

**What overall economic and social issues will be relevant in the coming decade and what is their impact on transport**

*Mr. Silverleaf*

There are of course many major changes taking place in economic and social conditions in both developed and developing countries, which are bound to have a considerable impact on transport research in the next decade. All I will try to do is to open the discussion, and mention one or two points which seem to me to be among the more important.

The first we should recognize is that we are in a period of uncertainty. We are always in a period of uncertainty in the sense that we are quite unaware of what next year is likely to bring and it is almost invariably true that next year is different from what we expect.

But I think that we also agree that we are in a greater period of uncertainty at present than we have been for some considerable time. Certainly in the developed world. I think we are probably in a period of transition in both national attitudes and economies. There is a general feeling that the economic growth pattern of the last decade is unlikely to be repeated in the next decade. But undoubtedly we also feel that there will be differences between different countries even in the developed world within the next decade. Also there will be considerable changes in social attitudes which will reflect themselves on transport and on the research that we should carry out to help that transition most effectively.

I think that I would add only two things. The first is that there is a growing awareness that in general terms, economic and social terms, and more particularly so far as we are concerned in transport, we must pay greater attention to the very considerable disparities between the general group of developed countries and that very substantial group of developing countries. Mr. Willoughby gave us some dramatic figures which illustrate that vast gap and many of us who are familiar with that and have worked in that context feel that we can look forward in the next decade to a growing recognition of the need to pay greater attention to these disparities and to try to reduce them and hope that this will be reflected in our transport attitudes, as Dr. Baffour said, making transport a world-wide responsibility.

Finally in the developed world we can look forward to a period in which there will be a greater emphasis on making the most of what we have, rather than taking it for granted that we will have resources to increase what we have already in a substantial way. We shall see it in many ways in the slowing down of car ownership rates, in the slowing down of new construction for major roads, in a much greater thoughtfulness about major investments for guided-track railways and other systems. That coupled with a growing awareness of social needs, trying to provide the transport that people want will provide a new and significantly different framework for the next decade.

*Mr. Manheim*

In addition to what Mr. Silverleaf has stated I would like to emphasize the particular issue of equity and the related issue of participation. The equity at a broad international scale, among regions of the world and countries at various stages of development, equity within regions of countries which was an issue clearly brought out in papers on intercity transport and in other sessions and equity within a particular region, an urban area or rural in terms of the distribution of benefits of transport among the users of different modes, among travellers for different purposes and among the operators and among those who are concerned about environmental issues.

This is an issue that becomes particularly pertinent even more in the age of uncertainty because we have seen in a number of the sessions a clear recognition of the fact that uncertainty is a certainty. But I am seriously concerned about the ability of the public to adapt to the age of uncertainty that so many of the papers of this conference have accepted as a natural event. As people are concerned about equity, who gets what benefits and at what costs and as people look at a more and more uncertain future and as they also demand more participation in the decisionmaking and more participation in the technical analysis, how much will the fear of the future change the nature of our planning and decisionmaking and the kinds of research that we should be doing.

*Mr. Frybourg*

Nous sommes tous conscients de l'importance des effets négatifs dans les transports de ce qu'on appelle en anglais les "adverse effects", qui portent en particulier sur les nuisances et l'environnement. Mais sans doute nous nous rendons compte mieux maintenant qu'à côté de ces effets négatifs, il y a les effets en retour, à plus long terme, non prévus, de la politique menée pour répondre à des sollicitations qui étaient claires à court terme.

C'est un phénomène que certains appelleraient de récupération, qui se fait bien souvent au profit des plus forts et au détriment des plus faibles. La recherche peut contribuer à limiter de tels effets notamment en se penchant sur la gestion des entreprises de transport, particulièrement difficile dans cette période économiquement instable, car le poids des investissements d'infrastructure rend les entreprises financièrement très vulnérables et lorsqu'on regarde les conditions de leur gestion, on constate que bien souvent, jouant avec une réglementation inadaptée et incontrôlable, ces entreprises sont au prise avec une clientèle qui n'hésite pas à utiliser la faiblesse économique et financière du secteur pour transférer les charges sur le contribuable ou sur les plus défavorisés. Si effets en retour il y a, cela ne doit pas pour autant donner mauvaise conscience au chercheur, même si certains prétendent que bien souvent la recherche n'est pas idéologiquement neutre.

En fait les transports n'ont pas à supporter la responsabilité des changements d'orientation de la société. Ce qu'il importe pour nous c'est de déceler à temps ces changements d'objectifs et d'être capables d'éclairer sur l'ensemble les effets à long terme d'une politique dont l'orientation à court terme est évidemment plus facile à déceler.

*Mr. De Waele*

Je pense que restrictions n'est pas synonyme d'incertitude. Au contraire plusieurs des restrictions, plusieurs des certitudes - c'est des certitudes négatives bien entendu - rendent les choix plus sûrs; par exemple le fait de savoir qu'il y aura moins de pétrole ne laisse plus autant de choix disponibles.

Il y a une certitude plus ou moins grande sur beaucoup de faits, que ce soit sur un urbanisme, au moins pour les pays développés que nous connaissons, sur des réseaux qui existent et que nous n'allons pas fondamentalement modifier dans les années à venir, sur nos revenus sur lesquelles nous sommes à peu près fixés, sur nombre d'autres facteurs. L'incertitude à mon sens réside essentiellement dans le comportement des individus et des groupes vis-à-vis de faits qui eux sont plus ou moins prédéterminés.

Du point de vue politique une très grande importance revient à l'étude des motivations et des comportements, à savoir pourquoi la réaction est telle ou telle, et aussi à la

possibilité pour les responsables d'informer le public d'une façon appropriée sur les intentions.

*Mr. Frenzel*

According to the general theme - transport decisions in an age of uncertainty - I am glad that there is uncertainty, because that is the demand as well as the justification for transport research.

If we were sure of what will come, we did not have to do anything. But because we are not sure, and in general we cannot be sure of tomorrow we must do something. We must act we should not react. We should not be paralyzed by the problems of today as they were in the world yesterday and will be tomorrow. But we have to do something. We should get things done and leave it to the market and to society to decide what is a good solution or what has to be abandoned. We should divide between the aspects of transportation and what is the demand and what is needed. What will people's need be tomorrow, in this changing world, what energy consumption and environmental protection, economy, and development will there be.

We should try, and try hard, to have a set of solutions or thoughts put forward to others in a political scene who have to decide what will happen. Most of the things we do today are fixed for centuries, because a new street, a new track of a railroad is a decision for 100 years at least and therefore we have to anticipate a lot in that period of uncertainty.

*Mr. Baffour*

There is a great deal of similarity in terms of methodologies in evaluating transport problems. The developed countries have a very highly sophisticated system of different types and about all tending towards the same system and basis, the analysis of problems, identification of the problems and the research effort, although they may vary from country to country, they all came from the very same direction and I believe the same can be said for developing countries. There are many stages of development in transport research in the developing countries. Some countries have no scientific basis at all, no personnel. Others are very much in their infancy. Others have by a system of linking with developed countries' research organizations, built up a sizable beginning which with patience and with mutual assistance and help in the right direction could rise to useful standards. In the developing countries, there is this emphasis on the need to establish research organizations to enable them to evaluate the need to establish their own systems of adapting their own material, the socio-economic basis of analysis, identification of problems of transport and for most of all the need to enhance the research efforts of these developing countries' units in order to first of all establish a state of confidence between themselves and the respective governments.

