Measurements and the Regional Planning Process

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•TO lead into the subject of measurements and the regional planning process, it is appropriate to recall some of the progress made in past years in transportation planning.

Although the early history of highway transportation planning was spotted with a few massive programs of measurement such as the Los Angeles and Detroit studies of 1923 and 1927, most traffic data collection in the 1930's was quite small in scale and was used for the planning of single new facilities. The roadside origin-destination study is the most familiar example of this kind of work.

However, when the attention of the country was turned to the growing problems of urban traffic congestion, it was found that planning needed a new data base. So the home-interview survey was born during 1944-45. In subsequent years, many large cities obtained these kinds of data. In addition to the travel surveys, complete inventories were taken of transportation facilities, and starting in 1956, of land use.

From this data base, knowledge was gained of certain urban phenomena of great importance to the transportation planning process. These phenomena include the generation of trips, the distribution of trips by length, the choice of route, and choice of mode of travel.

At about the same time, it was realized that transportation facilities for urban areas should be planned as complete networks, and not as individual facilities added one to another, year by year. Transportation facilities had to be planned as systems because each link is dependent on nearby links, out to a considerable distance.

Such network planning required a complex planning process to be created, in which scores of different activities had to be meshed together. A PERT diagram for such a planning process might include over 150 different steps, each requiring several man-months to complete. But this planning process can be generalized into a core process consisting of five or six elements, such as shown in Figure 1.

Perhaps the most important element in the planning process was the testing of alternative transportation plans. With the knowledge gained from the survey data, it became possible to test very complex transportation networks in their entireties. Simulation techniques were employed to test these networks since the phenomena being dealt with could not be represented by analytic mathematics. Computers were used to simulate the flows of persons and vehicles through networks of transit and highway facilities. Feedback procedures simulated the effect of highway traffic congestion.

These techniques allowed the consequences of alternative transportation plans to be foreseen. The costs of making improvements could be related to people's goals. In the case of highways, improvement in goal-related performance could be measured in the reduction of accidents, vehicle operating costs, and time losses. Through these relationships better decisions could be made about the amount, configuration, mode, and timing of transportation improvements.

Of course, transportation planning was not the only process employing these kinds of techniques. The planning of water resource systems is a similar kind of undertaking (1). It is interesting to note that while urban transportation planning deals with a very regular phenomenon—that is, weekday travel—water resource planning deals with rainfall, which is a random phenomenon. Yet both employ the same kind of overall process, and both develop plans for physical improvements.

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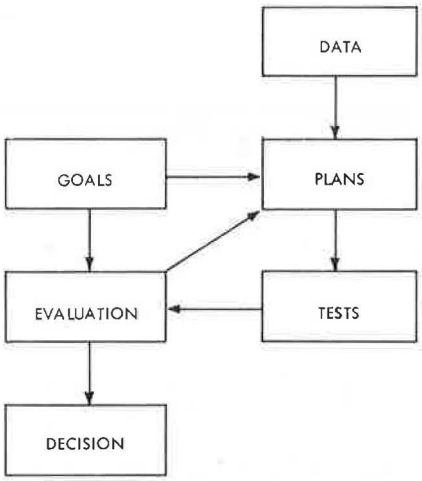

Figure 1. Diagram of basic planning process.

A number of people then began to ask why these kinds of processes could not be employed in much larger and more comprehensive planning operations. Why should not the use of land, the transportation of goods, and actions of government in the housing field be tested with the same rigor as in planning urban expressway and transit systems? Ultimately, should not governmental programs in education, health, welfare, and crime prevention be examined in the same fashion?

It would seem extremely desirable to give administrators as clear an idea as possible, in advance, of the effects of their proposed actions. Instead of planning and building single projects, as was the case in most urban transportation programs in the 1930's (and as still seems to be the case in a number of governmental programs), we should be considering total systems. And this should be based upon a sure understanding of the major urban phenomena.

