INTEGRATING SYSTEM AND PROJECT PLANNING FOR EFFECTIVE STATEWIDE PROGRAMMING OF INVESTMENTS

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The need to address community and environmental issues in transportation planning has been widely recognized during the past few years. The initial response to these issues has been to include a broader segment of the public and to examine a wider range of impacts in the project planning process. However, a project-oriented approach has proved inadequate for a number of reasons. During system planning, decisions are made that determine many project-related social and environmental impacts, and there are some impacts that by their nature should be treated on a system basis (e.g., air quality, housing dislocations, land use). Uncertainty in funding levels, community preferences, and impacts, particularly during longer-range system studies, further complicate the ability of a planning process to address community and environmental concerns in a continuous manner throughout system and project studies. To address these issues requires planners to develop an approach to planning that provides for continuous coordination between system and project planning. A key to implementing such an approach is recognizing that during system studies attention can be focused on a range of project and system choices that are available, rather than limiting project studies to one set of potential projects. A key lever in implementing this approach is to require a system format that includes capital and non-capital options (policy and operating changes), and describes implementation strategies rather than end-state plans. Supporting such a format should be a documentation of ongoing system as well as project environmental studies.

• DURING the last few years there has been an unprecedented concern for community and environmental factors in all of the major areas of public decision-making. This has been reflected by, first, a very loud and vocal public dissatisfaction with proposed public works projects, followed by a great many federal and state legislative bills designed to improve the mechanisms for considering these factors.

In the highway planning profession, the historical response to this concern for community and environmental factors has been twofold: first, to examine a wider range of impacts for each individual project and, second, to include a broader segment of the public in the project planning process. Although these efforts aimed at the project level have represented a major and positive step forward in the highway planning field, there are several drawbacks to a project-oriented approach.

First, there are a great many community and environmental effects implied by a system plan that simply cannot be analyzed on a project-by-project basis and that can only be addressed during system planning. For example, impacts on land use or the regional economy and air pollution are examples of issues that can only be handled effectively on a system-wide basis.

Second, decisions that are made during system planning studies may significantly establish some of the social, economic, and environmental effects of a proposed project. For example, by the time a highway project reaches the location study phase

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many significant decisions have already been made that may prematurely eliminate from further consideration other alternatives. The mode, type of facility (i.e., freeway, expressway, etc.), and general location have been determined by this time and a tentative schedule for implementation has been set. Different interest groups have often taken a strong position either for or against the facility, making further negotiations and compromise solutions difficult to achieve. Staffs doing location and design studies may therefore be constrained in their ability to take actions to alleviate or avoid adverse economic, social, and environmental effects because of system planning decisions.

Finally, by delaying community and environmental impact analysis until project studies are initiated, significant resources are expended for the design of projects that later are delayed, extensively revised, or even dropped from further study. Such changes in project concepts or schedules create the need to revise implementation programs and system plans. Although such delays or changes are not totally avoidable, anticipating project environmental impacts in system studies might result in fewer delays and disruptions to implementation programs.

In principle, these three factors suggest that there needs to be more continuity in addressing community and environmental issues throughout the entire planning process from system planning through detailed project design. In practice, there are several reasons why many significant social, environmental, and economic effects are difficult to anticipate during system planning studies.

The purpose of this paper is to discuss the problem of integrating system and project planning to systematically include community and environmental concerns. The paper will first identify the major problems in the current system-project relationship, then discuss a philosophy for integrating the activities at these different levels of planning, and finally present some practical and implementable techniques for more effectively integrating system and project plans.

DEFINITION OF SYSTEM AND PROJECT PLANNING

Before discussing the issues involved in relating system and project studies we first must define the terms as they will be used throughout the discussion. Naturally, any definition of system and project planning is somewhat arbitrary and it will vary from organization to organization. Both activities, however, are part of an overall process through which an agency manages resources and provides transportation and related services.

By system plans we refer to the sum of the facility, operating, and policy changes proposed over time for a particular geographic region. [This definition of system plan is obviously more than a map displaying proposed major capital improvements. The usefulness of this definition in integrating project and system studies will be discussed in more detail in a later section.] Thus there can be system plans for either a state, a region, or a municipality. Plans for different governmental (or geographic) levels will be overlapping and highly interdependent, however, and consistency among the different transportation system levels must be a primary objective of the overall planning process.

