

# Social assessment of technology and its application to urban transportation

by

FRANÇOIS HETMAN

Organization for Economic Co-operation and Development

Technical change derives from the inherent endeavour to modify the outside world so as to smooth out the risks of existence. By challenging nature with his crafts, Man has progressively created a functional link between science, technology and economy. This has led to societal systems where technology is geared to maximising economic growth and the average expectancy of material well-being.

## MAN-MADE SYSTEMS

As a matter of fact, technology has been the major factor in liberating man – at least in technologically advanced countries – from his main ancestral fears, hunger, illness and insecurity. This seems to explain why technology has won support from all sides. It has come to be considered as a kind of bounty, transcending individuals and societies as an autonomous force.

However, such a fatalistic fostering of technology and of its unconditional diffusion has led to new threats to human existence, such as nuclear destruction, ecological disaster, depletion of natural resources, malnutrition owing to the failure to curb the population explosion. At the same time, technical change makes obsolete whole categories of knowledge, production processes, professional skills and occupational patterns. This gives rise to economic and social disruptions, and a feeling of frustration both on the social and individual levels.

Thus, as a consequence of the very “success” of scientific research and technological change, mankind is now faced with new risks and dangers. These are man-made. There are no natural or supra-natural correcting mechanisms which can be applied. From now on, men will have to come to new terms with technology-induced human systems and devise new ways of bringing technological innovation and proliferation of techniques under some kind of social control.

This runs counter to a largely accepted and almost unquestioned conviction that technology is a basic factor of social change which acts upon society in an irresistible and self-enhancing way. Such a conviction is commonly held by the followers of most prevailing political doctrines and is based on several currently admitted views.

## TECHNOLOGICAL DETERMINISM

An oft-repeated contention is that technological innovation is by definition a self-contained process. By its inner logic – i.e. the pursuit of an improvement in a specific performance or an increase in productivity – each separate technology creates opportunities for constant innovation. In a sense, innovators are merely the “revealers” of new and gradual steps forward in a basic trend along a given functional trajectory. Further, technological innovators are stimulated by scientific discoveries which become available through research and de-

velopment, while scientific research in turn is stimulated by the firmly held belief in scientific freedom.

Dialectically, this technological determinism is frequently opposed to the apparent capriciousness and instability of social phenomena. Such an opposition is interpreted as the progressive inability of man and society to adapt to the pace set by technological development. According to this interpretation, while technology is advancing at an accelerating pace, human adaptability and social structures in general are stagnating if not actually regressing. This discrepancy ends by provoking a feeling of frustration which contributes to accentuating the lack of confidence in existing social institutions and to the prevalence of a gloomy view of increasing alienation.

Whatever the grounds on which this way of thinking is based, it reinforces the thesis of technological determinism in that it accepts as evidence that human, social and ethical phenomena lag behind technological developments. It implies that social problems tend to derive from technological change. Impacts are generated by technology and move in a linear fashion from technology to society. Society merely reacts, through feedback loops, in a rather haphazard and incongruous manner.

Arguments like these reveal a basic misinterpretation of the essence and societal role of technology. A comparison between the rates of technological advance and the evolution of society is quite irrelevant. Technology is only one method for coping with various social problems – one of the possible methods. A given technological development can provide an improved means, but cannot determine the rationale and content of a social achievement.

## NEW ATTITUDE TOWARDS TECHNOLOGICAL CHANGE

The new threats and problems created by technology make it more and more obvious that “technological” change does not automatically and necessarily mean “technological” progress, real economic growth and still less an actual increase in social welfare and human satisfaction. Conventional criteria of economic growth appear to be of limited significance and the so-called indicators of “progress” are increasingly contested.

Consequently, new tools for decisionmaking in the field of technology are needed. Since it has been recognised that technology can be the source of both benefits and undesirable effects, a drastic change in thinking and general attitude towards technological change is now taking place.

This calls for a new course of policy for which neither governments nor individuals have been prepared. Governments continue to favour technological innovation as a means to attain and maintain full employment of available resources and sustained economic growth. At

the same time, they are solicited to take strong action to reduce the negative effects of technology, and above all, to define new policies likely to make it possible to direct technology towards socially desirable ends.

How can such broad and diffuse, fundamental but also partly contradictory goals be pursued? As an answer to this question a new aid to decisionmaking has been suggested: technology assessment or rather social assessment of technology (SAT).