These questions seemed to be good ones, and so about a year ago, in a limited and hesitant sort of way, we began to think about a regional planning process. As originally conceived, the term "regional accounting model" was used because extensive, numeric accounts would have to be kept of land use, population, housing supply, travel, income, and many other items. Unfortunately, we found that economists had preempted the term and "regional accounting" was widely interpreted as meaning only economic accounting. We found also that we had to drop the term "model" because as our thinking developed we found we were talking about a process which contained at least five models, and in the present state of the art these cannot readily be rolled into one single computer program. So, we have finally emerged with the term "regional planning process." In some ways this seemed to be like starting out in 1945 to diagram the transportation planning process as we know it today. However, certain clues were present which helped us.

1. The basic planning steps of (a) obtaining data, (b) setting goals, (c) preparing alternative proposals, (d) testing by simulation, and (e) evaluation would all have to be included.
2. The tangible urban phenomena, at least, would have to be identified, and then made the targets of research so that they could be simulated. These tangible phenomena include population growth, the production of goods and services, the daily movements of people and goods, modifications to the supply of buildings, and movements of people within the housing supply.
3. Certain established processes, such as transportation planning and economic forecasting, could be included in toto.
4. Although at first glance the comprehensive regional planning process seems to open a view of endless relationships and feedbacks, the more one thinks about it, the fewer of these exist which are significant. The problem is to identify the significant ones.

Given these ideas, then, we developed a preliminary PERT diagram of a regional planning process in three-dimensional form (Fig. 2). The regional planning process consists of three major elements: transportation and land use taken together, housing and social condition, and economic and population forecasting. The goods movement transportation planning process has been illustrated only by single block in the diagram but if expanded proportionally it would add a fourth component of the same magnitude as the preceding three. Of course, the way in which the process is organized could be different. Later work will undoubtedly produce a much better and more nearly complete description.