The system planning process encompasses all those elements and activities necessary for producing area-wide plans. This definition of the process is broader than the usual definition because it includes the institutional structure and decision-making process for transportation (including the various interest groups involved), the process for generating and allocating funds, and the technical and non-technical procedures used by the planning or implementation agency. Defined in this manner, system planning encompasses a broad range of components and provides a framework within which project-related decisions can be carried out.

Project planning involves those activities that prepare some component of the system plan (whether a highway link, transit link, or traffic operations scheme) for detailed design and implementation, explicitly recognizing the relationship between a particular component or "project" and the entire system plan; i.e., in most cases, whether a project gets built or not can have major implications in the operation of the rest of the system.

THE PROBLEM: ISSUES IN INTERRELATING SYSTEM AND PROJECT PLANNING

Traditionally, system planning and project planning have been viewed as sequential activities, with system studies describing a general network and project studies preparing detailed designs for particular links. Although the two activities have not been entirely divorced from each other, system plans have specified the total list of projects that could be considered without providing strong guidance for the scheduling and implementation of specific projects (i.e., priority-setting and programming).

The gulf that can exist between planning at these two levels if carried out in this way can be characterized in a number of ways. First, the time horizon for the two activities has been very different, with system studies focusing anywhere from 20 to 30 years in the future and project activities looking 1 to 10 years away, depending on the project scope and lead time.

Second, the geographic area of concern to system planners is generally an entire urban area, a regional planning district, or the whole state, while project planners focus on a single (and often narrowly defined) corridor.

Finally, the personnel involved in the two activities often have very different perspectives on transportation problems. At the system level, area-wide issues are addressed, the emphasis is on planning rather than engineering, and considerable coordination is required with other agencies involved in types of development other than transportation. At the project level, more detailed design work is emphasized, and engineering location and design play a dominant role. Even more important than the difference in disciplines is the fact that the system and project studies are generally carried out in different units within an agency, with resulting problems in communication caused merely by physical separation. This is particularly true in the case of highway and transit planning. Often one agency is responsible for multimodal system planning, but project planning and implementation invariably occur in different agencies. In most cases the state is responsible for highway implementation and local or regional operators are responsible for transit.

The current gap between system and project planning can be described, at least partially, therefore, by a difference in the time horizon, the geographic area of concern, and the personnel involved. To overcome this "clash of cultures" a number of issues must be addressed at both levels of planning.

Barriers to Integration: System Issues

There are a number of problems with system planning that impede effective integration with project studies (1):

1. Many impacts of system decisions are long-term, occurring 10 or 20 years in the future. The effect of system decisions on location and development patterns and the future demand for transportation are examples of long-run impacts.
2. Many system impacts are area-wide and cannot be handled on a project basis. Air pollution and housing dislocation are impacts that ought to be handled by an area-wide rather than project-oriented approach.
3. The system impacts are difficult to predict because of a lack of understanding of complex cause-and-effect relationships. The best example might be the long-disputed relationship between transportation and land use patterns.
4. Some impacts are not fixed until project planning has determined the specific location and perhaps even design of a proposed facility. Thus at the system level it would often be difficult or impossible to really treat such impacts except in terms of general estimates or likely ranges of related impacts.
5. Environmental and social issues have been given little if any attention in system planning. They are essentially only carried out during project studies, where the impacts and issues are clearer and can be treated in detail. This approach ignores area-wide environmental effects and postpones the identification and analysis of project impacts, minimizing their influence on technical studies during both system and project studies. The result is that significant resources are often being spent for the detailed

design of undesirable or unacceptable projects. The need for a systematic and continuous treatment of community and environmental impacts is perhaps the first and foremost reason for improving the integration of system and project planning.

The full range of multimodal alternatives (both facility and policy changes) has not been considered in most system planning studies. Yet, as project studies progress, questions are raised about other options that, if approved, would have severe implications for, and require significant revision of, the entire system plan. In many cases, naturally, funding constraints inhibit a search for a wide range of alternatives by making funds available for only particular model solutions. A general relaxation of these funding constraints is occurring with the current change in the use of the Highway Trust Fund. This relaxation of funding constraints is making the examination of a range of transportation alternatives more meaningful.

