2. EXPERT PANEL EVALUATION

An expert panel was one of the techniques examined and evaluated for usefulness in predicting secondary land-use impacts of highways. A panel, consisting of individuals with backgrounds in different aspects of land use and forecasting, was assembled. This panel of experts was asked to adopt a 1965 frame of mind and to predict changes that had actually occurred over the past twenty years. To aid the panelists in developing such a frame of mind, a narrative of general societal conditions that existed in 1965 was read to them. They also received information regarding each of the two case study cities, as well as brief descriptions of the projects. The forecasting instrument consisted of a questionnaire to elicit evaluations of thirty-one features of community development and a map for each city. Each feature was rated as to whether an impact would take place, whether the impact was negative or positive, the magnitude of the impact and its importance. On the map, the panelists predicted the areas in which residential, retail, service and industrial impact would occur. The first round of this study was conducted in person while the second round was completed by mail. After the results from the second round were tabulated, they were submitted to a smaller panel in each of the cities for evaluation with respect to accuracy and usefulness.

This technique provides a contrast to other methods investigated in this overall study. An expert panel can handle intangible impacts, such as aesthetics, strength of government authority and attitudes of financial institutions, and extremely localized impacts, such as the development of a regional shopping center. These are not impacts that are easily assessed by mathematical models. In addition, an expert panel evaluation can assess intangible impacts with more comprehensive insight than can be accomplished with simple checklists. A structured expert panel appeared to have the following desirable characteristics: (1) expert knowledge and experienced intuition, (2) time efficiency, and (3) low cost.

Prominent Methods of Expert Panel Evaluation

Expert panel techniques include focus groups, gaming-simulations, and structured expert panels. These procedures have received considerable attention, both in the literature and in practice, because they are able to handle issues that are not easily quantifiable. It has been shown that human judgments from these methods can enhance the process of land-use forecasting.

Focus groups (Lovestock and Weinberg, 1984) allow a small number of participants (typically six to ten) to discuss a particular issue in an unstructured manner under the guidance of a skilled moderator. The early discussion is intended to be quite broad so that the participants will be put at ease and will be more comfortable while interacting. Through interaction more spontaneous and possibly more honest comments will be made. When the group is assembled it is necessary to allow for diversity as well as similarity. If too much contrast is present it may stifle discussion. The expertise of the moderator is the essential element in a successful group. It is the responsibility of this individual to maintain the direction of the group on the subject under consideration. This task requires a high level of skill. Clear, unambiguous interpretation of the results is rarely possible, because of the role of the moderator and the unstructured nature of this type of research. This technique would be useful at an exploratory stage but would not be suitable for detailed land-use forecasting. Therefore, this method was not considered appropriate for further investigation in this study.

Simulations are simplified representations of larger, more complex systems. Three different types can be identified: there are those that use computers exclusively (known as models); a combination of computer and human players; and human players only. Those simulations that just utilize humans to generate operations and calculate consequences are known as gaming-simulations (Greenblat, 1981).

Games have three features: (1) explicit rules about how a goal is to be achieved with certain resources, (2) players' psychological orientation that the goal is valueless in itself, (3) social consensus that the activity is inconsequential for the serious business of life (Inbar and Stoll, 1972). When games are used by decision makers in the real world the third feature is naturally violated.

There have been many games developed to assist planners. Three particular games have received considerable attention and illustrate the potential and weaknesses of such an approach. These are SIMSOC (Simulated Society), CLUG (Community Land Uses Game) and IMPASSE (the IMPact ASSEssment game).

SIMSOC (Gamson, 1972) is intended to be a cooperative learning experience. SIMSOC has many desirable features with which a simulated society can be constructed. Its main thrust is centered on social behavior. All components of this game involve the interaction of the participants as well as their personal, group and societal goals. While these elements must all be addressed during the planning and decision making process, they do not directly enhance the powers of prediction. There are no winners or losers, but some participants will do better than others. It is necessary for the players to take the objectives

of the society seriously. When ambiguous situations arise there is a coordinator present to refer the question to a group in the society for clarification. The ideal method of running SIMSOC, according to the author, is a full weekend workshop. This game is designed for approximately 40 participants (maximum 60) using four small adjacent rooms.

CLUG (Feldt, 1972) attempts to predict how land will be used based on existing constraints. The players' objectives in this gaming-simulation are to buy and sell land, to construct commercial and residential property, to put industries into operation and to make a profit. CLUG most resembles a board game, complete with dice, markers and play money. It is able to stimulate the interactive elements of conflict and cooperation, as well as strategic thinking. CLUG is designed to include 9 to 25 players who participate in five to ten rounds of the basic game, plus additional experiments if appropriate. The game could easily occupy twenty hours or more of playing time. In this game there are some preestablished components, some left to chance (the roll of the dice) and others are open to negotiations and decision making.

Because of its simplicity, CLUG will not predict what will take place in the future, but will provide an arena for creating possible outcomes. Modifications can be made to better simulate different problems. An argument that can be posited against games such as CLUG is that results will be constrained and directed by the game's design. This is not necessarily undesirable if the limitation of the framework is clearly understood. CLUG can be valuable, but its chief virtue lies in education rather than prediction. Students of urban affairs or urban planning may be better able to anticipate real world problems after playing CLUG.