The term was coined some ten years ago by the Science, Research and Development Sub-Committee of the U.S. Congress. It was then defined as a form of policy research, a method of analysis that systematically appraises the nature, significance, status and merit of technological progress with a view to identifying policy issues, assessing the impact of alternative courses of action and presenting findings.

As the notion spread, various activities and conceptual constructs have been subsumed under the same label. However, a review of the experience gained suggests that there are two main tendencies diverging in approach and basic philosophy.

### CHALLENGE TO ANALYSTS

The first tendency can be called the technologist's approach. It considers that technology assessment examines the impacts of all alternative policies which can be followed, but does not come out with a specific recommendation involving value systems. Assessment ends at the frontiers of the broadened technological analysis, leaving the rest to traditional, existing, social and political processes.

The second tendency, on the contrary, regards management of technology as a part of overall planning or "social engineering". In its extreme formulation, it starts by spelling out values, social policies and objectives and works down to technology assessment in order to clarify the most appropriate technical options.

These two points of view may be considered as extreme lines of definitional mapping between which social assessment of technology can take a great variety of forms. They are not mutually exclusive but rather complementary as they address themselves to the same cluster of problems, but from a different angle and at a different level of the decisionmaking process. At the present stage, both challenge scientists and engineers to develop a better understanding of inter-relationships between technology and society. They also challenge decisionmakers, from individual organisations to central government, to evolve new procedures and institutional forms which can help them to build up a firmer basis for their technology policies.

Such procedures and mechanisms should serve to indicate new directions for technology and for scientific research. They will also have to make clear the possible detrimental effects at an early enough stage for remedial measures to be considered by policy-makers. However, the difficulty is to ensure that policies and instruments are not so rigid as to hamper technological change and inhibit genuine social progress.

Theoretically, six main areas can be identified as starting points for technology assessment studies: technology, economy, society, the individual, the environment and value systems. However, for some of these and particularly for society, environment, the individual and value systems, there is as yet little knowledge available on relationships with technology. Most frequently, therefore, technology assessment studies are merely divided into two broad categories:

- (a) technology-initiated, and
- (b) problem-initiated.

In a broad sense, from the technologist's point of view,

the great majority of assessments are technology-initiated whereas from the social engineer's standpoint most assessments should be considered as problem-oriented.

Available examples of technology assessment studies are mostly of the technology-initiated type. This can easily be explained by the fact that the first generation of assessment took place in direct response to questions concerning the particular environmental impacts of selected technologies.

### CHALLENGE TO DECISIONMAKERS

The concept of social assessment of technology leads to a reappraisal of the role of science and technology in contemporary society, both with deeper understanding of the nature of technology, and of the innovation process, as well as consideration of the consequences of alternative technological decisions and a new approach to a better informed decisionmaking.

Social assessment of technology can be defined as a process of analysis, forecasting and assessment of technological futures and their impacts on society resulting in action options for the decisionmakers. On the analyst's side, it encompasses the study of technological parameters, the elaboration of technological forecasts, the analysis of social, environmental, cultural and political factors, the general assessment of all relevant effects and possible consequences of a technology and an evaluation of alternatives.

On the decisionmaker's side, it implies appropriate institutional mechanisms which make it possible to: identify demands for technological change; gear scientific and technological knowledge to societal needs; make the choice of socially desirable and politically feasible technological variants; determine suitable means of action; plan the appropriate phases of implementation.

There is a close and permanent interplay between assessment study and decisionmaking. It takes the form of convergent iterations which are necessary to evaluate the consequences of technological change on society and to determine the channels through which the societal objectives can exercise their influence on the future course of technological development.

This can be represented as a threefold systemic approach which integrates the processes of analysis, of decisionmaking and of information into one dynamic continuum – as illustrated in the chart attached. The analysis process itself is a multi-iterative feedback process which combines forecasting and evaluation methods to explore relevant societal aspects, of a given technological development and to evaluate their impacts and consequences.