It is through the action and policies of governments that transport efforts at all can be made. Development in the direction of real transport can be achieved in these developing countries. Therefore there has been the general feeling that developed country research units should endeavour to establish links with developing countries and establish between themselves a comradery and understanding, a trust which should be mutual, which should give developed countries' research organizations the opportunities to try out their results, at the same time correcting some mistakes that have been made in the past and also encourage and enhance the image of these research organizations in developing countries such that they may achieve the confidence of their respective governments and so enable them to influence the decisions of these governments. I also can

see that there is a stress to establish information centres where research findings and results may be stored, enabling developing countries to utilize these research findings of the developed countries.

*Mr. Suchorzewski*

I would like to express a feeling of great satisfaction because of the comprehensive approach of transport research. And I am really very proud to be a member of the group. Not always I had this feeling in the past. To illustrate the evolution I will use an example what happened about ten years ago at one of the large international meetings of transport people, both policy-makers, practitioners and researchers from the whole world. During the highly professional debate one of the speakers proposed that social and environmental factors should be taken into account by transport people who usually are orientated towards narrow objectives of their sector. What happened was that in the final report of this conference you could find that planners and politicians, would have to pay much more attention to social and environmental factors. The proportion of time we are devoting here to the more general objectives of transport systems gives reasons for some optimism even in this age of uncertainty.

*Mr. Harral*

Mr. Silverleaf and also Mr. Manheim have named 2 of the 5 principal socio and economic issues that we will be confronting in the next decade. Certainly we anticipate that the gap between rich and poor nations will grow wider. Certainly there is already set in train a greater concern for the issues of social equity, not only within nations but between nations. I would like to add to these two points three additional factors which will concern us all in the coming years. In the developing countries the problems of unemployment will be growing more severe in many cases, compelling the need for further attention to the problems of technology adaptation in the development of these countries. The efforts to stimulate income growth in the rural sector of the developing nations will certainly be intensified. Finally we must recognize that the rural urban migration process which has largely been completed in the rich nations, is only really beginning in much of the world. We can look forward perhaps with some apprehension to the development of massive cities in the poor countries which will generate enormous demands for investment funds, for development of urban infrastructure pressing still harder on the scarcity of funds in those countries.

**What could be the impact of uncertainties, especially for transport and what is the way in which transport could be used as one of the instruments to cope with some of the uncertainties**

*Mr. Suchorzewski*

We should be very cautious with solutions which are appropriate in other social and economic situations. We are in the period when we are too optimistic when looking at the methodology, techniques and tools which have been developed by research people. I might say that the main problem I am facing is how to make a proper use of these advanced sophisticated methods, techniques and tools.

It is particularly important when trying to face the problems in developing countries. I do not like the words "developing countries". It seems to me that this division of the world between developed and developing was invented by those who think that they are developed. When looking at the cultural development we would have quite different borders between different

parts of the world. It reminds me of one experience I had with one of the so-called developing countries. I was visiting a group of experts and one of them was a transportation planner in this city, and I asked him what is your major problem. He said, "my problem is how to improve the vehicular traffic at this two directional road in which this vehicular traffic is to a very high extent slowed down by intensive bicycle movement". So I asked, "what are the traffic volumes," and he said, "the situation is that there are between 5 and 7 thousand bikes per hour in two directions carrying 10 to 12 thousand people". The average per bike was 1.5, much larger, than the one of the automobile. And as far as vehicular traffic is concerned there were 50 to 100 passengercars, carrying about 200 people. So the objective which was formulated by this European transport planner was how to enable these 200 people to move faster at the cost of 10.000. Are we really right in advising others to follow our common mistakes instead of thinking how to help in cultivating some elements of travel behaviour and some elements of this time of life which are sometimes more sound than advocated by so-called developed countries.

*Mr. Mannheim*

One of the issues which clearly was raised, for example in the discussion on systems analysis in workshop 3 and cost analysis in session 3:4, was that of uncertainty. They also pointed in some directions in which transport research could attempt to deal with uncertainty such as through first of all explicitly recognizing that uncertainty exists and admitting it in our research and planning studies.

Secondly trying to quantify uncertainties, to put ranges on it and third to try to find designs that can be capable of dealing with uncertainty. The chairman of this particular workshop used the phrase designs that can be modified as construction proceeds or after it is completed to adapt to conditions departing from original assumptions. I would like to extend that thought but I think the way it was phrased, designs that can be modified, implies that we are dealing primarily with infrastructural improvements. But in fact a key element of developing transport strategies that are flexible in the face of uncertainty, is through institutional innovations, designing organizations which can deliver a variety of different transport services to a variety of different means. The infrastructure can also be progressively upgraded over time and so this clearly is a very important area of research. How to design organizations in developed countries as well as developing countries which can grow and change adaptively in the face of uncertainty as the needs of the users and as the concerns of the public change over time. We have, in the transport sector, very inflexible organizations and in another workshop on systems analysis and planning there was a very clear concern that the planning process itself has to recognize this and as a consequence becomes much more focussed on short range operational planning, to the total neglect of long-term consequences.

*Mr. Frybourg*

Je crois qu'il faut distinguer, dans les incertitudes que nous rencontrons, deux niveaux et pour chacun de ces niveaux les contremesures que nous pouvons adopter sont différentes. Le premier niveau concerne les paramètres extérieurs au transport, qu'ils soient économiques, démographiques ou sociaux. La connaissance de cette incertitude nous conduit évidemment à donner moins d'importance peut-être à une planification fine à long terme, pour se concentrer davantage sur les étapes intermédiaires et les aménagements progressifs.

Je crois également qu'il faut que nous développions les méthodes interactives ou itératives, et il faut, pour bien suivre ces cheminements, ne pas éviter la recherche sur les rapports de force dans le processus des décisions et spécialement la signification des conflits dont l'aménagement de l'espace et les transports sont l'enjeu. C'est à travers cette recherche de type institutionnel que l'on pourra développer la nécessaire relation entre la politique et la technique. Le deuxième niveau d'incertitude concerne les méthodes scientifiques dont nous disposons. La diversité des méthodes qui ont été exposées ici, montre à quel point actuellement les experts s'interrogent sur la nécessaire refonte de la méthodologie dont nous disposons.

Nous avons notamment vu triompher les modèles dits désagrégés, mais si nous poussons la désagrégation jusqu'à sa limite, c'est la notion même de modèle qui est mise en cause. Il faudrait, pour nous permettre de progresser dans nos méthodes d'investigations, que nous améliorions la collecte et la mise en ordre des données de base. Celles existantes reflètent trop les préoccupations internes, commerciales et financières des exploitants de transport; elles sont souvent difficiles à utiliser pour la recherche, particulièrement intermodale. On a pu même constater dans certains cas que les données nécessaires pour la recherche ne sont pas disponibles, car elles ne correspondent pas à des préoccupations de gestion sectorialisée.

*Mr. Silverleaf*

You asked me how we saw the impact of transport on the economic and social changes which we were discussing. From the papers given to the conference, from the discussions, from the summaries that we have had from chairmen of sessions, I draw certain general conclusions which may not be supported of course by everyone. The first is that I see a declining perhaps even a terminating trend and that is the belief in high technology as providing a major contribution to the solution of transport problems. We can see this throughout the world in urban transport in developed countries and equally perhaps in road construction methods for developing countries. It is perhaps however more true for ground transport than it is for air and sea transport, where I think there is still probably a higher belief in advanced technology as a natural continuing trend. Secondly in contrast I see a growing trend in making the best possible use of what we have and that means as Mr. Mannheim was saying a move from interest and investment in infrastructure towards operational procedures.