6. The technical procedures used in system planning tend to impede the examination of many alternatives. For example, functional classification and needs studies generally assume a "desired" or "minimum tolerable" level of service. However, once a level of service has been assumed, the appropriate design standards of a road are set. By examining service characteristics alone in making preliminary decisions on the types of facilities needed or desired, system planning is ignoring critical social and environmental issues as well as prematurely limiting the range of alternatives under study.

The network flow modeling tools have been oriented toward the analysis of a single mode without evaluating the relationships among modes. In addition, the models reflect an emphasis on aggregate area-wide effects and contain built-in biases that make examination of disaggregate needs and impacts difficult.

For example, existing techniques often assume that total demand is independent of the existing level of service or the level of service to be supplied in the future. In assigning trips to links, capacity limitations sometimes are also ignored. Such techniques result in unrealistic demands and tend to bias evaluation toward favoring more and larger facilities without examining the full range of consequences of such a policy.

7. Evaluation techniques have tended to emphasize average area-wide benefits, with little examination of the incidence of impacts and the specific requirements of subareas and subgroups. Such aggregate measures tend to conceal the distribution of benefits and costs among different user groups (local versus through traffic, various income groups, etc.) or between users and non-users. More attention must be paid to the measurement and prediction of the incidence of impacts.

8. Goals and objectives have emphasized economic efficiency in a narrow sense and have not been useful in illuminating the trade-offs that can occur among different interests. In reality, many communities contain a diversity of views about transportation. System planning must now also strive for broad public participation to determine the objectives of various groups by providing a forum within which compromises can be made.

9. System plans have been advisory in nature with little influence over actual programming decisions. In fact, given the revenues expected over the planning horizon, system plans have often represented unrealistic target networks. Often system connectivity and completion of the master plan are used to partially justify particular projects, even when completion of the network on schedule seems unlikely due to resource or community considerations. Many states are now in fact recognizing that they may never complete their master plan.

10. Uncertainties in predicted revenues, demand, impacts, or community acceptability have been ignored. Often the nature and magnitude of these uncertainties have not become apparent until a strong commitment has already been made to particular components of the plan. For example, the patterns of land use and economic activity assumed during system studies may be very different from those existing when a particular project is ready for construction. Similarly, developments in new technologies and new funding patterns may allow new modes or different mixes of modes. System plans may have to be significantly revised to exploit such new opportunities or information.

Project Issues

At the project level there is a similar set of problems that also act against a closer integration with system studies:

1. Independence of projects in an implementation program is often assumed, with even different segments of the same route being studied separately in some cases. As a result, project designs implicitly assume completion of the target network by the specified horizon year, with little consideration given to other design scales. In many cases this is an extremely inappropriate and costly assumption. If the target network is not completed, or not completed on schedule, better area-wide service could often be achieved with smaller scales. Also, allowing variations in project scale makes the possibility of meeting social and environmental goals more likely. A second result is that area-wide impacts of specific projects are difficult to deal with or are ignored and deemphasized.

Often rural projects are treated on a project-by-project basis. Many states view system planning as predominantly an urban activity, with the "3C" process serving as the legal impetus for developing a structured urban system planning process. Integrating system and project planning is in fact a rural as well as an urban problem. In rural areas there is a definite need to coordinate all project studies in a strategy for improving the rural transportation system and to solicit the involvement of interested groups early in the planning process. Furthermore, on a statewide basis, there is a need to coordinate all funding and programming decisions. Treating urban and rural projects separately may not result in the most effective allocation of funds and improvements to the statewide transportation system.

2. System level evaluation criteria are often used when the issues of most concern are local and disaggregate. For example, the benefits for peak-period through traffic might be the major justification given for a project, whereas the issues of concern for the local community are disruption to local traffic patterns or off-peak accessibility to shopping centers.

3. System plan revision is not seen as a viable option. Project delays or cancellation often do not result in a review and revision of system plans or at the very least make such a review a cumbersome task. Dropping a small and isolated project from further study might have few system implications and not warrant revising the system plan. However, when a large project or a number of projects are delayed or dropped, there is a need to critically reexamine the allocation of resources to other projects in a program and to determine whether a revision in the system plan or program is desirable.