One game that may eventually prove useful in land-use forecasting is IMPASSE. It is called a game by its authors, but it is actually a combination of a focus group and a structured expert panel. IMPASSE asks participants to evaluate issues that are arranged like spokes on a wheel (Duke and Greenblat, 1979). There are actually two wheels used, each divided into 30 wedges permitting a like number of issues to be rated. Different components relating to the same issue can, thereby, be considered simultaneously. The smaller wheel is for evaluator's responses. They are measured against the ones made by the participants on the larger wheel. This game gives participants an opportunity to compare their opinions with those of an expert. The expert can then provide the reasoning that generated the stated conclusions. The purpose of IMPASSE is to stimulate discussion. If there is disagreement, the expert, through his/her reasoning, may be able to facilitate consensus.

The Delphi Method (Linstone and Turoff, 1975) is another structured expert panel technique that attempts to reach

consensus through an iterative process. Delphi panels were first used to predict when events will take place. Rand Corporation has conducted several (Helmer, 1966). Some of the areas investigated included scientific breakthroughs, automation, space progress and future weapons systems.

For Delphi to attain the most reliable consensus of opinion held by a group of experts, intensive questionnaires with controlled feedback are used. After one round has been completed, the findings are tabulated and returned to the panelists. The panel monitoring team may choose to provide this information verbally or use a statistical technique to represent central tendency. Equipped with this additional information, participants may modify their original responses. The number of rounds is not prescribed, but generally three rounds are needed to gain consensus and show stability.

Delphi employs the services of several experts but interaction between them is discouraged. One of the most important features is that the panelists are unknown to each other. Anonymity is preserved by administering the questionnaire through the mail. With Delphi, a dominant personality or an individual with a particularly prestigious title would be unable to exert pressure, either consciously or unconsciously, on the other participating individuals.

The Delphi panel should consist of experts with varied backgrounds. In this way the forecast will benefit from the diversity of knowledgeable input. These experts are often individuals with many commitments; therefore, it is imperative to explain the expected amount of time that needs to be devoted to this activity. The time needed is not extraordinarily large, but individuals with full schedules need to be informed of the requirements.

Ervin (1977) applied the Delphi method to regional industrial land-use forecasting in Tennessee in the mid-seventies. This study was considered an "abbreviated" version, according to the author, since only two rounds were conducted and no effort was made to arrive at a stabilized consensus of opinion. However, it did provide useful information. Since this set of panels was conducted for several industries, it was discovered that the relative importance of the various factors would vary from one industry to another and location factors were important to some industries but of little significance to others.

More recently Cavalli-Sforza and Ortolano (1984) attempted to predict impacts of three alternative transportation projects in San Jose, California by using the Delphi method. Panelists were first asked to rate the importance of components of future scenarios with regard to transportation/land use interaction that may take place. In other words, panelists were asked: What

components should be included for further evaluation? There was also an opportunity to rate the likelihood that alternative transportation plans would be implemented. The study team then formulated the alternative scenarios that were used in subsequent rounds. In later rounds, panelists rated the importance and likelihood of the components. They were also asked to forecast land use, commuting patterns and choice of transit mode for each transportation project for both 1990 and 2000. The impacted area was also divided into four zones. Panelists made separate predictions for each zone.

Regarding land use, specific forecasts were made with respect to expected population, number of single family units and multi-family units, and number of commercial and industrial employees for the two different years. The panelists were also provided with this information for 1970 and 1975 so that they would have knowledge of existing trends. Responses were summarized according to medians and interquartile ranges. As the rounds progressed there was evidence of a tightening of the range around the median. This convergence (agreement) was precisely what was sought. Stability was evidenced by the fact that there were smaller changes between Rounds II and III than there were between Rounds I and II.

The greatest difficulty experienced by Cavalli-Sforza and Ortolano was the amount of time needed to reach a successful conclusion. It took progressively greater periods of time to recover the questionnaires as the rounds advanced. The third round was completed eighteen months after the inception of the study. Monetary compensation is one means of counteracting the problem. Of course, the most desirable solution is to bring together a totally committed panel from the inception.

Long time delays will certainly present problems. The most troublesome feature of long time lags is the break with consistency and interest in the project. Regardless of the care taken in selecting panelists, there will be unforeseen events to contend with. If a study is undertaken during the traditional vacation season, there will be greater difficulties in retrieving the materials. It is necessary to carefully plan the time frame of the project and allow a realistic period to complete each phase.

Study Technique: Structured Expert Panel

For this study it was desirable to combine several positive aspects of the aforementioned techniques. An iterative questionnaire, like the Delphi Method, formed the basis for the overall structure. However, it was felt that the technique would benefit from the informal setting, the personal input, the immediate feedback, and the guidance of a moderator that are essential to focus groups. Because land use is a spatial issue,

the structured expert panel would also benefit from a map, like the one in CLUG. But it was considered inappropriate to include the competitive element that is part of gaming-simulations such as SIMSOC. By drawing on these earlier methods, it was possible to develop a technique that could handle all the full range land-use impacts.

Panelists were asked to rate thirty-one features of community development that could change because of a highway project. These features are listed in Table 2.1. The questionnaire was based on a modification of the Leopold technique (Leopold, et al, 1971), which asks respondents to rate both the magnitude and importance of an impact. Both ratings used category scales with Ø signifying "no importance" or "no impact" and 1Ø signifying "extremely important" or "extremely large impact". An example set of scales is shown in Figure 2.1. Panelists were also asked to record the direction of the impact (larger or smaller). Panelists were specifically not asked questions regarding the desirability of the impact. When no impact was recorded, panel members were told to explain this response.