I think that there has been throughout our conference a recognition that in transport and in transport research, we are paying much more attention now in the last few years towards moving people and goods rather than counting vehicles and finally we can see a clear recognition that transport decisions and investment must be related more closely than in the past to broader policies, both urban policies and rural development policies and that I am sure that we shall find a growing recognition of the need not to consider transport as an end in itself or as a stimulant in itself but as part of a much more comprehensive group of development investments.

*Mr. De Waele*

La politique des transports des dernières années n'a pas résolu grand chose. Comme vous le savez très bien, le problème des chemins de fer s'est aggravé, le problème de nos villes s'est aggravé, le problème des subsides s'est aggravé, tous les problèmes se sont aggravés. Donc, il ne fallait même pas une crise ou ce que vous appelez l'incertitude pour avoir des préoccupa-

tions politiques et par conséquent de appuis dans la recherche. Mais cependant il y a quelques éléments neufs qui m'autorisent à peut-être proposer des thèmes de réflexions qui de toutes les manières complètent ou soulignent simplement ce qu'ont dit mes collègues déjà. En effet ces dernières années au niveau de nos budgets d'Etat, nous constatons un transfert assez sensible de moyens en faveur d'une priorité que nous avons dû donner à l'objectif social parce qu'il s'agissait de maintenir le pouvoir d'achat d'une partie de la population qui risquait de s'appauvrir ou même de n'avoir plus d'emplois du tout.

Ce qui a eu comme contrepartie par exemple que dans beaucoup de nos pays à un certain moment le trafic de marchandises a sérieusement diminué tandis que le trafic de voyageurs a continué d'augmenter.

Ce qui a comme conséquence également que très souvent au niveau de l'individu, le citoyen n'est pas conscient de la crise que connaissent seulement les entreprises et les Etats. C'est une réalité très importante qui a comme conséquence que les investissements devront être sélectionnés par des critères plus affinés. Il s'y ajoute le renchérissement du transport qui intervient à un moment particulièrement fâcheux pour des raisons de coûts de la main d'oeuvre et là il y a peut-être un thème à développer beaucoup à l'avenir. C'est l'économie des trois-quart du coût des transports. Nous avons écrit des bibliothèques sur l'infrastructure, sur des choses tout à fait subsidiaires, mais la part essentielle du transport, c'est l'homme, c'est une énergie qui aux chemins de fer coûte douze fois plus que l'énergie dont nous ne cessons de parler et qui en termes constants n'a pas varié pendant les dernières années en effet la main d'oeuvre en 1970 comme en 1975 coûte aux chemins de fer 10 à 12 fois plus que l'énergie proprement dite. C'est donc là un thème de recherche.

#### *Mr. Harral*

On the basic question what is the impact of transportation on the social and economic problems of the next decade the main point I would like to indicate is the emphasis and the role that transportation development will play in developing rural sectors in the poor countries. Certainly we foresee a major increase in infrastructural investment in that particular area but we have to look beyond just transportation to the other sectors and the complementary investments and services which must be provided.

#### *Mr. Baffour*

There is a steady decline in the foreign currency earnings in most of the developing countries for reasons other than transportation.

There is a steady drift from the rural areas to urban centres, imposing considerable strain on existing transport, particularly with respect to road transport, and its effect on agricultural and other infrastructural work development in the developing countries. I foresee a greater need for investment to increase the social and economic standing of rural areas to reverse the drift, to improve transportation, the distribution of commodities, particularly for the feeding of the people, which is essential to any meaning of development at all in a developing country. This would claim priority of attention to subsidizing transport and so the need for a long term planning in developing countries, the planning of roads becomes of great importance because it might be necessary and I think it is essential for a country to spend more for constructing better roads of lasting value, than short term planning involving extensive amounts of money annually in repairing and maintaining poor quality roads.

#### *Mr. Frenzel*

We do not have many possibilities for new main lines we can follow up, especially in the much developed countries. We have so much infrastructure, we have so many operating organizations, most people are used to use traffic and transport systems. Traffic and transport is no matter for specialists, everyone uses it every day so we must make clear what we think, what politicians should think and what people wish to have, and these wishes should be identified.

#### *Mr. P. Patin, France*

Je suis venu à cette conférence mondiale sur la recherche dans les transports un peu sur la foi du titre et sur la foi du menu. En ce qui concerne le titre je pense que quelqu'un qui nous verrait de l'extérieur se demanderait si la recherche dans les transports est vraiment limitée à la politique et à la socio-économie. La technique, on n'en a pas parlé, je pense qu'on ne devrait pas en parler beaucoup, mais peut-être aurait-on pu y faire quelques allusions.

Je suis venu aussi, je le dis, en fonction du menu et justement je reste un peu sur ma faim, pour conserver une comparaison gastronomique.

Précisément je m'attendais à ce qu'on nous donne des directives. Tout à l'heure je crois que c'est monsieur Silverleaf qui a parlé d'une baisse dans la confiance dans la technique. Pendant quelques années, dans la dernière décennie, on a laissé faire les techniciens.

Les techniciens commencent par inventer et ensuite construisent un moyen de transport autour de leur invention. Ce n'est pas une bonne méthode.

J'ai un peu l'impression que les problèmes n'ont pas été posés. Le rôle des politiciens c'est de se tourner vers nous, techniciens, en disant ce qu'il faut faire.

Faut-il que nous donnions par exemple en matière de transport urbain de la vitesse, du confort, de la capacité, de la fréquence? Nous ne le savons pas. En matière de transport interurbain, faut-il donner de la vitesse, faut-il faire de l'économie d'énergie, faut-il faire de l'économie de personnel comme Monsieur de Waele l'a dit tout à l'heure, nous ne le savons pas. Tout à l'heure Monsieur de Waele a parlé du coût du personnel. Biens sûr c'est 12 fois celui de l'énergie mais si nous prenons les pays dits en voie de développements, ils ont de l'énergie, ils ont du personnel et en général le personnel ne risque pas de manquer, au contraire, il y a du chômage.

Par contre, l'énergie commence à manquer partout. Alors que faut-il faire? Est-ce le personnel ou l'énergie qu'il faut économiser? Voilà toutes sortes de questions que nous nous posons et sur ces questions il me semble que nous restons un peu sans réponse.

#### *Mr. M. Esteve Rios, Spain*

J'approuve Monsieur Patin à propos du fait qu'ici il manque l'étude de quelques problèmes que je trouve fondamentaux. Tous ces modèles sont très bien structurés, très bien étudiés, mais je crois que la plupart oublient une chose fondamentale. Au moment d'appliquer ces modèles il y a une institution, il y a un gouvernement qui exprime ses choix limités d'investissement. A mon avis la plupart des modèles, des idées qui sont exposées ici, ont oublié d'une façon assez nette tous les aspects économiques-financiers qui amènent à la réalité un projet concret.

#### *Mr. K. Vonk, The Netherlands*

We are sure that the world is moving and is moving rather quickly. There will be a certain shortage of materials, of energy; there is a shortage of money - inflation is a shortage of money - and that action is needed in a rather short time.

Politicians are not free in their choice, they are free to choose for confusion or for a certain equilibrium but that is the choice they have to make.

Research has to make clear to politicians that they are very limited in the possibility of choice if they want to avoid confusion. Research should not only deal with economic matters and technology but also with organization, organization of public matters, to bring together the development of law and the development of law at a point of social organization, the development of economic decision and the decisions about technology. These are three main points and if they are not followed, we are up to confusion within a decade what depends on the situation in the different countries and the different regions.