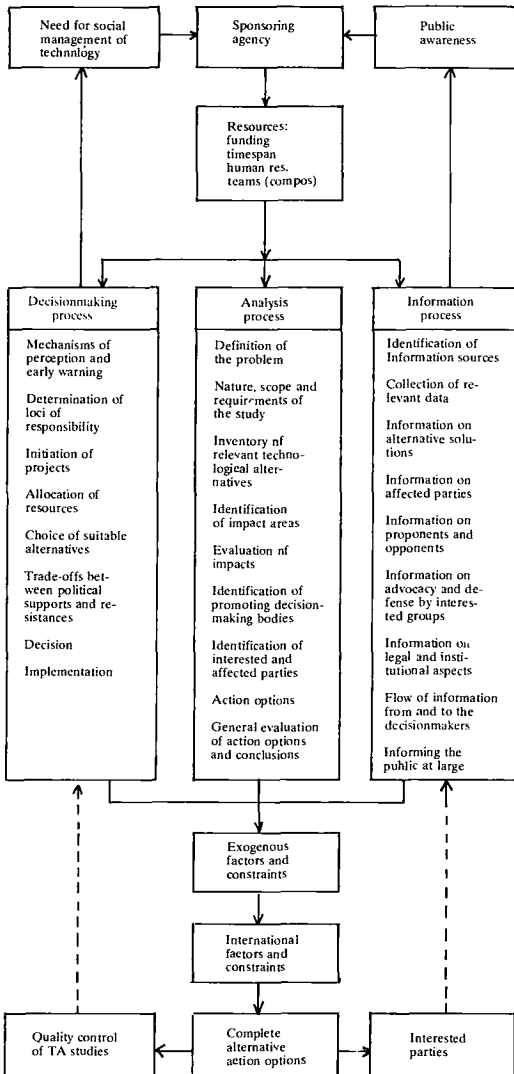
### INSTITUTIONAL STATUS OF SAT

Ideally, social assessment of technology should examine closely all virtualities of a technology. This implies that analysts are able to consider and evaluate all possibilities both as to their beneficial and negative effects. However, any new technological development entails an infinite number of unpremeditated consequences. There is no scientist or technologist who can take into account all of these consequences which go far beyond the capability of any group of people to understand and to draw the "social path" of a given technological event.

These are important and sobering limitations. It is obvious that social assessment of technology is not a technical device but rather a change in attitude towards technology and a new approach to a better informed decisionmaking in this field. It is not concerned with technical expertise per se but mainly with socio-political answers to the impacts of technology. If the analysts are to provide useful information their involvement, as-

sumptions, sources of data and methods of reporting to decisionmakers must be made clear so as to set workable boundaries to their effort.

What can be the institutional status of social assessment of technology? Is it an outgrowth of science and technology policy? Or is it a new branch of general policy stemming from the reaction to the "disenchantment" with science and technology and the subsequent questioning of the ends of scientific activity and passive acceptance of technological developments?



One would expect that it should be closely linked to technology policy. However, there has not been such a thing so far. From the institutional point of view, technology has no place of its own. Both in national governmental agencies and relevant committees of the international organisations, the word technology was only recently added to that of science. Although this marks an increased concern for questions of technology the couple, science and technology, remains illmatched. While government agencies for science policy are now established with pretty well defined attributions, this is not the case for technology. Deep investigations are still necessary to

understand the mechanisms of technological advance and of the interplay between technology and society before technology policy can be outlined in relevant operational terms.

## EXPERIENCE OF PRINCIPAL INDUSTRIALISED COUNTRIES

As a new concept and a new approach to technological change and social policy in general, social assessment of technology has still to find its place within the institutional set-up and decisionmaking mechanisms. It may therefore be of some interest to review shortly the experience of principal industrialised countries.

The most straightforward solution is to create a specific institution. This is the case of the *United States*. After five years of discussion, an Office of Technology Assessment was set up in 1972, under Congress with the aim of providing early indications of the probable beneficial and adverse impacts of the applications of technology, and to develop other coordinate information which may assist the legislative branch of Government. The Office started its activity in 1973. It has a limited in-house capability which is to be progressively extended, but contracts most of the studies to outside organisations.

As far as the executive is concerned, several governmental agencies undertake, or finance, technology assessment studies. Since the last reorganisation of the institutional framework for scientific and technological policy, the National Science Foundation is the most active in this field, in particular under its programme, 'Research Applied to National Needs' (RANN). The NSF contracts are widely dispersed among the various types of institutions; however, university groups have been preferred so far.