In addition, maps were provided for each of the case study cities, Sheboygan and Wisconsin Rapids, so the locations of residential, commercial, industrial and service impact could be identified. These maps, shown in Figures 2.2 and 2.3, represented the cities as they were in 1965. The features shown were the existing major road network, proposed changes, areas defined as industrial, concentration of workers, commercial, residential, open space and parks. The levels of soil suitability for septic tanks were defined. Also included were the locations of water and sewage plants, as well as schools, hospitals and shopping centers. The maps were not divided into zones. Color pencils were provided to be used by panelists for designating areas in which significant changes in land-use activity would take place. In addition, panelists were asked to show where a regional shopping center or a concentration of services might develop.

Since this study, in essence, was one of "predicting" events that have already come to pass, it was necessary to choose individuals that had little familiarity with the case study cities. The prospective panelists were asked to rate their familiarity with six cities (including the two case study cities). It was necessary to eliminate from the panel some otherwise highly qualified individuals on this basis. A thirteen member panel was recruited, consisting of five experts in technical aspects of highway planning from WisDOT, four university professors who specialize in community development, three community planners from separate agencies and one real estate developer.

The panelists were provided with a brief description of each

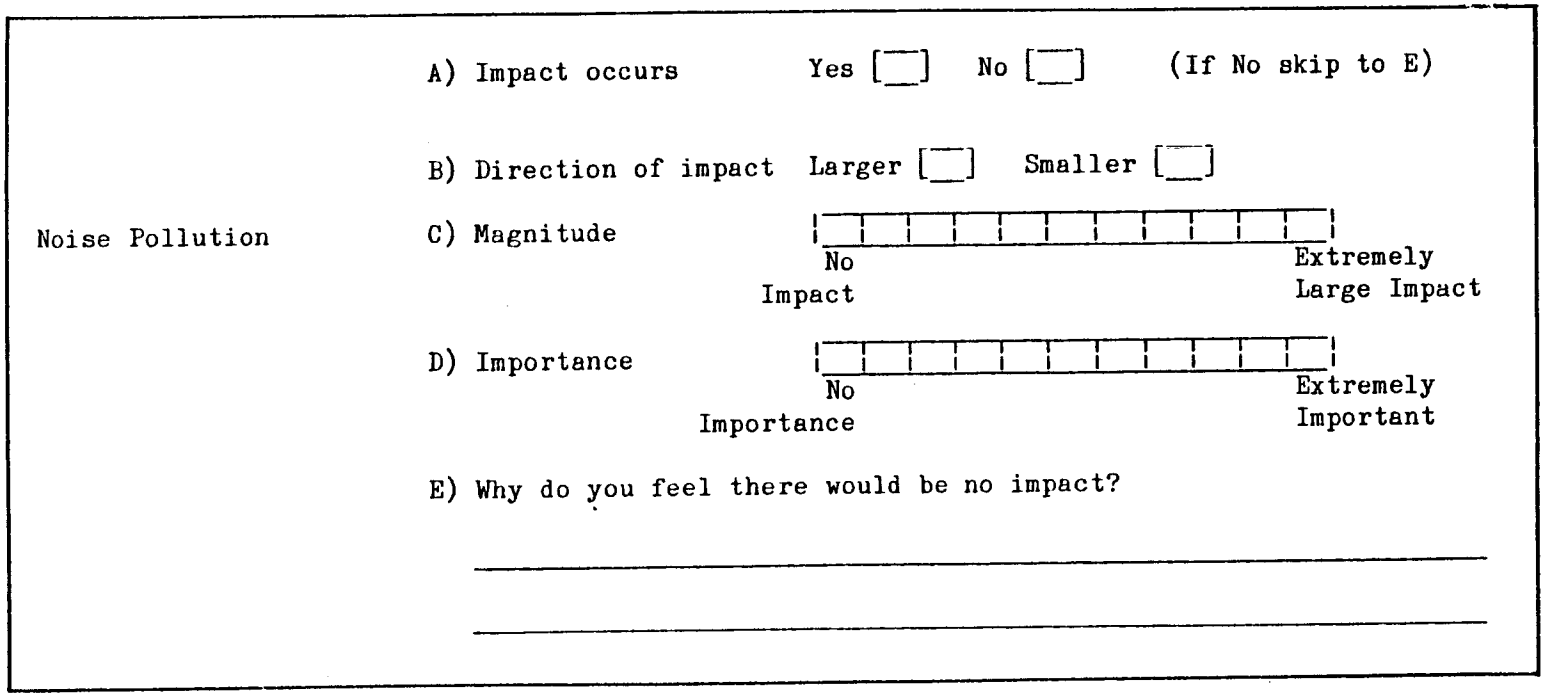

Figure 2.1. Sample Question with Scales

Table 2.1

LIST OF COMMUNITY FEATURES

Employment in existing industrial park (e.g. manufacturing)
Industrial employment elsewhere within the study area
Employment in regional shopping centers
Employment in community shopping centers
Employment in neighborhood shopping centers
Retail employment in the CBD
Employment in hotel/motel services
Employment in repair and cleaning services
Employment in advertising, management, consulting and legal services
Amount of regional educational facilities--post-secondary (colleges & technical)
Amount of local schools
Amount of regional health care facilities
Amount of local health care facilities
Service employment in the CBD
Employment in restaurant and fast food establishments
Total population
Amount of unoccupied housing units
Ability of local government to control land use through traditional measures, e.g. zoning
Length of average trip to work in miles
Amount of ride sharing
Amount of intercity travel for work purposes
Overall congestion in the study area
Congestion in the area of highway project
Aesthetics of area surrounding the highway project
Amount of development in communities near but not part of the study area
Amount of development in areas with incomplete utility service
Willingness of financial institutions to lend money for further land development
Land values near project (i.e., within 1000 feet)
Land values in the remainder of the study area
Tax base
Utilization of existing parks