While state highway and transportation agencies are beginning to recognize and address some of these issues, further steps can and should be taken. Any philosophy and techniques for integrating system and project planning must recognize the need to address both area-wide and local issues throughout the process and specifically to deal with the problems identified above at both the system and project planning levels.

Some researchers have described the current situation as one where at the system level decisions are often uncontroversial, yet most of the efforts at developing technical models and tools have addressed the "system problem" (2). At the project level, decisions tend to be much more controversial, yet few if any techniques and procedures have been developed to address the issues of concern. Again, the basic problem involved in integrating planning at the two levels is to strike a balance between the concern for systematic service requirements and localized disaggregate requirements. This leads us to present an outline of a philosophy that can lead to narrowing the gap between system and project planning.

A PHILOSOPHY FOR INTEGRATING SYSTEM AND PROJECT PLANNING

To effectively address community and environmental factors throughout the planning process will require new technical procedures as well as an improved integration of

system and project planning. Although some states have taken steps to strengthen the relationship between these activities, traditional practice has not yet accomplished the type of ongoing integration of system and project planning proposed here.

The traditional philosophy of integration has largely been that system planning preceded project planning and that project planning developed projects necessary to implement a "master plan." While the master plan gives a precise picture of what the future transportation system might be, it has not been tied explicitly to the programming activities that determine how projects will be scheduled toward implementation of the plan. Since implementation strategies are not considered in system planning, the master plan often represents an unrealistic goal that in turn distorts near-term project decisions if completion of the plan (or completion on time) is assumed.

More importantly, by prematurely focusing on only one future system, the master planning approach loses flexibility to revise plans in the future. The implementation program is geared toward the construction of one target-year plan. When community and environmental impacts become known during project studies, it is both technically and psychologically difficult to respond and consider new project or system concepts. By not anticipating a range of designs for, or the potential deletion of, a particular link during system studies, large amounts of resources are required to revise the plans later.

In fact uncertainties in funding, community preferences, and impacts of a particular action place severe limitations on a master plan approach (3). Transportation options must be developed with the knowledge that today's decisions are based on an imperfect understanding of the future of a region. Unforeseen changes may require new responses and adaptations that are impossible to fully evaluate at the present time.

The really important decisions are the near-term programming choices that irrevocably commit resources to projects and studies. In system planning it is neither desirable nor necessary to make firm decisions on one target system in some future year. By leaving future decisions open until more information is obtained, system planning can take into account possible future options and events and help to evaluate the most flexible direction for present programming decisions.

Many of the problems currently facing transportation agencies are directly related to the inability of the present system planning process to explicitly deal with uncertainty and to effectively relate near-term programming decisions to longer-range system plans. Therefore, one of the first and foremost changes in system planning is that system planning must focus not only on desirable master plans but on implementation strategies as well.

The philosophy for interrelating system and project planning must see those activities not as sequential but as integrated in a continuing manner. System planning should not precede project planning but provides a framework within which project decisions can be made and serves to mediate between and coordinate all the ongoing project studies. System planning thus should periodically assign resources and priorities among the ongoing subarea studies and project planning processes. The results of project planning influence decisions about the overall system, not just vice versa. Because project studies influence system planning, they must be coordinated with system planning in an ongoing way.

Such a philosophy explicitly recognizes that transportation plans are not implemented instantaneously in "one shot" but rather in a series of staged increments. System planning, therefore, ought to examine a range of different implementation strategies. For example, the 20-year time horizon for a master plan might be divided into 5-year stages. Each stage of a particular implementation strategy might include construction of a number of highway links or transit options and operating and policy changes, as well as different studies.

By developing different sequences of actions on facility improvements, emphasis is placed on what choices are available over the planning time horizon and how present decisions affect the range of choices available in the future. The different sequences can explicitly recognize uncertainty by evaluating the impacts of a number of potential outcomes from project negotiations or impact studies. Thus, implementation strategies provide a convenient framework for relating system and project planning by focusing on both short-term decisions and longer-range plans.