*Mr. G. C. Meeuse, The Netherlands*

Transportation is moving with a break-neck speed from bottleneck to bottleneck. I have learned much of the break-neck speed these days. The bottle-necks have been touched on briefly in this conference.

I should like to emphasize that in the coming decade more emphasis should be put on another aspect of transportation.

Transportation includes the movement, the conveyance, the transshipment and the storage. So trade transport models should include the storage aspects, because these could affect in a considerable way the reduction of waste of materials and of values, being the inventories, the stocks which are all around the world and which can be minimized considerably if transportation is developed in an optimization model.

*Mr. L. Sjoestedt, Sweden*

Is the adaptivity of the research society itself large enough to cope with a period of rapidly changing priorities. I should like to illustrate that with one example. During the last ten years there has been a great interest in developing completely new systems for transport, requiring also completely new infrastructure. But as Mr. Silverleaf stated, the interest in such new systems has diminished rather rapidly, which means that we are now interested in improving the existing systems.

This means that we are no longer dealing with complete systems, we are dealing with components of systems. And this changes very much the demand for professional skill from the research society. At least in Sweden we have noted that we now have a much greater demand for mechanical engineers than for civil engineers. And without going too much into this I think this might have something to do with these changed priorities.

*Mr. A. Hussain, Irac*

I want to make a comment on the attitude of transport planners and transport industry. I think there is one aspect which the transport industry has to look at in more detail and that is the depletion of resources. In the field of transportation, the traffic engineer, the transportation planner, the manufacturers and the decisionmakers are responsible for creating new standards. If we take as an example the energy use in urban areas and look at the way the energy resources are used by the vehicles, little has been done. Research has not concentrated on this matter. There are some institutes e.g. the TRRL that are doing research on commercial vehicles, the hauling system, that is using energy to its optimum.

Is it using this energy in the right way? So many resources are depleted. I can not see that there is an acceptance or an intensification of research in this field and I do feel that there is a need to broaden the field of the traffic engineer and the transport planner in this respect.

*Mr. Suchorzewski*

From the point of view of somebody who takes part in the research establishment in the field of urban transportation in my country and being to some extent responsible for the assignment of resources to different projects I am of such an opinion:

A lot of money has been spent during the last dozen or so years for about 500 products, aiming at the development of completely new or almost new innovative transport systems or elements of these systems.

And now we are in the situation of a great disappointment of the results which we achieved from new innovative systems as far as energy consumption is concerned. We can spend 10 or 100 times more energy if we accept some of these solutions or inventions.

Therefore an emphasis has been put to software solutions rather than to hardware solutions.

*Mr. Frybourg*

Je voudrais également intervenir sur ce thème de la recherche technique. Monsieur Patin, à juste titre, a constaté une absence quasi-complète d'interventions sur ce sujet, qui est bien un sujet de recherche dans les transports et cela tient notamment à une participation certainement insuffisante des industries du matériel de transport. Nous aurions souhaité que des chercheurs appartenant à cette industrie puissent davantage participer et c'est un point que nous devons garder en mémoire pour les prochaines manifestations. Cependant en restant au niveau de ce que certains appellent les caractéristiques fonctionnelles des systèmes de transports qui permettent d'orienter la recherche technique, certaines interventions ont confirmé plutôt qu'apporté des idées nouvelles sur ce qui peut être fait pour orienter cette recherche. Nous savions que dans le domaine des transports collectifs il est impossible pour fixer les performances de ne considérer que le seul véhicule. Il faut tenir compte également des conditions d'exploitation de ce véhicule, notamment des flottes et de la politique tarifaire, et il faut également tenir compte bien sûr des possibilités d'insertion de l'infrastructure. En dehors des difficultés financières qui certainement vont limiter les possibilités de réalisations de systèmes entièrement nouveaux, par rapport à la situation que nous avons connue dans les dix dernières années, il est clair que les systèmes de transports nouveaux, qui reposaient sur des infrastructures entièrement nouvelles et une automatisation très poussée, rencontrent des difficultés pour leur déploiement en site réel à cause des réticences des populations de voir insérer en surface une infrastructure entièrement nouvelle, et bien entendu de la baisse de motivations pour les objectifs d'automatisation, à un moment où les perspectives de l'emploi sont préoccupantes. Cependant, et ce point a été clairement établi, les gouvernements s'efforcent de ne pas fermer prématurément les voies prometteuses et par conséquent continuent à financer certaines recherches d'amont sur des composants ou des sous-ensembles des systèmes de transport qui sont apparus comme particulièrement importants, à l'occasion des développements passés sur les systèmes automatiques à cabine. Et cette recherche sur les composants qui n'engagent pas des moyens financiers considérables, si nous réussissons à la maintenir active, aura ce mérite d'avoir éventuellement des possibilités d'application sur les systèmes classiques existants, car les recherches sur les composants ne sont pas liées à un système particulier, et de permettre si les conditions évoluent, de redémarrer des travaux sur des systèmes entièrement nouveaux. Il est donc important de maintenir vivant le potentiel scientifique qui a été éveillé au cours de ces dix dernières années sur le thème des transports terrestres collectifs, thème qui avait été pour le moins délaissé dans

le passé, mais pour le maintenir vivant il faudra certainement davantage le concentrer sur les composants et les sous-ensembles que sur les systèmes entièrement nouveaux.

*Mr. Manheim*

I think the question raised by Mr. Sjoestedt is one that ought to be one of the main focal points of the discussion. Does the research community and the institutions in which we participate have the capability to adjust to a new era of dynamic change. Can we start searching for The single technology or The magic number of desired speed, can we stop searching for The best plan for the year 2000, can we stop training ourselves to only build facilities or build equipment instead. Can we design organizations. Can we, who are teachers or administrators educate students and personnel to be comfortable with a world in which there are no definite answers, in which next year's problems, next year's services, next year's budget and next year's organization may be very different from this year?

*Mr. Frenzel*

I will try to give some remarks to the question of energy.

There are a lot of studies as well as real improvements where we can improve existing systems or implement systems of less energy consumption. On the other hand there are some alternatives, for instance for fuels, on another basis than crude oil, hydrogen for instance.

Furthermore not by improving technology the best reduction of energy consumption can be found but in changing the organization of traffic and transportation of today as well as the behaviour of the users.

At least there are thoughts to solve the problems, to totally abandon traffic and transportation. For instance by new means as broad-band communication; no physical communication as in traffic and transportation.

I do not know whether it is possible to have meetings, not by sitting together physically but by telecommunication.

These are possibilities which have been studied and will be studied but there is no solution immediately as well as there is no solution immediately of these new technologies which were debated some years ago.

*Mr. Silverleaf*

I would like to return to the question Mr. Sjoestedt asked, a key question, which affects many of us here as individuals and to which Prof. Manheim added a few essential comments.

Can the transportation research community cope with the rapidly changing situation in which it has found itself and will find itself. Perhaps because I am an optimist by nature I want to give an unqualified yes to that question as an answer. I believe that the answer depends perhaps more than anything else on two factors.

The quality of the research workers in transport and not their initial disciplines and secondly the quality of the research managers, preferably in the research institutes. Many of you will know that the laboratory or research institute of which I am director has a staff of over 1000 and during the past ten years we have made, what we believe to be, radical changes in the nature and extent of our programme of work.

A whole new transport group e.g. has been essentially formed within that decade. But also we have changed the nature of the work in the traditional areas very considerably. All of it is now very much more policy-oriented, than project-oriented or technology-oriented. And we have done this partly by recruiting new people and expanding the range of disciplines within the staff so that

we have now sociologists as well as medical staff, as well as engineers, mathematicians and physicists. But we have done it more I think by changing the activities of those who came in with a totally or very considerably different purpose from that which they are now pursuing.