In the *Federal Republic of Germany*, a proposal to create a similar parliamentary institution as in the United States was made by the Opposition. This initiative was not supported by the Government and the final decision was postponed sine die. In the executive, it is mainly the Federal Ministry for Research and Technology that have for years done work related to technology assessment and is now financing important assessments in the field of transportation and communications. The Commission for Economic and Social Change – a study group with limited life-time which was disbanded last year – has financed a number of studies with a technology assessment character. A number of systems studies were carried out by the Nuclear Research centres in Karlsruhe and Jülich, the Studiengruppe für Systemforschung in Heidelberg and the Battelle Institute in Frankfurt.

Apart from the United States, the most active country in the field of technology assessment has been *Japan*. After the striking environmental deterioration which followed the forced pace of industrialisation, management of technology is considered now as an essential element in the future orientation of economic and social development. Technology assessment studies are undertaken in the executive by the Science and Technology Agency on one side, and the Ministry of Trade and Industry on the other. Since 1971, a number of studies were completed on subjects ranging from energy to transportation, building, telecommunications, pesticides, etc. Both agencies use both in-house capacity and outside contractors, in particular, universities.

In the *United Kingdom*, the Programme Analysis Unit has been working on specific evaluation studies since 1967. This Institution is financed jointly by the Department of Trade and Industry and the Atomic Energy Authority. Until recently, its main role was a technico-economic appraisal of R&D projects with a view to

guiding the allocation of government funds. During the last few years, it completed studies on topics of current interest, for example air pollution, inter-city transportation, security of vehicles, etc. These studies are generally confidential.

A special type of technology assessment study is constituted by some Public Inquiries which are held on the initiative of the responsible ministries. A well-known example is the large scale study on the siting of the third London Airport (known as the Roskill Commission).

In *France*, evaluating economic consequences of technical developments has been an intrinsic part of the planification process of the Planning Agency. Apart from this specific approach, some recent studies in the field of environmental protection and land-use can be regarded as technology assessment studies. The concept of technology assessment was introduced in 1972 into the activities of the working group, "Development of techniques and new technologies relating to the environment" of the Inter-Ministerial Group for Environment Problems. An important inventory of literature and technology assessment activities was realized under this Group.

In *Sweden*, a number of studies of technology assessment character were realized by the Office for Technological Development and the Swedish Academy of Engineering Sciences. Since 1973, social assessment of technology has been a central part of the activities initiated by the Secretariat for Future Studies, special staff service created under the Prime Minister.

In the *Netherlands*, in addition to specialised "planning" agencies; the Government created the Scientific Council for Government Policy, an autonomous body which is entrusted with study of future trends and societal developments. Establishment of research councils for future studies is contemplated in both *Norway* and *Denmark*.

Several large international organisations have significant activities in the area of technology assessment.

For a number of years, the *United Nations* have been exploring the various aspects of technological change, in particular from the angle of transfer of technologies and evaluation of technical projects.

*NATO* has been active in this field since 1972, when they organised, together with the International Institute for Management of Technology, an International Seminar on this subject.

The most recent initiative is the project *Europe plus Thirty*. On request by the Commission of European Economic Community, a comprehensive report on the need for studies of future developments has just been completed by a group of external experts. This document examines the essential aspects of the "forecasting and assessment function" and its use in policymaking. It is intended to serve as a basis for discussions within the EEC with a view to establishing a special European Office for Future studies and social assessment of technology on a European level.

#### OECD PROGRAMME ON SAT

OECD work in the area of social assessment of technology was initiated in compliance with the new orientations for science policy, outlined by the Ministers of Science in their 1971 meeting. Exploratory research began with the organisation, in January 1972, of the first international seminar on technology assessment in which participated some 40 distinguished scholars, technologists and politicians. This seminar was devoted to discussions of possible approaches and usable methods, as well as of the first experiences in the field.

This exchange of information was a starting point for an in-depth exploration of the state-of-the-art which led

to the publication of "Society and the Assessment of Technology", a comprehensive OECD report, examining the general philosophy of social assessment of technology, conceptual starting points and methodological frameworks, reviewing the available experience, establishing a general typology of assessment studies, exposing the methods of cost/benefit analysis, outlining the possible areas for use of assessment studies, examining the institutional problems and relationships between analysts and decisionmakers.

Another initiative was the establishment of an Advisory Group on Control and Management of Technology. This group was composed of high officials from a number of OECD Member countries. Its main role was to inform the OECD Secretariat on national policy developments related to technology and its impacts on society. The discussions of this group were of great help in clarifying the needs, and in formulating the OECD programme in the area of social assessment of technology.