Although the resources available for system planning will restrict the number of sequences and uncertainties that can be considered, attention need not be limited to one sequence over time. In theory, implementation strategies could be developed for every possible event that may occur in the future. In practice, however, because of the complexity and number of future events and options, they need only represent what appear today to be major choices facing the decision-making process.

The role of system planning in the context of alternative implementation programs is to carefully anticipate the choice issues that must be resolved as planning continues and devise tentative sequences of improvements based on potential outcomes from these choices. As new information is gathered, new options will be added, while others will be dropped from consideration.

In summary, system and project planning must be integrated so that the go/no-go decision to implement any project or a particular design will not disrupt the ability to allocate funds smoothly to other high-priority projects.

Obviously, both the master plan and a plan based on implementation strategies can be altered in future periods in response to changes. Neither irrevocably commits a region to one sequence of implementations over time. The two essential differences between the approaches are how initial decisions are made and the flexibility provided to revise the plan over time. Initial decisions with the master plan aim at one target-year system. Although the master plan in fact can be and in practice is revised, many alternatives are foreclosed prematurely by focusing initially on one target network. Recognizing that revision will occur later may in fact lead to an entirely different concept of a master plan and a more flexible and adaptable first-period set of decisions. The implementation strategy approach therefore considers uncertainty explicitly and a number of potential improvement sequences when initial decisions are made. By anticipating the changes that may occur and a range of the choices available in the future, this approach explicitly requires periodic evaluations and revisions and ongoing coordination with project studies.

TECHNIQUES FOR INTEGRATION

The implications of implementing a philosophy of continuous integration of system and project planning extend to all aspects of the current system planning process. Improving the current process could involve as drastic a move as changing the institutional relationships between state, regional, and local levels of government or changing the allocation process for the distribution of transportation funds. It most certainly will involve changing the activities of the planning agency, including needs and sufficiency studies, network flow modeling, and priority setting and programming.

This section identifies a number of specific techniques for improving the system and project planning interface by changing the documentation requirements to support a continuous planning process. [Other techniques dealing with legal, administrative, and technical changes that would improve the integration of system and project planning are discussed elsewhere (4).] These reporting requirements represent a key activity of a planning agency, and they can be designed to provide an effective integrating mechanism for project and system planning.

System Plan Format and Content

One of the best opportunities for more effectively integrating system and project planning lies in strengthening the ties that exist between system planning and the programming process that focuses on near-term implementation of sets of projects or programs. There are a number of reasons why programming is a key activity. First, the programming process is the focus for important decisions and negotiations concerning the commitment of money and manpower to various projects and studies. Second, programming provides an appropriate forum for consideration of both long-run and short-run actions aimed toward implementation of a system plan. Finally, programming is a periodic activity (often with yearly budgeting cycles) and thus is a convenient checkpoint to review the status of ongoing project studies and to revise the system plan in light of current project development activities.

Traditionally, the link between system planning and programming has been weak. System planning primarily through functional classification and needs studies provides lists of projects that are then assigned a priority in some manner. Programming then chooses projects until the budget is exhausted, subject to a number of other constraints. A key lever to strengthen this linkage is to require a system plan format that encourages discussion and documentation of both system and project activities and provides for stronger and different kinds of system inputs.

The basic planning document should be a multiyear program package that combines both short-term and longer-run improvements while explicitly recognizing the resource and other constraints facing transportation plans in the system plan development phase. Such a document would represent an extension of the current multiyear implementation programs developed by most state highway agencies to cover the entire planning period.

Currently most states require a 20-year target plan and a short-range (up to 5 years) implementation program. Our recommendation is to combine the requirements for the target-year transportation plan and the implementation program into one planning program package that reflects reasonable resource assumptions and illustrates all the actions on transportation anticipated for an area over the entire planning horizon. Thus, the proposed planning document would contain all capital improvement projects (large and small), maintenance, operating, policy changes, and studies for all modes within a region. In addition, the planning program should identify all sources of revenues and the implementing or operating agency responsible for each action contained in the program.

For urban areas such a document would extend the U.S. Department of Transportation requirement for a unified work program to include project implementation (such as UMTA capital and service improvements) as well as planning activities. Moreover, it is recommended that the planning program format be adapted for both urban and rural areas.

