

Because of the breadth of the topic, it was extremely difficult to systematically identify and attach priorities to needed social and environmental impact research. The panel therefore developed a list of possible research topics, and panel members were then asked to vote according to order of importance for the 6 most important topics. The topics and number of votes received are given in Table 1.

One interesting observation on study design is the possible comparison of the 3 portions of BART: one-third is above ground, one-third is at ground level, and one-third is below ground.

#### PANEL 4: IMPACTS ON ECONOMICS OF THE REGION AND TRANSPORTATION SYSTEMS

Harmer Davis, chairman

The panel thought that current economic impact techniques need to be reassessed. There was considerable discussion on how to evaluate the consequences of BART. There was general agreement that an analysis of BART must include the overall economic costs and benefits of the system, the effects on the other transportation investments, and the indirect effects on the economics of the region. The panel rejected the "shopping list" approach to evaluating the economic consequences. It discussed the potential clients for the research and their overlapping and conflicting nature. A suggestion was made that the economic consequences should be evaluated in terms of resources that are used up.

The use of cost-benefit analysis for determining the economic consequences of the BART system has many shortcomings. Not only economic but social and environmental consequences, which may use cost-benefit or other techniques, must also be considered. Even so, no immediate alternative is in the offing to replace the broad approach that may be categorized under cost-benefit analysis. The fact that costs and benefits are currently undergoing a substantial redefinition does not automatically nullify the value of the approach. The panel affirmed that in any analysis the total region should be used as the unit for analysis.

The question of subsidy was consistently interjected into the discussions. Some subsidies are real, and some are intergovernmental accounting transfers that are used to meet other objectives and are therefore bookkeeping activities and should be ignored in cost-benefit analysis.

Costs were discussed by the panel under the general categories of capital costs, operating costs, and indirect costs. Some of the factors to be considered in defining capital costs are the impacts of inflation and technology, governmental requirements, forced changes on the system, and extensions of the system regardless of their profitability. Operating costs, which include the maintenance and operation of the equipment and facilities, were thought to require new consideration for the comparison that will be needed. The indirect costs include the effects on other transportation systems, short- and long-term effects on the economy itself, and costs attributable to business, environmental, social, and institutional changes or disruption caused by the construction and operation of the system, including changes in traffic flow and police protection requirements.

The basic benefits to be anticipated are the change in time for commuting, i.e., the time costs saved by the system users. One of the primary concerns should be a study of the problems of estimating demand and predicting modal split under different policies and conditions. The relationship between the pricing of the services and a demand should be considered.

The redistribution effects of the BART system should be studied including its effect on the accessibility to jobs, on urban structure, and on the region's tax base. One research strategy might be to compare the alternatives of freeways, other BART systems, other transit systems, or making no decision for transit improvement.

The panel was concerned with the data base needed for such impact studies and felt that an overall strategy for data collection was warranted. As other panels pointed out, some data would be required on a continuing basis, other data could be obtained on a sampling basis. Planning and census agencies that collect data on a recurring basis

should work out a mutual scheme for sharing the information with all parties doing research requiring such information.

The panel voiced general concern that a generally accepted concept for economic evaluation has not developed in transportation as was developed in water resources in the early 1930's. A concerted effort is needed by transportation economists and planners to develop an acceptable technique for evaluating economic consequences of transportation improvements.

## DEMAND ANALYSIS AND TRANSPORTATION COST AND PRICING FOR THE BART SYSTEM

Although the demand analysis, cost, and pricing for the BART system was discussed in the formal papers and in the panel discussions, some participants of the conference thought that it neither was given the position of importance that it warranted nor received sufficient consideration of the research needs. It was pointed out that the construction of the BART system was primarily predicated on its ability to divert highway users to urban transit and thereby reduce the need for future expansion of freeways and Bay crossings in the region. In addition, there is concern that the BART system should also serve low-income, minority, aged, and other groups who do not have ready access to automobiles and are dependent on public transportation facilities.

The participants pointed out that the outcome of the BART system not only will be a concern of the Bay Area but also will be examined as a case study by other urban areas contemplating urban transit innovations. Regardless of the social, economic, and environmental effects of the BART system, the key determinant in decisions by other cities to construct similar facilities will be the economic viability of the system and its ability to satisfy transportation demands and reduce urban traffic congestion. Therefore, several conference participants suggested that a section be attached to the panel summaries amplifying the need for an analysis of the demand, costs, and pricing of the BART system.

Some of the topics suggested for demand analysis research are, Who will use the system, when, and for what purposes? Who is not using the system? Why are they not using it? A primary research topic would be the effects that BART has on the demand and use of other transit systems and transportation facilities. Studies in other urban centers indicate that major improvements in rail transit have a marked effect on parallel bus systems. The effects of levels of service, comfort, and convenience on BART usage should be researched. Likewise, travel time comparisons and delays between BART and other modes should be researched to determine their effects on modal split.

Cost and investment analysis for BART should receive special attention. BART offers an excellent opportunity to examine the factors involving investment costs and decisions as to cost allocation. It offers an opportunity to evaluate factors determining interest rates and the ability of the system to recover capital investment as well as to meet operational, maintenance, and depreciation costs. The system also offers an opportunity to examine the relationship between levels of service and the costs involved. Likewise, research is needed on comparison of capital and operating costs per passenger on the BART system with those on other transportation options.

The BART system offers some unique financing techniques such as the toll bridge revenues and property taxes to cover debt service. The effectiveness of such financing should be considered as well as its effect on tax and investment opportunities for other transportation systems in the Bay Area.

Intertwined in the demand and cost analysis is the need for research on pricing strategies for urban transit systems. Welfare economists have given considerable discussion to methods for pricing public transportation services and have made recommendations varying from free service to pricing that includes total operating and capital costs. The BART system will have a pricing structure initially based primarily on distance traveled; some readjustments are expected in the pricing strategy over time. The BART system will therefore afford an excellent opportunity to examine the relationship between price and demand and the effect of price strategy on diversion from other modes of transportation. Varying the pricing structure will require decisions regarding whether the objective is to optimize revenue or passenger usage and a consideration of the economic and social consequences of such decisions.