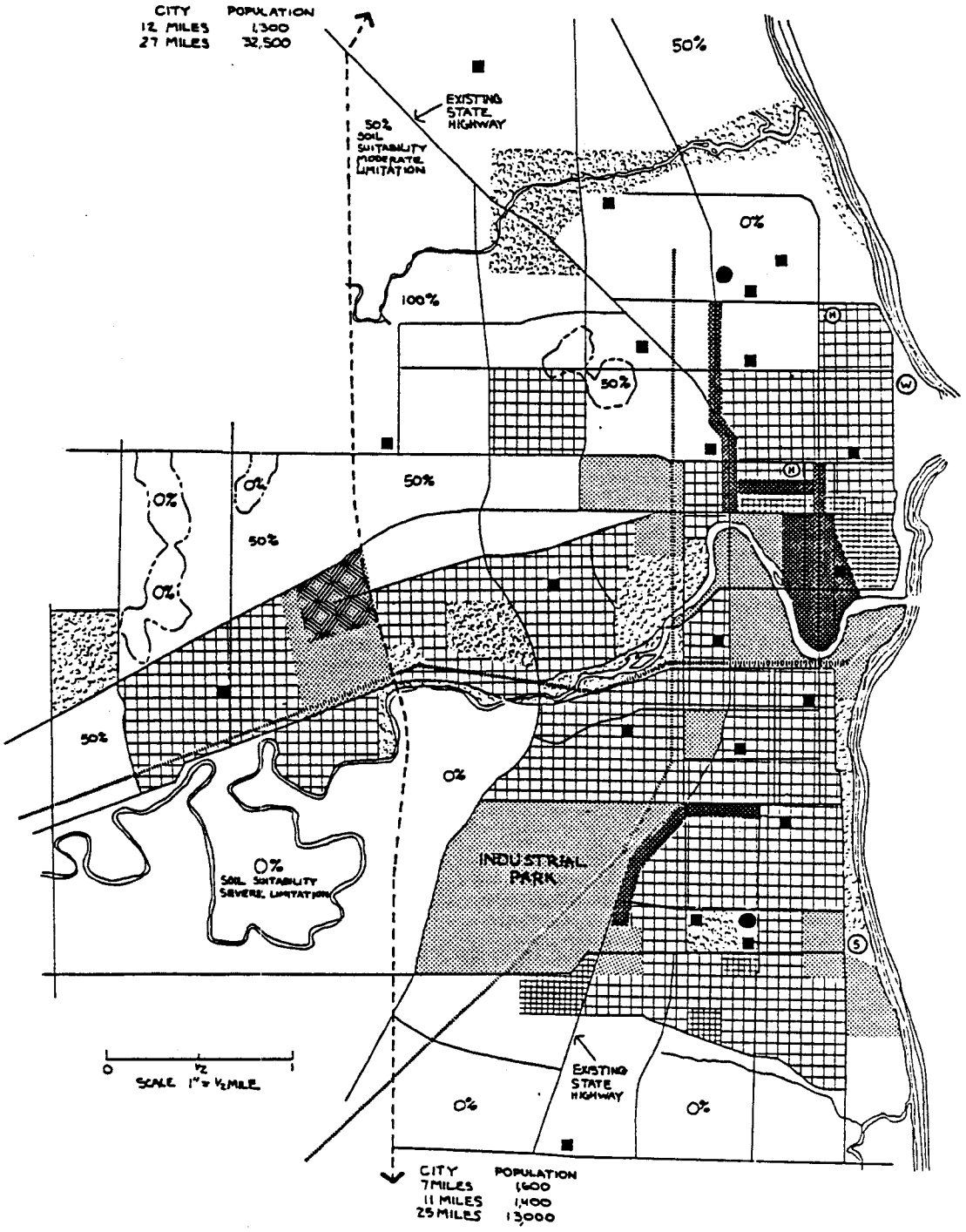

Figure 2.2. Map of Sheboygan

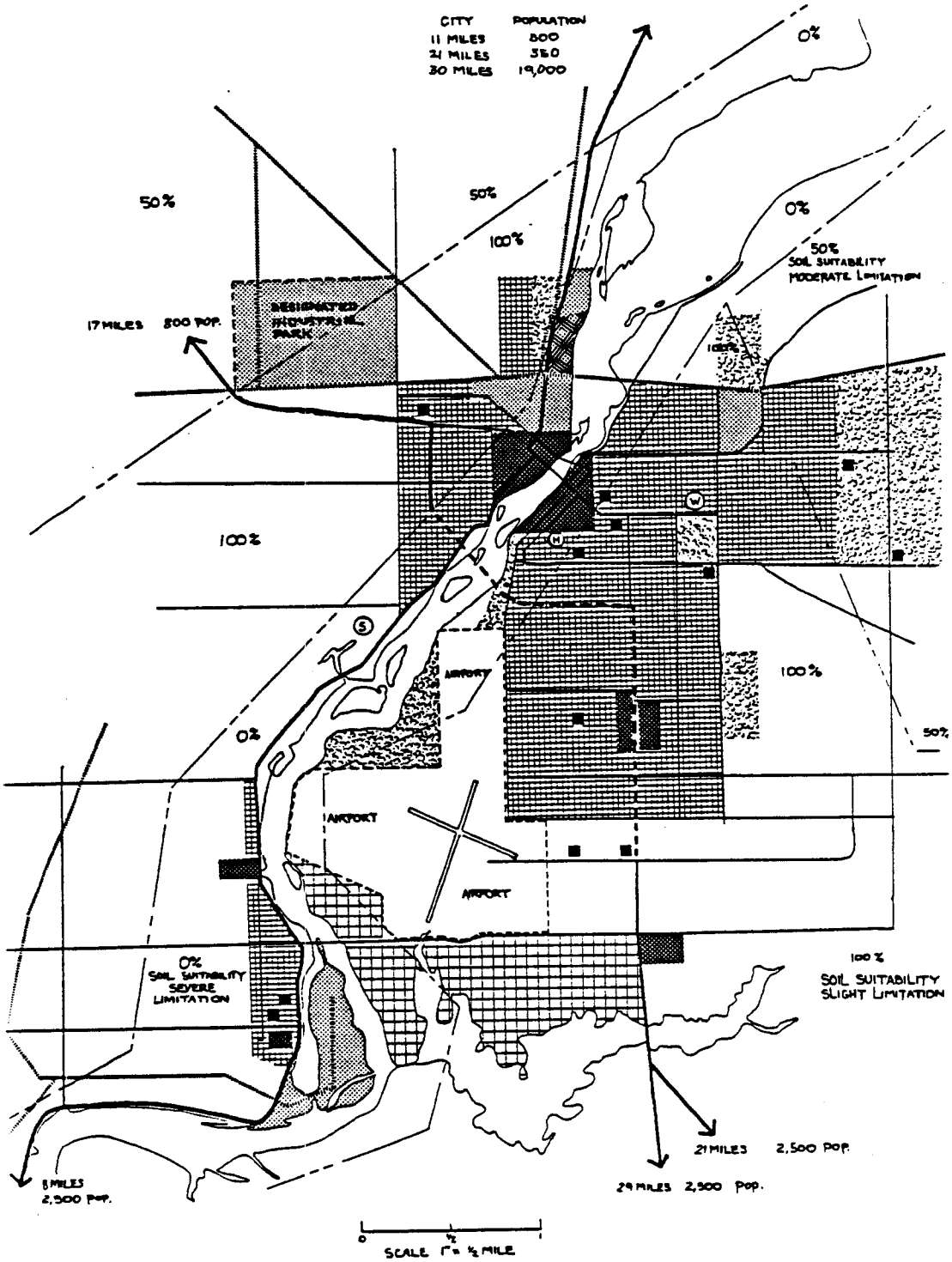

Figure 2.3. Map of Wisconsin Rapids.

city labeled only as "City A" and "City B". The descriptions contained information regarding size, government, economy and concentration of employment. The project for Sheboygan was a freeway bypass, just west of the central city. The project for Wisconsin Rapids consisted of two events: (1) widening portions of an existing two-lane rural highway that is a major link in the state highway system; and (2) adding a bridge across the Wisconsin River so that traffic on this highway could bypass the CBD.

In the interest of expediting the first round, it was conducted in three sessions. Based on the location of panel members, one session took place in Madison, another group met in Milwaukee, and one individual completed the questionnaire for Round I in his Milwaukee office. These sessions were accomplished on three consecutive working days.

At this session panelists were read a narrative of societal conditions in 1965 and complete instructions for handling the features of community development questionnaire and the map (see Appendix A). A member of the study team was present to answer any questions, but the panelists were reminded not to interact with the other panelists. It was necessary to provide some clarification at each session, but the panelists were able to make their responses in an expedient manner.

First round responses were summarized for use in the second round. The responses for questions A, B, C and D for each feature were tallied on a questionnaire as indicated in Figure 2.4. If the panelist felt that the community feature would be larger as a result of the project, the magnitude or importance response was recorded above the appropriate box on the questionnaire. On the other hand, if the community feature was judged to be smaller as a result of the project, it was recorded below the box. The reasons for no impact, given in response to question E, were also recorded as shown in Figure 2.4. It was also necessary to provide a short addendum to the description of each city in response to questions raised by panelists at the time of the first round.

Composite maps for each land-use activity (Residential, Retail, Service, and Industrial) were developed from the information provided by Round I. In the first round panelists had one map on which they were to define the areas of impact for the different land-use activities. In the second round there were four maps provided for each city, one for each activity, showing how all the panelists evaluated the areas of impact. These maps are reproduced in Appendix B.