Also, a number of options for many projects should be included in the list of projects to be assigned a priority, since each option for a particular facility has a different set of impacts, a different cost, and a different effect on the community. As shown in a previous paper by two of the authors (3), the effect of a budget constraint alone can alter the set of projects chosen. For example, it may be desirable to select something smaller than the largest of all options for each location if the budget is tight and overall network coverage and equalized mobility is an objective. By providing multiple alternatives, we may increase the cost of studies but we will have also increased the flexibility for change in later periods.

There are a number of advantages to defining the basic planning document as a multiyear planning program rather than a target-year plan. First, defining the system plan as a planning program encourages the planning agency (or agencies) to immediately focus on resource and other constraints early in the planning process. The result will be a plan that represents a proposal with a realistic potential for implementation and hence a better guide for transportation decision-making. In the past, system plans have often described only "desirable" target networks that have had little influence on and relationship to programming and implementation decisions. Although the content of the plan can be expected to change at any time, the plan should reflect as realistically as possible existing or anticipated constraints on transportation decisions (resource, environmental, etc.).

Second, combining short-run and long-range improvements in a program package increases the potential for the effective involvement of a wide range of different interest groups, particularly in system planning. Program packages define both immediately implementable steps (such as signalization, flow metering, minor upgrading of existing facilities and interchanges) and the longer-range improvements (such as major new facilities and broad policy changes like peripheral parking schemes, or even new studies). Since the lead time for major transportation projects can be as long as 10 years, program packages show interest groups how their concerns can be addressed in the near future as well as give all participants a realistic sense of the time required for more major improvements. A number of states have recognized this already, at least in a preliminary way. The Connecticut Department of Transpor-

tation, for example, has adopted a similar format and uses regional plan summaries as the basis for conducting public meetings in each planning region of the state.

In addition, public participation should not simply be involved in deciding on the studies and projects to be included in the plan but also on the relative priority of those studies and projects. The proposed plan format will focus on both the content and scheduling of planning activities.

Finally, defining the plan as suggested here will make it easier to relate and coordinate system and project planning in an ongoing manner. Since the desirability of some projects in a region, or their timing, may depend on other projects in the plan due to traffic or resource considerations, the program package can explicitly identify these interdependencies and indicate when or how changes ought to be made to the program package if the status of a particular project changes. In programming and project development, a project often is considered independent, for the most part, from other projects under study. Using a planning program format will facilitate the inclusion of system considerations in project development decisions. Also, combining plans and programs for all modes will encourage cooperation among agencies doing system planning and those responsible for implementation.

Contingency plans may provide additional flexibility within the basic planning program format, particularly in areas where a number of controversial issues are unresolved or for major projects with significant lead times. In these cases, in order to facilitate the orderly allocation of resources, it may be desirable to develop tentative implementation strategies for a range of potential future decisions. For example, if a major freeway has a 10-year lead time but no assurance of its acceptability can be made that far in advance, it may be wise to examine and plan a contingency program for smaller-scale and traffic operations improvements in the corridor in case at some future point in corridor studies or project development the freeway is dropped. By anticipating such occurrences, the agency can provide for an orderly implementation program rather than reacting to crises as they occur. At the same time, the agency can provide the community with more than a "freeway or no improvement" choice.

Although developing contingency plans may require more resources for planning, it provides for a more realistic range of network and project choices when there is significant uncertainty in funding levels, community acceptability, the predicted impacts of proposed projects, and external events with implications for transportation (land-use control, federal or state air quality regulations, etc.). In the long run, contingency plans may result in a more efficient use of resources by providing flexibility and keeping options open.

While alternative plans can be displayed particularly for the medium to long run, the first 1 to 2 years of the planning program should be decisive and represent what actually will be budgeted and implemented or studied during that time period. By making the first few years of the program decisive but explicitly recognizing the range of choices available in subsequent time periods, the planning document can support and indeed encourage a periodic decision-making process. Every 1 or 2 years a new budget is prepared and the entire planning program is documented. The proposed format then encourages a planning process whose periodic output is a new budget that reflects the fiscal flows over time anticipated in the planning program. Such a document and reporting strategy provides one means for addressing the relationship between project and system planning in a continuous manner as required by the process guidelines contained in FHWA Policy and Procedural Memorandum 90-4 (required by the Federal-Aid Highway Act of 1970).