What we need to know is the direction in which we should go. We must have new directions, new policy objectives clearly set for us and sometimes also new criteria of success. I think if you had been working in technological research there is a natural assumption that if the child you create is not adopted by someone else and brought up and expanded, that you have failed. I do not believe that. Even in technological research if your research has shown clearly what would be involved in implementing the results of that research, so that the decision can then be made not to implement it and that decision is broadly and soundly based, you have succeeded as a research worker. Now that is an attitude that we have had to introduce and to convince many of our staff a few years ago when one or two projects on which many had worked hard were shelved, they felt they had failed. I do not believe that they feel the same way now. Provided what they do is properly recognized, they can feel a proper sense of success and are ready to move into new fields, new attitudes, new approaches.

*Mr. Noortman*

We were talking about the economic and social issues that will be of relevance in the coming decade and we discussed too the impact of these issues on our transport system and vice versa, the impact of transport on the economic and environmental development.

Now I would like to raise another point, namely given what was discussed before, do we have a reason to change the priorities in research compared to what has been done up to now. And in the second place is there enough communication between the research people and the decisionmakers to be sure that an optimum use is made of the know-how that is available and if not what measures should be taken to improve the situation.

*Mr. Manheim*

It is important to note that the discussion before the break did not imply a negative feeling but a positive feeling of a real challenge in terms of research priorities. There is a very important challenge in terms of adapting our research directions to these new circumstances or perhaps not so new as Mr. Silverleaf insisted. Mr. Meeuse for example talked about the storage of goods and there were papers in some of the sessions e.g. on rail systems research talking about the more effective utilization of existing resources, rail vehicles etc.

The same kind of research can be done in bus fleet management, in truck fleet management and looking at integrated multi-modal systems with a primary emphasis on the impact of service on users and of costs to the operator and with an emphasis on finding innovative ways to improve the operation of a system effectively. That is a very interesting research challenge in both the public and the private sectors, which requires new kinds of approaches, new methodologies, substantial new data; that is a very exciting opportunity. This reaches into the design of specific methods within operating organizations for utilizing this research and methods for getting this research established, accepted by the staff of operating organizations.

That to me is also an interesting research challenge which I find exciting and not negative.

*Mr. Silverleaf*

I like to agree very strongly with Prof. Manheim. In

fact I was surprised when Mr. Eldin suggested that there was a malaise among research workers. I certainly do not detect that in my own group and in any people I meet and I very much doubt that many of you here feel that transport research is in a bad way in that sense. I believe that there will be quite significant continuing changes in the directions of research and in research priorities. This morning at one of the sessions Mr. Hetman from OECD used a phrase about societal approach to technological problems. I think that perhaps this is a little too broad and equally perhaps a little too narrow, but I think that it does generally express the broad direction in which transport research will continue to go in the next decade. It will really be a societal approach to a wide range of technical and operational problems which will differ in emphasis according to the nature of the society for which the solutions are required.

We will not forget some of the key differences between developed and developing countries. That distinction of course being made only in economic terms and no other way. But I believe that broadly speaking this is the sort of way in which we would go. I will be a little more specific and quote two or three examples. One is the greater emphasis on finding improved operational methods for conventional means of transport, both in urban and in rural situations. There will be a need for research to give us a better understanding of individual transport requirements and equally how to aggregate these in a way which will lead to socially acceptable policies. The third point I would mention is perhaps a negative one. I think that in setting our research priorities within a broad transport in the next few years, we need to avoid to put an excessive emphasis on what appears to be very major problems at the moment. It may turn out to be no more than transient difficulties. As we have been reminded not only does transport itself has a long time history but so does transport research. And I believe that we could make the mistake of concentrating too much attention on problems which are not perhaps as important as they seem. There I suggest that energy requirements for transport come into that category. I have myself never believed even when I did fail to get any petrol for my own car for a couple of days, that there was a crisis of the kind that was being described. I believe it illustrates one of our dangers but we do not think sufficiently about identifying the broad long term purposes of our research and which could easily be diverted into short term irrelevances.

If we do that we will fail to put enough effort into what may really be the basic enduring problems.

#### *Mr. Baffour*

There is a serious challenge to research work in developing countries. Particularly more at this time than later because we are faced with the problem of laying down higher standards and producing better results, utilizing research findings more closely than before.

It was comparatively recently that heavy equipment has come into use for roadbuilding, therefore placing emphasis on specialization, mechanical engineering, handling of equipment and managerial organization.

The unfortunate situation is, that the governments of developing countries as I said before, are finding it extremely difficult to finance these new roads, because it does really mean that what they would spend on these roads will have to be taken out of other priorities in the socio-economic situation of the countries. And therefore it does mean that research has got to go in the direction of finding substitutes for materials that have to be imported.

These are the challenges that face research organizations in developing countries and what I know of them is

that they are equal to the task but a great deal more depends on what assistance they can get in the way of exchanging experience with research organizations in developed countries.

#### *Mr. Frybourg*

Mon intervention portera sur deux points, le transport international et les modèles. A l'occasion d'une conférence mondiale, il me paraît normal de mettre l'accent sur le problème du transport international.

Il fait appel à de nombreux acteurs, les états, les transporteurs, les chargeurs, les pays développés et les pays en voie de développement. Le transport international est le support d'objectifs nombreux, le commerce extérieur, moyen du développement économique, l'indépendance, la possibilité pour les Etats de contribuer, en conservant leur spécificité, au progrès mondial. Les transformations dans l'économie mondiale permettent d'espérer l'apparition de pôles de développement dans des zones jusqu'alors considérées comme sous-développées, en Asie, au Moyen-Orient, en Amérique du Sud et dans certaines parties de l'Afrique.

Cette émergence est la condition d'un rééquilibre du transport international. Elle permet d'éviter un protectionnisme qui n'a plus toujours l'excuse de la faiblesse et qui aurait érigé un nouvel ordre coûteux pour tous. Mais encore faut-il que tous les forts anciens et nouveaux acceptent une réglementation qui réduirait les désordres cycliques et les effets de domination qui ne manqueront pas de s'exercer à l'égard de ceux qui restent faibles. Il y a là un domaine privilégié pour la recherche qu'il me paraît utile de mettre en évidence.

La deuxième intervention concerne les modèles qui ont toujours fait la joie des chercheurs. En bien ces modèles devront pour l'avenir davantage intégrer les informations provenant du fonctionnement actuel des transports et de leur évolution récente. Il faut donc rapprocher plus que nous l'avons fait dans le passé ce que l'on a appelé la planification opérationnelle et les grandes fresques de l'organisation de l'espace à un horizon éloigné. Pour cela nous savons que nous manquons encore cruellement de données adaptées à l'approche plurimodale, qui s'impose si l'on veut continuer à donner à l'analyse des systèmes de transport et de leur interaction avec l'organisation de l'espace, l'ambition et le sens qui nous paraissent indispensables à une meilleure insertion des transports dans les objectifs généraux de la collectivité.

#### *Mr. De Waele*

A la première question, j'ai répondu tout à l'heure. Je répète donc brièvement que les priorités de recherche à mon sens sont surtout dans la direction des études de motivations et dans la recherche d'une amélioration de l'information.

Mais pour moi le grand problème est celui de la communication entre la recherche et la décision: identifier d'abord le décideur ou celui qu'on appelle décideur, parce que en effet on appelle parfois décideurs une personne qui ne prend pas jamais de décisions. Cela peut être également la définition de l'homme politique, celui qui ne prend pas de décisions. C'est la remarque que Monsieur Patin nous a faite tout à l'heure: mais au lieu de supposer tout ce que les décideurs auraient pu demander, est-ce que il n'aurait pas été possible de le demander aux décideurs eux-mêmes.