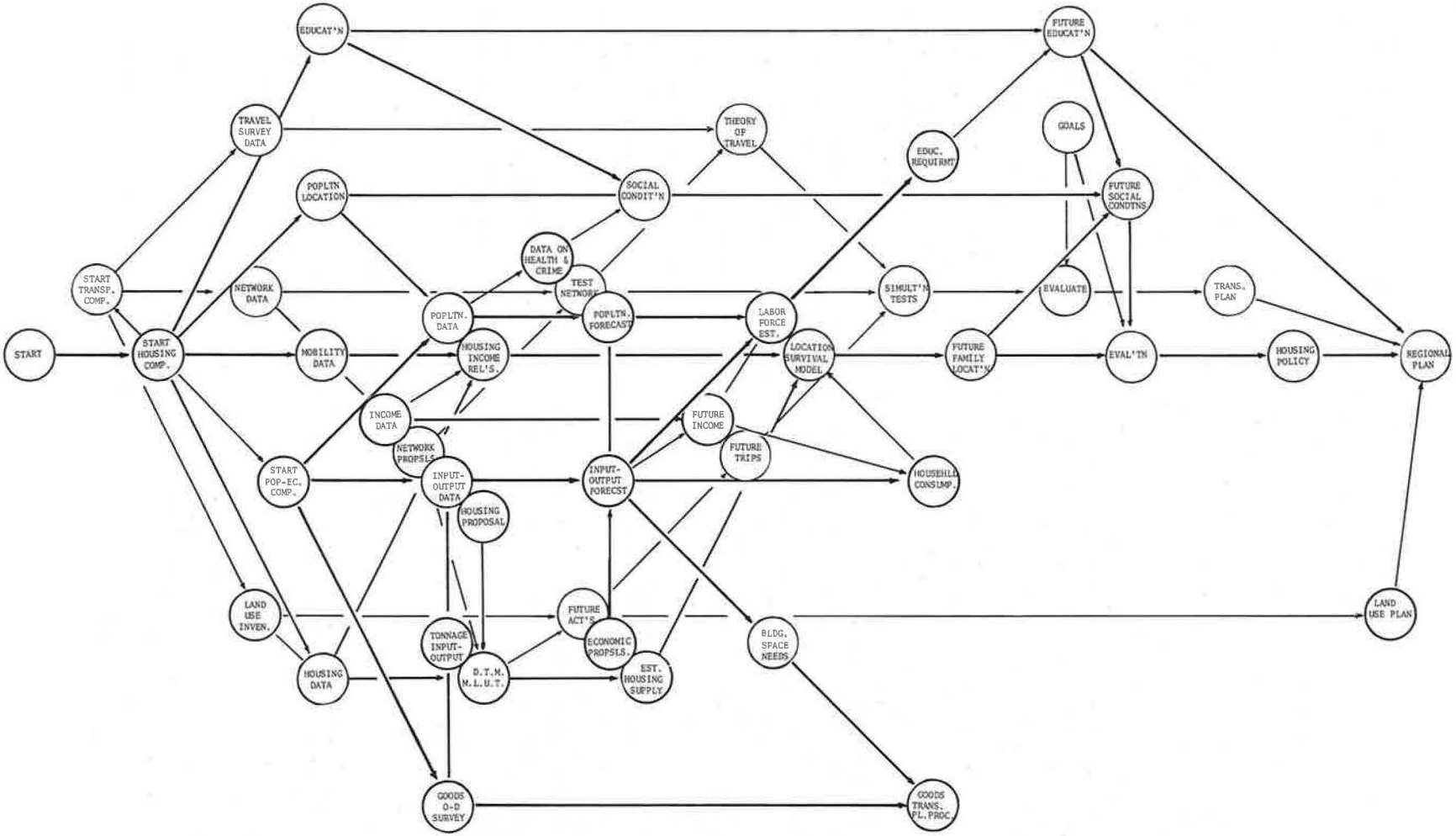

Figure 2. A diagram of a regional planning process.

The regional planning process contains five computer simulation models. These simulate (a) the growth of the population, (b) the growth of the economy, (c) the addition of housing and building to the present supply, (d) the migration of population within the stock of present and future buildings, and (e) the daily movements of people throughout the metropolitan area.

We must reiterate, of course, that this is only a very preliminary view of the regional planning process and that a great deal of work remains to be done.

Within this planning process, the major gaps in our understanding are in the fields of housing, in goods movement transportation, and in an understanding of the noneconomic relationships between people. These last, of course, are extremely important because they are presumably affected by governmental programs such as education, police protection, and health and welfare. It would be extremely desirable for these things to be included within the regional planning process.

The progression of the advancement of the regional planning process is probably, however, indicated by past advances. These have been in the fields where measurement of tangible things has been easy, and where plans are for physical changes which are under the direct control of a few governments. Water resources and transportation are the foremost examples, and the state of the art is most advanced here.

Two fields therefore suggest themselves as areas where advances may next be made. One of these is the process by which new buildings are added to the existing supply in a metropolitan region. Several models have been proposed or developed which simulate this city-growth phenomenon. Hamburg and Lathrop's is one case in point. Another is Schneider's work on land development and transportation for the United States Department of Transportation.

Another phenomenon of importance is the migration of population within the metropolitan housing supply. While some work has been done in this area, it is probably fair to say that an immense amount of systematic work remains before we can forecast future locations of population groups with different social and economic characteristics within the metropolitan housing supply.

Having now given a preliminary picture of the regional planning process, we turn to the measurements which would be needed for such a process. This is where the preceding ideas begin to bear upon the work of the Urban Information Systems Committee which sponsored this paper. Defining what information is needed for an urban information system or for a data bank is always a difficult and trying process. One way to help define data needs is by considering the requirements of a regional planning process. At present, of course, this is only speculative, but in part common sense and previous experience suggest what will be needed.

I would suggest, therefore, that the data needs for regional planning will consist of eight main files, seven of which measure tangibles. The eighth measures the economic relationships. Five of the files contain data which are at present gathered (although not always on a regular basis) for metropolitan areas, but not necessarily for regions. Three of the files are new or would require so much new information as to be substantially new.

The first three files on the following list have traditionally been obtained by urban transportation studies, files 5, 6, and 7 would be substantially new ones.

1. Land Use. All parcels (or small groups of parcels) in a region should be measured and identified as to use. In addition there should be cross referencing between parcels and buildings. Data on value of a regular sample of parcels should be obtained so as to be able to deal systematically with changes in land values and total land values for a region.
2. Transportation Facilities. All transportation facilities in the region should be measured in the fashion typically employed by modern transportation studies. This should include transportation facilities not only for the movement of people in vehicles but for the movement of goods.
3. Daily Travel. A sample of daily travel by persons and vehicles in the region should be obtained, with additional data on weekend and holiday travel.