The second round, unlike the first, was conducted by mail. All the summaries compiled from Round I were mailed approximately two weeks after it took place. The following materials were provided for each city: general instructions, a features

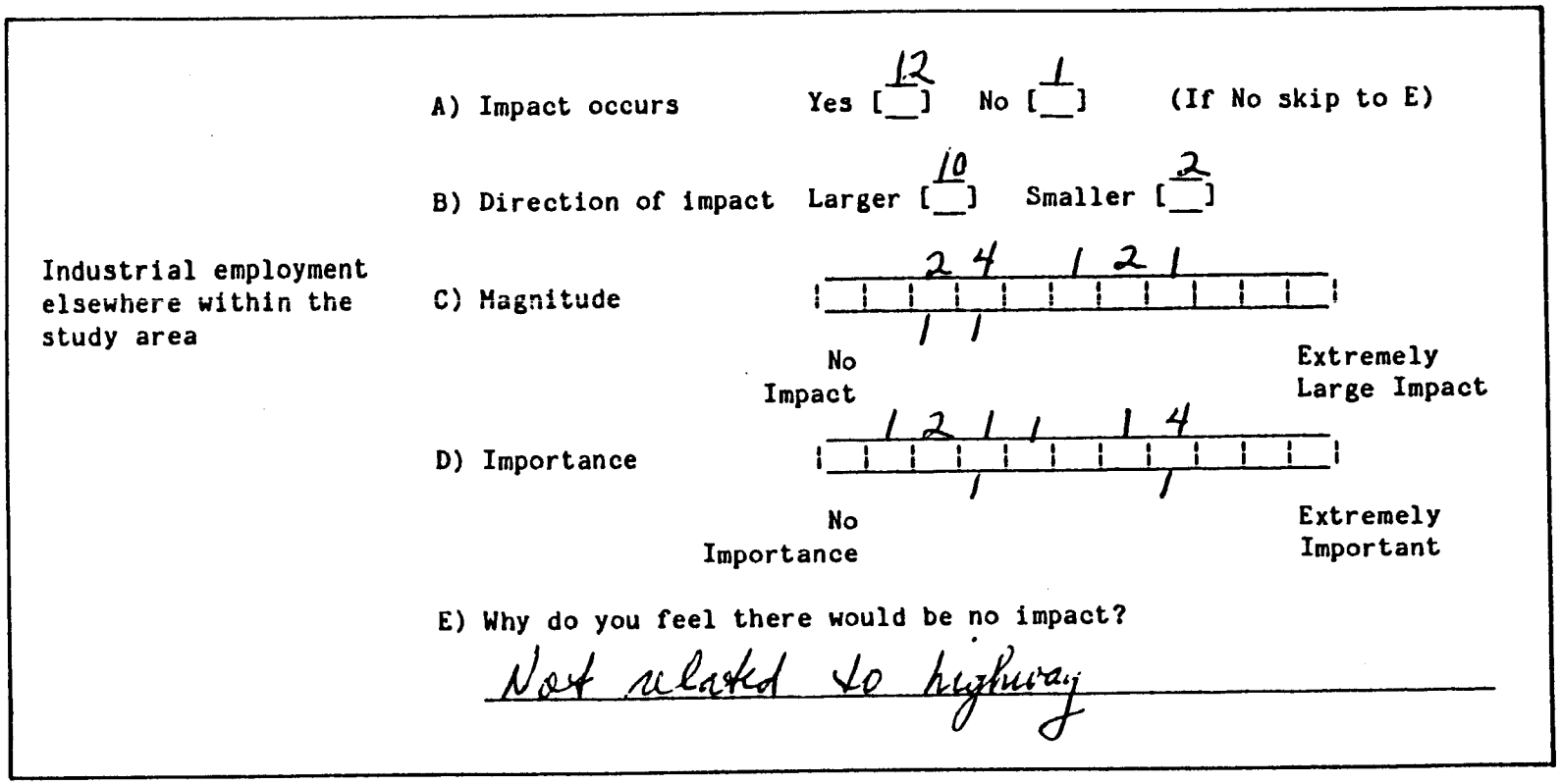

Figure 2.4. Example Compilation of Round I Responses

questionnaire with responses recorded; four maps showing the locations of impact on population, industry, retail, service (not retail); the original description of the city, an addendum to the description with information requested by the panelists in the first round. The addendum for Sheboygan included a map showing planned interchanges.

In Round II panelists were asked to respond to exactly the same questions as they had previously answered. This gave them an opportunity to reevaluate their answers given the collective responses of the whole panel. Each of the maps now provided zones that could be selected as areas of impact. Panelists again used the color pencils to designate where impacts would occur. However, they were asked to show areas of positive impact in one color and areas of negative impact in another color.

In Round II the features of community development responses were tabulated in the same way as they had been in Round I. These responses are summarized on Tables 2.2 and 2.3. The reasons for stating no impact are shown in Appendix C. Combined results of the map portion were produced by coloring zones to represent how many panelists said an impact would occur. Separate colors were chosen for: three to seven panelists saying a positive impact would occur in a zone; more than seven panelists saying a positive impact would occur in a zone; three to seven panelists saying a negative impact would occur in a zone, and more than seven panelists saying a negative impact would occur in a zone. The results in Round II displayed greater convergence and consensus than Round I, especially for Wisconsin Rapids.

Evaluation of the Forecasts

Since the panelists forecasted events that had already taken place, it was possible to evaluate the accuracy and usefulness of the technique. The results were presented for review to evaluation panels of local experts. These local experts were people who had actually observed the changes that took place, and thus would be in the best position to assess the forecasts.