Dans un gouvernement il y a à peine un ministre qui ne soit pas concerné par les problèmes de transport. Même ceux de l'agriculture et de l'éducation, ont de très bonnes raisons de s'occuper du transport. Ceci est un premier problème tout à fait typique des transports. Il faut savoir ensuite si ce sont les ministres qui prennent ces décisions,



ou si ce sont les groupes de pression derrière les ministres, à quel niveau le parlement travaille encore. Il faut également se demander quelle est la relation ministre-fonctionnaire. Bref il faudrait pratiquement démontrer tout le rouage d'une société bloquée pour voir comment se prennent les décisions, si on en prend encore et si en fait nous ne sommes pas plutôt propulsés par une série d'automatismes que nous avons créés. Pour ma part je pense que ce que nous appelons déjà depuis quelque temps incertitude, est essentiellement de la confusion politique, voire même de l'irresponsabilité institutionnelle. Je voudrais quand même essayer de répondre à la question, à supposer qu'il ait une identification des décideurs: que doit être le contact alors entre le décideurs et le chercheur? Puisque nous sommes dans des mutations rapides et que de toute façon le décideur est régulièrement confronté à des échéances électorales, je pense qu'il sera essentiellement concerné par des problèmes à moyen terme. Et il ne faut pas que le chercheur se trouve particulièrement vulgaire si on lui demande ce que peut faire un ministre, lorsqu'il n'a pas beaucoup d'argent, lorsque le problème est urgent et lorsque il voudrait quand même faire quelque chose. Je crois que ce sont des problèmes très intéressants et que par là le chercheur peut se rendre utile, indispensable ou tout simplement crédible, beaucoup plus qu'avec des démonstrations très savantes de grandes formules qui n'intéressent plus les ministres.

*Mr. Harral*

I will be a bit more specific and run over a list of several items that are of great importance for research on the problems of transportation in developing countries. These really constitute four broad headings of engineering research on low cost technologies, management research and management economic research, broader studies on the socio-economic impact of investments and finally urban problems.

Addressing first the issue of technological research for low cost and appropriate technologies I might like to take exception to certain of the remarks of my distinguished panel member Mr. Baffour on the issue of how to design strategies. There has been in recent years a great deal of research set in motion which will be continuing at least for another 5 years on the whole issue of highway design and making strategies looking at the costs of construction, maintenance and vehicle operating costs and attempting to identify economically appropriate or optimal design and maintenance strategies. I would like to submit that we do not yet know definitively the answer to the question that Mr. Baffour raised.

Is it in fact better to build roads to very high standards initially and in effect capitalize future maintenance cost streams or rather to build on very low standards and have to worry with the future maintenance. I might suggest that in the course of coping with uncertainties in transport and road investments one of the major tools we have is in fact time staging of investments. And certainly this is an important element in road construction policies.

There is the issue of the transferability of the research that has been set on the way in Kenya, Brasil and India and in other countries in the developing world and I might add that the research probably has almost as much meaningfulness for the rich countries of the world than for the poor countries, when we look at the poor state of knowledge, of management decisionmaking tools in establishing the levels of highway maintenance which is just as poor in the rich countries as it is in the low income countries.

The second area is the issue of appropriate factor mix in the various facets. We have looked at the issue of

construction of infrastructure, where we have in fact found that more labour intensive methods would appear to be economically feasible potentially in at least some 40 or 60 countries of the world. The next decade really should see the completion of several demonstration projects in various countries which will be the ultimate test of the feasibility of these methods in the developing world today.

Finally in the area of low cost technology I must draw attention to the problem of rural transport. Take countries such as India for example with one of the world's largest railway systems. Still the major mode of transportation there is the bullock cart. In other countries in Africa and Latin America, animals and indeed human portage are still significant means of transport in rural areas. There is need for investigation of the technological alternative, not advanced technology but the very simplest technology that helps to solve the problems of rural transportation.

Shifting now to the second broad area of management and economics research, I would merely call attention to the need for further integrated studies of the transportation process from the original manufacturer to the recipient of goods, a neglected dimension in the first half of the panel session. We do anticipate increasing specialization, a growing role of the developing countries in the manufacturing of many products.

The development of systems suitable for rapid transportation of manufactured products is something that must receive some attention. Also in this general area of research, the whole problem of subsidization of transportation. What is the role of railways, what is the role of public transport, what are the circumstances under which we feel it economically appropriate to consider the allocation of extremely scarce resources to the area of subsidizing modes of transport which would not otherwise be viable.

The third general area to which I would like to call attention is the problem of measuring the socio-economic impact of rural roads and rural investment generally. As I indicated earlier this is a major field of increasing emphasis in the developing world and further attention is needed there. I think it emerged from this conference that theoretical models of analysis have generally gone beyond the state of the data base and further understanding of these problems can really come about only through development of institutions for collection of primary data on the underlined phenomena.

Finally the issue of urban problems as we have indicated. The cities will be growing enormously, unlike the cities of Europe which are in a static situation. Therefore there are both opportunities and need for the research on land use planning and control as a measure for reducing transport demand. There is a need for further research on the role of public transport particularly as it effects the poor people and finally the role of the bicycle.

The poorest people in these countries will not have access to unsubsidized motorized transport. And measures to enhance the feasibility of the use of the bicycle in urban transport is perhaps one of the more important areas of urban transport research.

*Mr. J. H. Doyen, World Bank*

There is one assumption that seems to be prevalent among the panel members as well as the conference. Transport infrastructure is there and is taken for granted. The problem is to limit its expansion or to guide it and to use it to the best benefit of the people.

Now this may be very well so in the situation of the so-called developed world but it is far from being so in the situation of the developing countries. They are still struggling very hard with the establishment of their basic



infrastructure. Not only the establishment but also the maintenance of their basic infrastructure. And my conviction from working in these countries is that it will be increasingly difficult for these countries to expand the highway infrastructure which accounts for 80% in most of the countries for the freight and passenger transport. Not to expand this infrastructure but to conserve it. In many countries the highway infrastructure that is the primary network is regressing. I can name Peru, I can certainly name Zaire, a country which has gone through the various ranges of the developing process. And why is this happening?

Because the costs of maintaining the infrastructure which has been built cheaply as Dr. Baffour mentioned, are increasing. The traffic is increasing rapidly and so are the constant costs for the infrastructure just to be maintained in many countries. This would imply an increase in budget appropriation for strict maintenance and conservation of existing infrastructure to 10 to 15% per year.

There is tremendous pressure on the budget in these countries and the country cannot afford this. As a result in many countries, especially over the last 5 years, we have seen that there is a process of regression; what used to be paved roads are now gravel roads, roads which used to be graveled are now regressing to a state of deteriorated earth roads. And now this is giving particular relevance to the subject of research which Mr. Harral mentioned. The problem of managing a highway network, how to conserve this network from the point of view of government. There is so much money available, what should we do with it.

Should we put all in maintenance, should we do a mixture of rehabilitation and maintenance, should we wait until all the roads are down the drain and then rebuild them. This is a very real problem and it is not an isolated one and it is a problem which I can only propose as a subject which needs acute research. The problem what is the best use of a limited amount of money.

The other question which I feel should be the subject of particular attention in developing countries is the problem of the trucking industry, which accounts for sometimes more than 80% of the freight transport. Trucking industry has developed in an unregulated environment, an environment of regulation not being enforced. Now the problem of renewing the stock, expanding it to meet the demand implies the use of scarce foreign exchange resources.