Both the theoretical work accomplished and identification of national views pointed towards the desirability of stimulating national studies and enhancing international cooperation. The need was perceived to elucidate methodological issues and to set up guidelines which might be used by the Member countries and the international community at large.

This work was undertaken with the help of a panel of experts and it led to the publication of "Methodological Guidelines for Social Assessment of Technology". A general framework for social assessment studies is outlined in this document. It is an attempt to reconcile the exigency of a comprehensive set of guidelines with the legitimate concern for practical usefulness. Obviously, such a framework implies a number of caveats and raises questions as to its adaptability to any specific subject. These points and other comments by the experts are included in the same volume.

Simultaneously was started an activity which was intended to test the social assessment approach in applying it to real problems of the interested Member countries. From a great number of topics suggested by national authorities, three subjects were selected for studies to be launched within the OECD programme. These were:

- New Urban Transportation Systems - efficient modes of collective rapid transportation;
- Humanised Working Conditions - new modes of organising work and working conditions;
- Telecommunication technologies as an instrument of regional planning and balanced regional economic and social development.

From the beginning, two possible approaches were suggested by the OECD Secretariat: studies in co-operation by pooling available national resources in a common effort and studies in co-ordination leaving each country free to organise the work at national level. This second approach was preferred by the interested Member countries. Consequently, the studies were to be carried out in parallel by national research teams, the OECD Secretariat assuring mainly exchange of information and co-ordination.

The final objective was to make a comparative study of the national contributions with a view to identifying the main aspects where further improvements appear desirable in future technology assessment activities.

#### PROJECT: NEW URBAN TRANSPORTATION SYSTEMS

Finally, a sufficient commitment could be secured only for the first subject: New Urban Transportation Systems. By now, this project is nearly completed. National reports from six participating countries were assembled and the comparative synthesis is under preparation. A

closing session of the project leaders will be held in the near future to discuss both the national contributions and the results of the comparative study. Their comments will be taken into account in the final document which will be submitted to the OECD Committee for Scientific and Technological Policy.

The project was carried out within the timespan of about two years, following the first exploratory stage, devoted mainly to defining the practicability and operational steps of the methodological approach and to identification of national studies which could be retained in the framework of the project.

To facilitate this identification the OECD Secretariat prepared an outline of the general procedure along the lines of the "Methodological Guidelines for Social Assessment of Technology". At the same time two discussion papers were distributed, which had been prepared by external experts. One was technology-oriented and reviewed the main features and technical characteristics of new urban transportation system families<sup>1</sup>. The second was methodology-oriented and dealt with conceptual considerations likely to emerge in the process of application of social assessment of technology to problems of urban transportation systems<sup>2</sup>.

The succeeding meetings of the national project leaders made it clear that none of the national organisations involved were ready, or had the possibility to devote a sufficient part of its resources to a specifically designed social assessment study. Instead, proposals were made to derive some kind of contribution from the current work. In order to obtain at least some degree of similarity with respect to the format, a list of 12 "common points" was drawn up as a guidance, with the hope that all participating research teams would be able to contribute to these items and, if not, to bring out explicitly the difficulties of assessment (See list attached).

As a result, even if compared with an extremely limited common frame of reference, the national contributions received could hardly be considered as social assessment studies of technology. Most often they were parts of broader projects undertaken within the current programme and responsibility of the respective research organisation. Frequently, they were merely derived from an already completed work which had been carried out with a quite different objective in mind. Each of them was thus devoted to a particular aspect or point of interest so that it was particularly difficult to identify common areas on which a meaningful comparison could bear.

In general, however, a certain effort was made to introduce the idea of social assessment of technology either as an additional category of conceptualisation or, more wholeheartedly as a promising methodological tool, allowing for exploration of aspects often neglected in traditional technical feasibility studies.

The attention of the participating research teams, was progressively focused on two elements of the social assessment of technology, considered as a particularly useful broadening of the analysis, i.e. the establishment of societal scenarios and the involvement of concerned groups. This explains that among the six national contributions, two were devoted mainly to designing and evaluating scenarios of future states of society with respect to a given type of transportation technology. Two other contributions reported almost exclusively on experiences gained with simulated implementation of the public involvement in the case of an introduction of a specific mode of transportation.

This is not a negligible result if one considers that the main thrust of the OECD programme must have been to draw attention to the ideas and methodology of the social assessment of technology with a view to making

both the researchers and decisionmakers aware of its potential value to policy-making.

