

6. The alternative solutions and the objectives of the system being analyzed are describable by a reasonably tractable mathematical representation.
7. The parameters of the model are estimatable from readily obtainable data.

These last four conditions are, of course, rarely met in practice. In such cases, systems analysis studies may still help in providing new insights and understanding to the problem of concern, but will probably be less successful than would otherwise be the case.

## EXERCISES

- 1-1. What are the characteristics of water resources planning or management problems that are most suitable for analysis using quantitative systems analysis techniques?
- 1-2. Identify some specific water resource systems planning problems and for each problem specify in words possible objectives, the unknown decision variables whose values need to be determined, and the constraints or relationships that must be met by any solution of the problem.
- 1-3. From a review of the recent issues of various journals pertaining to water resources and the appropriate areas of engineering, economics, planning and operations research, identify those journals that contain articles on water resource systems planning and analysis, and the topics or problems currently being discussed.
- 1-4. Many water resource systems planning problems involve considerations that are very difficult if not impossible to quantify, and hence they cannot easily be incorporated into any mathematical model for defining and evaluating various alternative solutions. Briefly discuss what value these admittedly incomplete quantitative models may have in the planning process when nonquantifiable aspects are also important. Can you identify some planning problems that have such intangible objectives?