How to manage the trucking industry? How much should be regulated and what is the experience in other countries?

Another problem is the partitioning of the trucking industry. There is a very modern part which is intermodal, the container and the trailer trucks, which are very expensive and foreign owned and foreign operated and on the other side you have very small truckers which have a very low loading factor. How to integrate this best. Tremendous saving can be achieved there.

#### *Speaker's name unknown*

J'interviens comme ressortissant d'un pays pour lequel les problèmes de transport ont une importance majeure. Il s'agit de l'Empire centrafricain, pays enclavé situé à 1.200 kms de l'Océan Atlantique et auquel tout ce qui est importation et exportation se solde par des coûts très élevés. Je suis venu à cette conférence comme profane car personnellement je ne suis pas versé dans ce domaine très technique que j'ai suivi depuis hier avec beaucoup d'intérêt. J'ai été donc désigné par mon gouvernement pour suivre ces débats et ensuite faire rapport sur les conclusions qui en seront tirées.

L'impression d'abord que j'ai, à la lecture du titre, est

une sorte de découragement car on parle des décisions sur les transports dans un période d'incertitude. Et il a été développé beaucoup de points d'incertitude. Mais j'ai en même temps tiré beaucoup de réconfort à la lecture de la deuxième part du titre -conférence mondiale sur la recherche dans les transports.

Je me permets de dire à mon niveau que la recherche en matière de transport, contrairement à ce qui a pu être dit, a beaucoup d'avenir, de perspectives, et M. Frybourg disait tout à l'heure en parlant de transports internationaux, que justement vous aviez beaucoup à faire. Aujourd'hui on parle de restructurer le monde, on parle d'un nouvel ordre économique international et un monde dans lequel on espère que chaque Etat apportera sa contribution de par ses ressources naturelles etc. Aujourd'hui on se plaint de manque d'énergie. Mais le manque d'énergie n'est pas certain car il y a encore des pays dont les ressources énergétiques ne sont pas encore exploitées. Ces pays ne demandent qu'à être développés dans leurs moyens de transport pour que à leur tour ils puissent apporter leur contribution. On a parlé des difficultés bien sûr dans le transport urbain des pays Européens. Mais dans d'autres pays, la plupart des pays d'Afrique, d'Asie et d'Amérique, ce n'est pas seulement le transport urbain, c'est le transport rural, c'est le transport pour développer l'économie nationale, et cela est vrai plus particulièrement pour les pays enclavés dans l'Afrique et il y en a un certain nombre, comme le Niger, le Mali, la Haute-Volta, le Burundi, le Rwanda, l'Ouganda, le Centrafrique etc. et en Amérique également; ces pays-là, quoique actuellement dits sous-développés, ont en réalité des potentialités que demain peuvent contribuer à l'enrichissement du monde. On peut ajouter aussi une note d'utopie. Je pense que les chercheurs devraient être considérés un peu comme des utopistes et dans cette perspective je ne pense pas qu'on puisse voir la chose avec pessimisme.

Et je dis donc, comme l'a dit tout à l'heure Monsieur de Waele, que peut-être il y a des difficultés qu'il faut résoudre du côté des gouvernements. Il y a des problèmes politiques et des problèmes financiers, mais il y a peut-être aussi lieu de penser également au statut des chercheurs; il serait peut-être intéressant de trouver un statut international pour les chercheurs qui seraient indépendants des gouvernements et qui pourraient alors faire des recherches sur les routes dans les pays riches, dans les villes etc. et qui constitueraient une banque de données dans laquelle les Etats iraient puiser suivant le cas.

On pourrait donc concevoir dans cette perspective d'un nouvel ordre économique international que les chercheurs indépendants -vous êtes certes indépendants, mais il faut tenir compte des enveloppes financières qu'on vous propose- internationaux et non représentants de tel institut national, mettent à la disposition des gouvernements des données exploitables, suivant les moyens financiers et les données politiques de chacun, pour contribuer à leur développement. On doit concevoir le développement du transport comme lié au développement des Etats, comme lié à l'établissement d'un nouvel ordre économique mondial et dans cette optique, les chercheurs dans le domaine du transport international ont beaucoup à faire et on peut leur souhaiter bonne route.

#### *Mr. D. L'Huillier France*

J'ai l'impression que si on pouvait arriver à cette conférence avec l'idée que le transport était en accusation, on a tendance à terminer avec l'idée que la recherche dans les transports est, elle, en accusation. Je ne pense pas qu'il faille quand même faire preuve d'un peu trop de masochisme, tout n'est pas perdu. Je pense surtout que

nous avons réalisé peut-être un peu tard que le transport en lui-même dans l'activité économique et sociale est un prélèvement sur la production sociale, sur la plus-value ajoutée chaque année à une société donnée. Mais c'est un fait qui a existé de tout temps, il a été masqué parce que peut-être la croissance de la mobilité, de l'échange et de la division internationale du travail a fait qu'on essayait de produire toujours plus de transport pour produire toujours plus d'utilités de biens économiques et de services. Alors peut-être effectivement, comme le disaient Monsieur Harral et Monsieur Frenzel, il est temps de se demander si on peut pas vivre mieux avec moins de transport en changeant les structures et je propose que l'on fasse des modèles sur les voyages évitables, "the avoidable trips". Cela pourrait être un concept intéressant justement pour voir dans quelle mesure, il est possible en analyse de système de réagir un peu contre une croissance anarchique du transport. Et je pense que dans cette optique globale il serait intéressant de faire porter notre étude sur tous les phénomènes de captivité qui existent à l'intérieur du système de transport.

Et pour terminer sur une note optimiste dans le domaine de la recherche, je pense que s'amorce aussie cette nécessité d'interaction, non pas seulement entre les politiques et les chercheurs, mais à l'intérieur du milieu de la recherche lui-même. Je pense que nous devons être prêts à adopter une attitude véritablement transdisciplinaire qui fasse travailler ensemble des gens d'horizons différents et sur des problèmes semblables, comme le disait Monsieur Silverleaf, mais également que nous devons accepter le fait que différentes approches méthodologiques, voire parfois idéologiques, peuvent contribuer au meilleur éclaircissement de l'infini diversité de notre champ.

*Mr. A. Kanafani, U.S.A.*

At the risk of striking a pessimistic note I think it would be productive for us to recognize that research is limited in its contribution towards solving transportation problems. I would like to propose that some of the most difficult problems and questions in transportation planning, particularly long range transportation planning, can only be answered by the imagination and foresight of decisionmakers. I think that these are things that cannot be researched and I would appreciate hearing various comments from the distinguished panel as to how they see the limitations of research.

*Mr. P. K. Wheeler, U.S.A.*

I would like to take two remarks of the panel out of the context and just say a couple of things briefly. One was that the research should be more in policy, should be more responsive to the wishes of the users and second that policy objectives need to be more clearly set for the researchers.

I think the first, the wishes of the users are clearly being expressed in a system where research costs are not being charged to the users. There have been a lot of national interests, a lot of sectional and industrial interests and the response to the present system, that is the way users are expressing their demands, may be very misleading. We should always pay very close attention to this distortion within the transport sector and often between various modes.

The second point I would like to mention is that the decisionmakers have some uncertainties also and it is very difficult to put forward an operable, a sustainable policy objective. It is very hard to formulate one and it is very hard to attach one to a real world situation. I think this may be asking too much of a decisionmaker. I have spent the past two years trying to find some clear-cut policy objectives expressed in the will and doings of our

legislative bodies and I have yet to discover anything of this nature. However research, while not making the final decision it needs to become much richer, it must contain more alternatives and more broad views of what the ramifications of pursuing various policies will be.