One can argue that it would be unfair to insist on the lack of homogeneity of these various national contributions and particularly on the absence of most of the basic categories of information which constituted a full-fledged social assessment of technology, since these contributions were not undertaken as assessment studies per se.

#### Common points of the national studies

##### 1. *New balance between public transportation and the motor car*

Technological assessment of transport systems should be carried out, based on the assumption of a possible modification of the present balance between private cars and public transport which would favour the latter. The future role of private cars in cities should also be considered and broadly defined.

##### 2. *The assessment will be based on social needs*

The assessment would focus on social needs of the various population groups concerned; special attention being paid to the distributive aspects of the impacts of a given technology (distribution effects of the impacts, among the groups of any given group).

##### 3. *Long-range indirect impacts*

Long-range indirect impacts of the technologies will be analysed; i.e. impacts on living modes, on the evolution of some activities, on urban development, on societal organisation and disparities.

##### 4. *Consideration of technical performance of systems*

As far as possible, the evaluation of the expected system's performance would be based on field results, rather than desk-research. The problems of data veracity and uncertainty require special attention; it is important that sources of uncertainty as well as the level of uncertainty be clearly identified.

##### 5. *Local projects evaluation*

The technological assessment should be based on the study of local projects, integrated into a specific environment, so that the specific constraints become evident, and that interdependencies with urban development be taken into account. Attention should also be paid to the interdependence of the movement of goods in urban areas.

##### 6. *Local policy context*

The technological assessment should be conducted within the framework of the general policy at the local level; due account being taken of the political power structure and of the various institutions involved.

##### 7. *Consideration of impacts on the transport-manufacturing industry*

The analysis should be performed with regard to at least two aspects: i) the influence on industrial structures; and ii) the problems of manpower, employment, etc.

##### 8. *Societal scenarios*

The hypothesis concerning societal developments, on which the development of technology (environment, economic context, social relations, public safety, urban development...) will depend, should be specified through simplified scenarios. However, a strictly qualitative approach which would lead to the assembly of heterogeneous elements in society which dilutes any serious analysis of transport systems, should be avoided.

##### 9. *Involvement of concerned groups in the social assessment of technology*

Although its application is difficult, the involvement of concerned groups in a social assessment of technology, is most desirable, as it offers a means by which the real meaning of the impacts at the groups' level may be understood.

##### 10. *Comparison with marginal improvements of existing systems*

The assessment of the technologies under consideration implies that these technologies be compared with less innovative alternatives; in particular, marginal improvements (that do not consist of a modification of the technology) to existing systems should be considered as alternatives to the technological innovations under review.

##### 11. *Transition problems*

Assessing a technology under the assumption of its eventual implementation is insufficient. It is equally important to make an appraisal of the problems raised by its progressive introduction into the urban system, in order to identify possible blockages, the chances of success, as well as the effects of this transition phase, which may extend over a long period of time.

##### 12. *Operating conditions and statutory provisions*

The statutory provisions and operating conditions (especially concerning safety) are adjusted slowly, depending on technological progress. It appears essential to specify possible modifications and restraints to modifications in this area, that could influence the technological assessment.

#### WORK OF THE U.S. OFFICE OF TECHNOLOGY ASSESSMENT

In comparison with this experience, one would expect that the studies carried out by the U.S. Congressional

Office of Technology Assessment come much closer to the concept of a full-fledged social assessment of technology. From the start of its activities in January 1974, it has benefited from an already considerable amount of work carried out in this field by the National Science Foundation. Given its unique position and status, OTA, can avail itself of important autonomous resources which make it possible to continuously improve its procedures and to call upon a broad range of knowledgeable people from different disciplines and horizons.

In the field of transportation policy, OTA conducted, in particular, several coordinated studies to evaluate the potential of new mass transit technologies to meet urban transportation problems<sup>3</sup>. Its methods of work and importance of effort can be illustrated by the example of the assessment of Automated Guideway Transit.

The objectives of this assessment were:

- i) to provide the Senate Appropriations Committee with information on the current status and the social and economic aspects of these technological developments;
- ii) to evaluate the key problems associated with these technologies as perceived by potential users, the communities and the transit industry;
- iii) to identify major policy issues and automated guideway programme alternatives and to explore their implications.