Separate evaluation panels were recruited for Wisconsin Rapids and Sheboygan. Each panel was made up of four individuals who were active in city planning or highway engineering. All evaluation panel members had lived in their respective cities for at least twenty years and were well aware of the impacts that their city had experienced.

The Wisconsin Rapids evaluation panel found the forecasting panel to be most accurate in predicting service and industrial impacts. Both the forecasting and evaluation panels agreed on the location of retail impacts, but the evaluation panel rated the magnitude and importance of retail impacts more strongly than

Table 2.2

SUMMARY OF ROUND II RESPONSES--SHEBOYGAN

Statement	Number of No Impact	Number of Responses Positive Impact	Median Positive Magnitude	Median Positive Importance	Number of Responses Negative Impact	Median Negative Magnitude	Median Negative Importance
Employment in existing industrial park (e.g. manufacturing)	0	13	4	5	0	0	0
Industrial employment elsewhere within the study area	0	12	3	4	1	4	4
Employment in regional shopping centers	2	11	6	6	0	0	0
Employment in community shopping centers	2	4	4	3	7	3	4
Employment in neighborhood shopping centers	4	1	4	6	8	3	2
Retail employment in the CBD	0	0	0	0	13	6	7
Employment in hotel/motel services	0	13	6	5	0	0	0
Employment in repair and cleaning services	8	5	3	3	0	0	0
Employment in advertising, management, consulting and legal services	5	8	2	2	0	0	0
Amount of regional educational facilities--post-secondary (colleges & technical)	13	0	0	0	0	0	0
Amount of local schools	4	8	3	4	1	4	1
Amount of regional health care facilities	7	6	2	3	0	0	0
Amount of local health care facilities	7	6	2	2	0	0	0
Service employment in the CBD	2	0	0	0	11	5	5
Employment in restaurant and fast food establishments	0	13	4	5	0	0	0
Total population	6	7	2	2	0	0	0

Table 2.2

SUMMARY OF ROUND II RESPONSES--SHEBOYGAN (continued)

Statement	Number of No Impact	Number of Responses Positive Impact	Median Positive Magnitude	Median Positive Importance	Number of Responses Negative Impact	Median Negative Magnitude	Median Negative Importance
Amount of unoccupied housing units	5	6	3	3	2	3	3
Ability of local government to control land use through traditional measures, e.g. zoning	2	3	2	5	6	7	6
Length of average trip to work in miles	0	10	4	4	3	4	2
Amount of ride sharing	7	0	0	0	6	2	2
Amount of intercity travel for work purposes	0	13	4	3	0	0	0
Overall congestion in the study area	2	0	0	0	11	4	4
Congestion in the area of highway project	1	12	2	3	0	0	0
Aesthetics of area surrounding the highway project	0	8	2	2	5	3	4
Amount of development in communities near but not part ofthe study area	0	13	3	2	0	0	0
Amount of development in areas with incomplete utility service	0	13	2	3	0	0	0
Willingness of financial institutions to lend money for furtherland development	2	11	3	3	0	0	0
Land values near project (i.e., within 1000 feet)	0	13	7	7	0	0	0
Land values in the remainder of the study area	2	12	6	4	0	0	0
Tax base	5	8	3	3	0	0	0
Utilization of existing parks	10	3	2	2	0	0	0

Table 2.3

SUMMARY OF ROUND II RESPONSES--WISCONSIN RAPIDS (continued)

Statement	Number of No Impact	Number of Responses Positive Impact	Median Positive Magnitude	Median Positive Importance	Number of Responses Negative Impact	Median Negative Magnitude	Median Negative Importance
Amount of unoccupied housing units	7	5	2	1	1	3	3
Ability of local government to control land use through traditional measures, e.g. zoning	6	2	6	6	5	4	6
Length of average trip to work in miles	4	8	2	2	1	0	0
Amount of ride sharing	11	0	0	0	2	1	1
Amount of intercity travel for work purposes	3	10	2	2	0	0	0
Overall congestion in the study area	0	1	3	1	12	3	3
Congestion in the area of highway project	0	8	3	2	5	3	3
Aesthetics of area surrounding the highway project	0	8	2	2	4	5	3
Amount of development in communities near but not part ofthe study area	9	4	2	1	0	0	0
Amount of development in areas with incomplete utility service	6	7	3	3	0	0	0
Willingness of financial institutions to lend money for furtherland development	2	11	3	3	0	0	0
Land values near project (i.e., within 1000 feet)	0	12	5	5	1	5	5
Land values in the remainder of the study area	8	5	2	1	0	0	0
Tax base	1	12	3	3	0	0	0
Utilization of existing parks	10	3	2	2	0	0	0

