxation and of Railway and Utility Rates" (Econometrica, 1938) is both a classic in welfare economics and a basic statement on marginal cost pricing. E. Sax was not only a pioneer of public finance economics but also the author of a monumental work on transport development (Die Verkehrsmittel in Volks- und Staatswirtschaft, Vienna, 1878-1879). A. Predoehl, well known for his structural approach to international trade-theory, contributed a major book on transport policy (Verkehrspolitik, Goettingen, 1958) and played a major role in establishing the Marine Transport Institute in Bremen.
- 2 For example the vast majority of transport economics textbooks published up to early 'fifties had been almost completely devoted to institutional descriptions.
- 3 See J.R. Baldwin "The Evolution of Transport Policy in Canada" (Canadian Transport Commission, Seminar Series, Ottawa, 1977) for the description of the role played by Bureau of Transportation Economics.
- 4 Many senior executives of transport enterprises had joined the corporations as staff economists and had good training in economic analysis (eg. Robert Bandeen, Canadian National; John Stenason, Canadian Pacific; Stephen Wheatcroft, British Railways)
- 5 For a critical review of comprehensive transport models as alleged aids to policy formulation and planning, see K.W. Studnicki-Gizbert "Transport Policy Models and Transport Policy Development - A Major Challenge or a Search for a 'Philosophical Stone'?" in E.J. Visser(ed) Transport Decisions in an Age of Uncertainty: Proceedings of the 3rd World Conference on Transport Research, The Hague: Martinus Nijhoff, 1977

- 6 Fundamentally, two types of transport demand models can be distinguished: (i) models which relate individual characteristics of the traveller or a shipper to the use of transport system (i.e. the relationship between a specified set of characteristics of a traveller or a shipment and a given set of characteristics of a transport service, including price), and (ii) models which relate the use of transport to production or consumption or income or social patterns of specific areas or points of origin and destination, and which use the traffic flows, (and their modal distribution) for the estimation of demand parameters. The first type of models corresponds to "abstract mode, abstract commodity" models, logit or probit models being used for estimation of the parameters. This type of approach is often described as "disaggregated" in contrast of "aggregated" analysis of actual flows and regional patterns. A full taxonomy of demand models, and problems to which they can be usefully applied is quite complex. Regrettably, there has been quite a lot of self-advertising of the virtues of different approaches by their proponents - some of this salesmanship was not only unseemly but also clearly absurd.
- 7 For a fuller treatment of taxonomy of different approaches to the State intervention in transport, see K.W. Studnicki-Gizbert, "Regulatory Policy Options in Transport, Transportation Research Forum, Proceedings, 12th Annual Meeting, Oxford, Indiana, Richard B. Cross 1971.
- 8 Influential early contribution was J.R. Meyer, M.J. Peck, J. Stenason and C. Zwick, Economics of Competition in the Transportation Industries, Cambridge, Mass., Harvard University Press, 1959. A bibliography of contributions to the analysis of the problem of competition and regulation in transport would take many pages. For extensive bibliography and Canadian perspective see G.B. Reschenthaler, "Direct Regulation in Canada: Some Policies and Problems," Logistics and Transportation Review, Special Issue, 1979.
- 9 Useful summary of the vast literature is contained in C. Kraft, J.R. Meyer and J.P. Valette, The Role of Transportation in Regional Economic Development, Lexington: Lexington Books, 1971 and in A. Bonnafous, F. Plassard and D. Soum, Impact of Infrastructural Investment on Industrial Development, Paris: European Conference of Ministers of Transport.
- 10 Ontario Department of Highways, A Plan for Ontario Highways: An Engineering Analysis of Needs on King's Highways and Secondary Roads, Toronto 1956, and Ontario's Roads and Streets: An Engineering Study of Road and Street Needs by the Municipalities of Ontario and the Department of Highways, Toronto 1958.

- 11 Practically all of Jaworski's contributions were in the form of internal reports prepared for the (Canada) Department of Transport, but see his "International Airport Allocation of Operating Revenues and Costs," Aeronautical Journal, June 1971.
- 12 Z. Haritos, Rational Road Pricing Policies in Canada, Ottawa: Canadian Transport Commission, 1975.
- 13 Eg. David M. Winch, The Economics of Highway Planning, Toronto: University of Toronto Press.
- 14 A full formulation of the "Harvard Model" is contained in D.T. Kresge and P.O. Roberts, Techniques of Transport Planning, Vol II, Washington: Brookings Institution, 1971.
- For an excellent summary of the approach see B.V. Martins and C.B. Warden, "Transport Planning in Developing Countries," Traffic Quarterly, 1965; for a critical review of "Harvard Model" see E.P. Holland and C.G. Harral, Journal of Economic Literature, 1972.
- 15 This statement must be qualified somewhat: Victoria underground line in London and the third London airports are, the well known examples of application of benefit-costs analysis in advanced countries. See: M.E. Beesley and C.D. Foster, "The Victoria Line: Social Benefit and Finance", Journal of the Royal Statistical Society, 1965; A.D.J. Flowerdew, "Choosing a Site for the Third London Airport: The Roskill Commission Approach" in R. Layard (ed.), Cost-Benefit Analysis, Harmondsworth: Penguin Books, 1972; E.J. Mishan, "What is Wrong with Roskill", Journal of Transport Economics and Policy, 1970. A number of other cases is discussed in H. Georgi, Cost-Benefit Analysis and Public Investment in Transport, London: Butterworths, 1973 (translated, the original German edition was published in 1970); for the fundamental critique of the application of benefit-costs analysis to public decisions, see P. Self, "Nonsense on Stilts: Cost-Benefit Analysis and the Roskill Commission," Political Quarterly, 1970. Of course, benefit costs analysis originated in the United States; for the survey of developments up to early 'sixties see A.R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey," Economic Journal, 1965.
- 16 For the discussion of program approach see A.G. Papandreou and U. Zohar, Project Selection for National Plan and The Impact Approach to Project Selection, Toronto: York University, 1974.
- 17 For a description of such a training project, see K.W. Studnicki-Gizbert, "Training of Transport Specialists in Argentina" Transportation Research Board, Washington 1981.

- 18 Even a selected bibliography of value of time studies would be several pages long; The fundamental, theoretical contribution is G.S. Becker, "A Theory of the Allocation of Time", Economic Journal, 1965. A useful review of applied work including extensive bibliographies is Special Report 149, "Behavioural Demand Modelling and the Valuation of Travel Time", Transportation Research Board, Washington, 1974.
- 19 H. Libenstein, Beyond Economic Man, Cambridge Mass.: Harvard University Press, 1976. Libenstein introduced the term "X-efficiency" to describe the organizational efficiency; he persuasively argues that "X-efficiency" gains are substantially more important than the potential gains achievable through the improvements of "allocative efficiency".
- 20 The Economist, October 10, 1981, p. 112