System Environmental Report Associated With a Multiyear Planning Program

There is widespread agreement that social and environmental impacts ought to be considered in system as well as project plans. There is considerably less agreement on the appropriate mechanisms and techniques for accomplishing an integrated approach to environmental analysis throughout the planning process.

One possible mechanism is to encourage explicit documentation of the social and environmental impacts of system plans through preparation of a system environmental re-

port, which ought to be integrated into the system plan implementation program described in the previous section. The California State Transportation Board has developed guidelines for the preparation of regional plans that require such a document (5). Pennsylvania's Action Plan also calls for an "environmental overview statement" during system planning (6).

A system environmental report (SER) should neither approach the detail currently found in project environmental impact statements nor simply summarize the current status of project environmental analysis. Rather, the SER should present a summary of the plan's area-wide implications for, and impacts on, the environment as well as provide a framework within which later and more detailed project environmental analyses can occur.

Specifically, the SER might contain the following:

1. Identification (and possibly map overlays) of environmentally sensitive areas, land use assumptions, prevailing air and noise pollution contours, and general topography. Also included would be basic demographic data and projections on population, income levels, and employment and the range of uncertainty associated with these projections.
2. A summary of aggregate area-wide social and environmental effects implied by each of the system plan alternatives under consideration. Such a summary would estimate such things as the total open space and farm land likely to be taken or subsequently developed, the area-wide effect of displacements from all projects on the housing market, and the compensation programs required to attempt to minimize adverse effects.
3. Identification of unresolved issues or further studies required in order to estimate the system-wide social and environmental effects.
4. Identification of the status of environmental studies for each project, including major unresolved issues, network implications (i.e., interdependencies with other projects) for projects currently being seriously questioned on environmental grounds, and the current status of the project EIS (under way, completed, approved, etc.).

It is to be hoped that the SER could be produced as a natural by-product of the planning process and the reporting that had occurred to date. Given the magnitude and complexity of issues to be addressed in the SER, it is extremely important that its production not entail a massive after-the-fact documentation exercise. Rather, the SER should be designed to merely summarize or compile the results of ongoing analysis and thereby avoid the criticism leveled at project EISs: that documentation often does not occur early enough in project development to affect the study, in addition to being a burdensome and time-consuming task.

For example, in states where the priority-setting process of choosing projects for an implementation program is done in an open forum considering both technical and nontechnical factors, that portion of the transcript of such a meeting or series of meetings relating to social and environmental issues could be summarized or placed verbatim in the SER.

The actual documentation of system environmental concerns ought to be integrated with the documentation of the system plan itself. Thus, if the plan takes the form of a multiyear implementation stretegy as recommended in the previous section, the SER sections of that plan ought to discuss the anticipated impacts of alternative sequences of improvements and what sequences are left open or foreclosed by the first-period budget decisions. As the system plan is periodically reviewed and updated, the SER component of the plan should also be reviewed and revised.

SUMMARY

In conclusion, there are a number of issues that must be addressed in both system and project planning before close integration of these activities and more effective investment decision-making can occur. These issues include the need for a continuous and systematic appraisal of social and environmental concerns at all levels of planning and the need for plans and programs to explicitly recognize the uncertainty in any long-run predictions or tentative decisions.

To respond to these issues, we recommend a philosophy for coordinating system and project planning on a continuous basis. This philosophy suggests the need for system planning to focus on implementation and investment strategies as well as master plans.

The documentation of the planning process should support the recommended approach. First, a plan format that combines a target-year plan and implementation program in a multiyear and multimodal program package will encourage coordination and display both short- and long-run options. Second, a requirement for a system environmental report product as a management and decision-making document can help to ensure early consideration of social and environmental concern. Such a document should present a summary of area-wide effects and identify issues to be resolved in project studies.

Both the system plan and environmental reporting strategy should be designed to recognize that the most important decisions are the near-term programming and budgeting decisions. The system plan and environmental report should display the consequences of the resource allocation decisions in terms of the options left open and foreclosed and the likely ranges of impacts. In addition, any documentation should lend itself to periodic review and revision without necessarily requiring major new reporting efforts.

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