If research can do this, then the decisionmakers will have a much richer background, when a policy decision comes along. I think research must also attempt a bit more to the institutional factors in the transportation sector. It seems to me that researchers should quit taking the institutional setting as given. They must be able to really look through some of the regular things like licencing, labour practice and modal separation problems and suggest more solutions in those areas.

*Mr. A. L. Webster, U.S.A.*

We have become increasingly aware of both financial and social aspects of transportation, but on the benefit side we are still operating somewhat in the dark ages. I suggest that mobility is one form of freedom. It allows us to increasingly live where we are most comfortable, to work where we are most productive and to play where we have the most fun.

We need to have ways of assessing the value of such attributes. In an economic sense transportation makes possible the acquisition of resources from a broader field, makes possible reasonable specialization, economies of scale of production, increased competition in markets, thus it can mean greater choice at less costs for all of us.

We need to be able to estimate such benefits. In an uncertain environment we may do very well to concentrate on processes rather than on a series of improducts. For instance I would pose the following questions. How can we improve the market and governmental procedures by which resources will be allocated to the evolution of transportation in the future.

Can we cut off the ways in which markets fail and design ways to ameliorate the conditions and to make the part-markets operate more perfectly in allocating resources to transportation and society.

Can we design methods of governmental regulation, research allocation which complement more perfect markets and encourage evolutionary transportation developments which are increasingly in the broad public interest. I think Mr. Harral touched on this when he commented on subsidy for instance. In summary an orientation where we try to maximize the social profits of transportation rather than think in terms of least-cost systems may be warranted.

*Mr. Noortman*

The topic of our discussions was decisionmaking in an age of uncertainty. We started to discuss what are those uncertainties, and a whole range of them were presented this afternoon. There was one certainty and that is that there are uncertainties and we can even locate them, at least the most important of them. Only we do not know at what time they will be of serious importance and in what direction exactly they will go. There were some pessimistic elements in it, that is the widening gap in economic development level between the now so-called economic developed areas and the less developed areas. There was a rather pessimistic uncertainty, that is to say to what level unemployment will increase. Probably it is an uncertainty that it increases. Perhaps pessimistic as well was the statement that we will be confronted with a migration from the rural areas towards the more urban areas. From several points of view you can consider that as a negative development.

On the other hand, more positive, the trend to social equity, trends to better understanding, that we have a

world responsibility to cope with the problems we are confronted with in the future. To cope with them from our responsibility as a human being as a member of mankind.

On the one hand the responsibility of decisionmakers. They have to come to decisions. It was mentioned that we know a lot of decisionmakers, but where are the decisions. Not taking a decision is a decision as well. So how uncertain the future may be, the decisionmaker has to go on, or he has to step aside. The researcher has to try to give him support as much as possible from his professional know-how. Therefore the increasing importance of policy oriented research, not ivory tower research, but policy oriented, down to earth, willing to abandon old fashioned approaches, willing to start new ways. A lot has been explained these days about what was wrong in the ways we went in the past and what are the possibilities in the future.

A whole list of wishes was formulated during the discussions. Not all these wishes can be answered. Certainly not at the same time. But anyhow there was a general trend to optimism. Optimism that we are able to cope with the problems we are confronted with. That we are not denying to chose new roads to the future.

There are enormous gaps in our equipment. There are enormous gaps in our know-how but at least there is the willingness to go new roads and to go those roads together. Not isolated but on a world-wide scale.

I think that this is a very positive point.

What trends can we see in new research developments. I think it was a common opinion during the discussions that we need multi-modal approaches, that we need multi-sectoral approaches and multi-disciplinary approaches. It has the danger that we are trying to broaden our models in such a way that we can embrace all the problems at the same time. That is an impossibility. We will have to make some abstractions, but anyhow we understand the necessity to see transport as a part of a much wider field of decisionmaking. A much wider field of economic and social activities. It was mentioned that transport is not the point of how to move vehicles. The point is to transport human beings and goods from origin to destination.

We want to look behind the actual transport activity. We want to look into the systems that form the basis of our total activity.

In order to do that it is necessary to improve the communication not only between the research people but certainly between the research people and the decisionmakers. That means and it was mentioned several times, that research should use words that are to be understood by people, normal human beings; they should not talk in a mistic way, they should not talk only in a jargon that cannot get beyond their own studies. At the same time it is expected from the decisionmaker that he is willing to formulate precisely his problem. Only then it is possible to communicate. And this trend to humanize research underlines the necessity not to think so much in the development of master plans or short term plans but in the necessity to train human beings to form organizations of research people that are able to build continuous flows of research results to the world's decisionmakers. Especially in the period of uncertainty it is impossible to do a job once and then go to rest. To be flexible it is necessary to create a continuous flow of information. Otherwise the decisionmaker cannot make use of the research results. He needs his answer today. The answer for the next years has only historical value.

We cannot isolate research from training. What sense does it make to ask people to develop very highbrow systems and methods if not at the same time in the area where the model has to be used the people are available

to operate with the model. It should be integrated as well in the area where the models should be used. And a continuous effort to combine research and training should be recommended. And I think just to bridge the gap between the researcher and the decisionmaker it is vital to come to more simplified procedures than using research as a tool to support the decisionmakers, whether it is a political decisionmaker or a manager. Simplify procedures that make it possible to get an answer today on the problem of today. This does not mean that we should return to naive models. The simpler the procedure, the more serious research efforts are necessary to develop these simplified models.

The more simple the model, the broader the basis must be in research to create this operational simple model. It is not the researcher that has the responsibility for decisions. It is the political man and it is the business man that has to take his decision. If policy-oriented research sets a task for the research people it has to make this research more human and I understand that it is not in the first place necessary to concentrate on new technological research. To make the optimum use of available resources means optimal management. Let us understand that this does mean new roads in research. If you are obliged to develop better management information systems that means at the same time that you have to create new resources as input for your more policy-oriented research models. The more sophisticated these models are, the broader is the stream of empirical information which is needed as input for those models. The marriage of management information systems and policy-oriented systems is a happy marriage. I have the feeling that we made a step forward. A step on a very long road, but as long as we are willing to go together on that road I am convinced that we will make progress. It will be possible to transpose the research results to other areas, not only from developed areas to developing areas but the other way round as well. It will be necessary to create new forms of communication between research people. It is necessary to come to international research institutes that are independent from governments. Some institutes are already existing.

It is more important to open the ways to reach these research institutes and to bring their efforts together.

I would not like to end this conference without thanking the people that have given their effort to bring the results we have in front of us. I would like to mention in the first place the authors that presented such excellent papers. I would like to mention the chairmen of the sessions. I would like to thank the members of the panel that did such a very good job, the steering committee that made such an effort to make the best of this conference. Last but not least I would like to thank the secretary of the steering committee Mr. Visser and his staff that after all had to do the job and also I would like to thank the interpreters.

This is the end of the formal part of this conference.

*Mr. Suchorzevsky*

I would like in my own name and I am convinced that all participants would also join me to express the warmest thanks and feeling of gratitude to the host country, to its government and the institute involved. To all the Rotterdam people, to the organizers of this conference, to the steering committee, technical staff and interpreters for everything they have done to make this conference not only an interesting and successful but also an exciting and unforgettable event. I feel that special thanks should be expressed to two people, one is the secretary of the conference Mr. Visser, the other is Mr. Noortman for his excellent leadership.