The assessment was conducted by a team of more than 30 experts in the field, drawn from universities, consulting organisations, transit planning and operating agencies, manufacturers public agencies and concerned citizens. They were organised into five panels – current developments in the United States, economics, social acceptability, operations and technology, international developments – whose findings were included as supporting material to the final report written by the OTA staff. The panels consulted with other interested individuals including representatives of urban planning organisations, transit operators, industry and other groups who could make a significant contribution.

In all OTA studies major emphasis is put on identifying policy alternatives and their implications for allocation of government research and development funds. The best explored aspects are, quite naturally, the technological systems under consideration with a profusion of technical details and, where possible, empirical operational data. Important attention is paid also to cost/benefit analysis and economics of operations. An effort is made to identify social problems raised by the use of automated systems.

However, no attempt is made to integrate the various categories of findings so as to present to the decision-maker an array of global alternative pictures. The need for more social and economic information is emphasized. The less known factors are those related to planning and decisionmaking at the local level, and in particular to questions of acceptance, impacts on population, safety, quality of service and land use.

#### DIFFICULTIES AND PROSPECTS OF SAT

As a new concept and a new approach to technological change and social policy in general, SAT has still to find its place within the institutional set-up and decision-making mechanisms.

With the exception of the United States and their Office of Technology Assessment, there are no special institutions for SAT. As is illustrated hereabove by the experience of OECD, the major obstacle to SAT, both within the country and at the international level, is the absence of technology policy and a government body responsible for it.

In the present situation, it is extremely difficult to find for any candidate for SAT, the appropriate institution

which is willing, able and authorized to undertake such assessment studies. There is a wide dispersion of competences among the various ministries and agencies. Furthermore, institutions which show an interest for SAT – and there are often several of them, each responsible for only one aspect of a given technology – are hampered by their narrowly defined responsibilities; they have the greatest difficulty in modifying their programmes in order to devote some resources to SAT.

In addition to these well-known phenomena of structural rigidity and institutional inertia, there is the fact that the concept of SAT is still badly understood and hardly propagated. For all these reasons, its usefulness is minimised and its implementation resisted.

As a rule, technology is developed as a trial and error process with opportunities for feedback from social, economic and legal institutions. Such a feedback should allow technologists to modify and reshape a technology and to adapt it better to social objectives. In reality, there is little adaptation because the social consequences are difficult to clarify and impossible to attest objectively, and because practical and political involvements make it generally difficult to modify the course of action. This makes decisionmakers hesitant and ready to justify on-going technological trends, rather than to challenge them.

It should be recalled that the fundamental rationale of social assessment of technology is that from now on various social groups other than the actual initiators and proponents of a technology are claiming the right to have their say in decisions concerning the future application and diffusion of a technology. There are several basic characteristics which distinguish the social assessment of technology approach, making it potentially far-reaching in shaping the decisionmaking process:

- i) Social assessment of technology requires to be conducted in a “systemic way”, i.e. the problem under consideration is studied as a system, as a dynamic whole whose components are defined both per se and through the mutual relationships.
- ii) Its central part is a systematic inventory of the possible impacts on society, both direct and indirect, short- and long-term.
- iii) The crucial phase is the attempt to evaluate all these impacts including, besides the usual technical and economic ones, the impacts on individuals, social groups, social structures, the environment and value systems.
- iv) Not only promoters and interested parties have to be taken into account. In particular, the options and socio-political weight of those social groups who have previously been considered as external to the decision-making process must enter into the analysis of impacts and especially into the formulation of policy.
- v) The expected outcome of genuine social assessment of technology is to present an array of coherent action options to the decisionmaker.

The assessment implies therefore, a multi-disciplinary approach allowing for a simultaneous tracing of the pathways between technological developments and societal impacts. It can be performed only as a multi-iterative feedback process where the analysis of a technological development interacts with generation of new knowledge about its impacts and with needs for action options likely to optimise the societal benefits of the course decided upon.

With such a wide range of phenomena, variables and relationships to be considered, social assessment of technology is of necessity a particularly complex matter and an extremely extensive and demanding activity which is hardly possible without incessant evaluation of those states of society which relate social and economic developments to technological change.

## REFERENCES

[1] G. Hupkes: **New Urban Transportation System Families.**  
[2] Alain Bieber and Xavier Godard: **Notes on the Social Assessment of Technology in the Case of Urban Transport.**

[3] **An Assessment of Community Planning for Mass Transit. Automated Guideway Transit: an Assessment of PRT and Other New Systems.** Automatic Train Control in Rail Rapid Transit.