4. Population Data. This file would be obtained from the Census, but might have to be updated on a sample basis.

5. Building Survey. Measurement of a sample of all buildings in a region, obtaining data on such things as floor area, number of rooms, age, condition, and value.

6. Migratory Travel. A sample of five years of migratory travel of families and unrelated individuals within the metropolitan region should be obtained, with auxiliary data on before and after housing, income, education, family composition, and the like. Although some mobility surveys have been made within metropolitan areas, only two (Chicago and New York) have obtained metropolitan-wide data.

7. Daily Movement of Goods. Measurement of a sample of freight movements within the region under study, obtaining data on origin, destination, type of commodity, weight, value, and mode of travel.

8. The Economy. These are economic data such as would be required for input-output forecasting and for estimating income and consumption patterns. Probably considerable additional detail on income and consumption would be needed in order to link this file with the file of buildings and migration.

Data needs do not stop, of course, with the possession of the regional measurement of just these preceding, and mainly tangible, items. Ultimately, some kind of measurements will probably have to be made of the noneconomic human interrelationships. These would include the processes by which information and understanding are transferred (such as by education) and the processes of social restraints (such as law and crime prevention). It cannot even be suggested here how this could be done, or whether it would be appropriately included in a simulation-oriented planning process.

However, there is a temporary way out of this dilemma which is suggested by past experience in transportation studies. This is to obtain data that measure the condition of the population (before and after planning proposals are put into effect) as defined by the population's goals. For example, in the transportation planning process, we found that in addition to our main data files, we had to get data on accidents, time lost in congestion, and vehicle operating costs, since reduction of these things was a major goal. The trick, of course, is not only to measure certain conditions which are goal-related, but also to measure the relationship between these conditions and the improvements which are being planned—in some cases there may be no relationship at all.

In the regional planning process, we suggested some of the things which, at least as a beginning, might define the condition of a population, and which are, in effect, goals of population. These are given in Table 1, together with some of the data which might be obtained to measure them.

Regional measurements will probably be obtained only to satisfy demonstrable needs. An important need is to develop a systematic regional planning process. A regional planning process provides a way in which the long-range consequences of certain governmental programs or lack of programs can be evaluated. By understanding better how the important urban phenomena occur, they can be simulated. Government actions or constraints affecting these occurrences can then be studied, as in a laboratory.

Having gone through the labor of preparing a preliminary picture of a regional planning process, it has become clear that the best way of defining exactly what information should be obtained, and how the regional planning process will be structured, is by plunging in and doing it. This is the way in which

TABLE 1

GOALS DEFINING CONDITION OF POPULATION AND POSSIBLE MEASURES OF GOAL PERFORMANCE OR CONDITION

Goals	Measures of Goal Performance
Health	Numbers of persons in hospitals; visits to doctors; medical payments.
Mental health	Numbers of persons in institutions or under treatment for mental illness.
Personal income	Census income statistics; tax payments.
Housing quality	Space available for housing per family; age and condition of structure; neighborhood characteristics and services.
Freedom from crime	Crime statistics.
Education	Education statistics.

transportation planning and water resource planning processes were developed. Further, the lesson of past experience is that a large organization, adequately staffed and supported, is far more productive than a series of short, small projects undertaken by different people.

The voids in our understanding of urban phenomena are tremendous. We do not yet know well enough how cities grow, how buildings are added to the stock, how modifications are made to the building stock, how people move about within the supply of structures which are available to them, and how efficiently goods are moved within regions. At present, most actions in these fields are being taken on a project by project approach which is analogous to that of the highway building era of the 1930's. In the light of the tremendous funds which are being spent by private persons and governments in developing metropolitan areas and regions, it would certainly be worthwhile for an adequate data base to be obtained, from which greater understanding and greater ability to plan could be obtained.

REFERENCE

1. Hufschmidt, Maas, et al. Design of Water Resource Systems. Harvard University Press, 1962.