Table 2.3

SUMMARY OF ROUND II RESPONSES--WISCONSIN RAPIDS

Statement	Number of No Impact	Number of Responses Positive Impact	Median Positive Magnitude	Median Positive Importance	Number of Responses Negative Impact	Median Negative Magnitude	Median Negative Importance
Employment in existing industrial park (e.g. manufacturing)	1	12	3	3	0	0	0
Industrial employment elsewhere within the study area	10	3	2	2	0	0	0
Employment in regional shopping centers	12	1	2	2	0	0	0
Employment in community shopping centers	2	11	2	2	0	0	0
Employment in neighborhood shopping centers	6	7	2	2	0	0	0
Retail employment in the CBD	0	0	0	0	13	3	3
Employment in hotel/motel services	5	8	2	2	0	0	0
Employment in repair and cleaning services	12	1	1	2	0	0	0
Employment in advertising, management, consulting and legal services	12	1	3	2	0	0	0
Amount of regional educational facilities--post-secondary (colleges & technical)	13	0	0	0	0	0	0
Amount of local schools	10	3	2	2	0	0	0
Amount of regional health care facilities	13	0	0	0	0	0	0
Amount of local health care facilities	13	0	0	0	0	0	0
Service employment in the CBD	2	0	0	0	11	1	1
Employment in restaurant and fast food establishments	1	12	2	2	0	0	0
Total population	12	1	3	3	0	0	0

the forecasting panel.

Overall, there was also agreement about population impacts. However, some disagreements about population impacts occurred because the study team did not provide complete enough information to the forecasting panel; neither the maps nor the narrative gave any information about high water tables present in some potential growth areas. Also, the study team did not inform the forecasting panel about a large parcel of land held by a local high school, which meant that the land was not available for residential development.

In Sheboygan the forecasting panel did not produce as strong a consensus as they had for Wisconsin Rapids. This made it more difficult to evaluate, but the Sheboygan evaluation panel agreed with most of the forecast. The closest agreement concerned the location of industrial activity. The forecasting panel was able to predict the development of a regional shopping center and to pinpoint its exact location. With only a few exceptions, there was agreement on the magnitude and importance of the thirty-one community features.

The evaluation panel in Sheboygan differed from the forecasting panel primarily in the map portion of the study. The location of retail (excluding the regional shopping center), service and residential areas were only partially accurate. Again, the errors were traced to insufficient information being given to the forecasting panel. For example, access to areas near freeway interchanges was not fully described. The evaluation panel disagreed with the forecasted level of employment in community and neighborhood shopping centers and in some services. As in Wisconsin Rapids, the Sheboygan evaluation panel felt that the magnitude and importance of negative impact on retail in the CBD were stronger than forecasted.

Overall, the forecasting panel slightly underestimated the impacts in Wisconsin Rapids and slightly overestimated them in Sheboygan. Inaccuracies resulted chiefly from incomplete information. This does not indicate a serious flaw in the procedure. In this study it was necessary to reconstruct data from a much earlier year, to be presented to a group of people who were unfamiliar with the cities. But when such an approach is implemented for a future project, the forecasting panel can include residents who would be much more informed about current conditions.

Both evaluation panels felt that the format of presenting maps and features of community development was useful. They had little trouble in understanding the forecasts, but tended to confuse measures of consensus as being measures of strength.

Discussion

A forecast using a structured expert panel can be conducted quickly and efficiently, providing insights that only human expertise can supply. This study was completed in less than two months, once the instrument was developed. A structured expert panel is also a relatively inexpensive undertaking. Participants do not require sizable monetary compensation, and there is no costly equipment. A wide range of issues can be addressed -- some quite intangible. A strong consensus can be reached on difficult subjects; consequently, the results can be interpreted as more dependable than those of a single expert.

The forecasts were reasonably accurate and a good measure of agreement was present. Where the forecasts diverged from actuality, the divergence could usually be attributed to inadequate information presented to the panel. This problem could easily be avoided in actual practice, since both more detail and respondents with greater knowledge of a particular city would be available. An ideal panel would consist of both local residents and outside experts. In addition, a limited amount of data could be collected between rounds if a strong need is indicated by the panelists.

The multiple-round format gave the panel a chance to request additional information, ask for clarification of information already provided, and to define their own zones for reporting impacts. In essence, the panel further refined the evaluation instrument as they completed the first round. A dynamic instrument is an important feature. It permits the panel to raise and evaluate issues that may have been overlooked by the study team and to discard issues it deems irrelevant.

It has been demonstrated that panelists are able to fully understand the development processes in cities the size of Sheboygan and Wisconsin Rapids. For small cities only a limited amount of information needs to be presented. Clearly, a panel could be overloaded with data when evaluating impacts in larger cities. However, it was not possible, from this study, to determine the maximum sized city that could be evaluated with a structured expert panel.

It would have been possible to ask the expert panel to make projections for a future year (e.g. 2010) but it would not have been possible to assess the accuracy of an expert panel for forecasting land-use impacts. By projecting the present from 1965, accuracy could be tested. This method of forecasting the present worked well and is recommended to others seeking to test forecasting techniques.

The first round of this study was conducted in group sessions to expedite the process. It would have been possible to conduct the entire procedure by mail, but long time delays would

have resulted. The excessive time required to complete the San Jose study was considered problematical. If WisDOT were to use this technique, such a time line would negate the usefulness of the findings. Although anonymity was violated by conducting the first round in group sessions, panelists were instructed not to discuss their opinions with other panelists. There was no evidence that this method of conducting Round I biased the results.

The results of an expert panel forecast are not quantifiable in the same manner as those produced by a mathematical model, but that is not to say they are less reliable. Since we have been exposed to a vast array of sophisticated, computer-assisted techniques, it has become a natural tendency to rate these as most accurate. But a structured expert panel benefits from personal insight that would be difficult to incorporate into a mathematical model.