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The economic and social consequences of projects, programs, and policies are of substantial concern for policy makers and planners. A widely used approach for anticipating the nature and magnitude of these effects is frequently described as socioeconomic impact assessment or social impact assessment (Halstead et al. 1991, Leistritz et al. 1986b). The socioeconomic impacts of projects and programs include their effects on the economic, demographic, public service, and fiscal dimensions of affected communities. These effects can be viewed as either positive or negative. To maximize potential benefits and to mitigate outcomes that are viewed as problematic, decision makers and residents of affected areas need information about the impacts that are likely to occur (Lansford and Jones 1991, Burchell et al. 1985). Computerized socioeconomic impact projection models are a common means of obtaining such information (Jones et al. 1988, Leistritz and Murdock 1981).

The computerization of socioeconomic impact assessment models is one of the keys to their utility (Hamm et al. 1984). To be most useful for planning efforts, impact projections must be timely, flexible, sensitive to changes in project characteristics, cost effective, and reliable. Computerized models that integrate a number of impact dimensions (e.g., economic, demographic, public service, and fiscal) are particularly desirable because they can be used to quickly provide updated projections of changes in a wide variety of key socioeconomic variables that might arise as a result of an initial change in project design (Leistritz et al. 1986a).

Until recently, virtually all computerized socioeconomic impact assessment models required mainframe computers for their operation. For example, all such systems identified in a 1980 survey were mainframe models (Murdock and Leistritz 1980). However, the increasing availability and capability of microcomputers, coupled with desires for greater model transferability and user adaptability, have created a demand for socioeconomic impact assessment models suitable for microcomputer use (Halstead et al. 1991).

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This article introduces the Microcomputer Economic-Demographic Assessment Model (MEDAM), a microcomputer-based model for assessing economic, demographic, public service, and fiscal impacts of resource and industrial development projects. The model is based on the Socioeconomic Analysis of Repository Siting (SEARS) model, a mainframe system previously developed by the authors (Hamm et al. 1984). This article describes the characteristics, outputs, components, and limitations of MEDAM.

OVERVIEW OF MODEL CHARACTERISTICS AND OUTPUTS

The MEDAM model was written for IBM-PC and compatible computers. It is a compiled BASIC program that runs under the Disk Operating System (DOS) environment. The model generates 10 output or report files; users can specify which of these reports are to be printed. Users also can alter numerous model assumptions to tailor the analysis to their locale and specific needs. Minimum hardware requirements includean IBM-compatible microcomputer with 128 K of memory (Coon et al. 1993).

Developing a model that would be suitable for use on most microcomputers required some critical design decisions. As a result of these decisions, MEDAM differs from many mainframe models in that baseline projections are not provided. The model provides projections for a wide variety of socioeconomic indicators for construction and operational project phases in summary form and for up to 6 counties, 6 towns, and 6 school districts in any given model run. The reporting options available for various jurisdictions are listed in Table 1. In total, MEDAM provides 10 different reports that include projections of:

- business activity (summation of business and industry sales by economic sector)
- personal income (total)
- employment by type (project construction, operational, and secondary)
- population by age and gender
- housing demand by type (single family, multiple family, mobile home, and other)
- school enrollment by grade level
- criminal justice service requirements (number of offenses and law enforcement officers required)

- medical service requirements (number of physicians and hospital beds)
- public service requirements (demand for fire protection, water supplies, solid waste disposal, and transportation)
- public sector costs by type of service
- public sector revenues by source
- net fiscal balance
- capital expenditures summary by governmental unit

All reports provide information for each of the first five years following project initiation and every fifth year thereafter through year 25. These outputs allow a wide range of socioeconomic information to be provided for local and regional planning.

Table 1. Summary of MEDAM Reports by Geographic Level

Regional Level	County Level	Municipal Level/ School District
Economic Activity	--	--
Employment Summary	Employment Summary	Employment Summary
Population by Age and Gender	Population by Age and Gender	Population by Age and Gender
Criminal Justice	Criminal Justice	Criminal Justice
School Enrollment	School Enrollment	School Enrollment
Housing Demand	Housing Demand	Housing Demand
Public Services	Public Services	Public Services
Fiscal Impact (State Gvt.)	Fiscal Impact	Fiscal Impact

In many planning situations, however, model users may be uncertain of specific project characteristics such as employment levels or the exact starting date of construction. To accommodate alternative project scenarios and to allow users to obtain information reflecting a variety of additional alterable assumptions (such as service rates or per capita public sector expenditures), MEDAM has a number of user-alterable parameters. For example, users can readily change the model's rates that show service demands per unit of population, housing requirements for each type of project-related workers, and public sector expenditures per capita or per student.

The model's default rates are national or regional averages. However, the user may substitute local service rates or other rates developed for the impact area. Default values are provided for all variables in the model except for (1) project expenditures, (2) construction and operational employment, (3) the percentage of each worker type who are inmigrants to the area, and (4) the percentage of inmigrating construction workers who bring their families to the area. Changes to the model default values are implemented by the user through responses to a series of interactive questions (prompts) that appear during the model run specification. A summary of the parameters that users may alter is included in Table 2.

The remaining pages of this article summarize the conceptual structure of the MEDAM model and describe the model's capabilities and limitations.

Table 2. Summary of MEDAM User-Alterable Parameters

User-Alterable Parameters
Project of interest
Construction start date
Jurisdictions of interest (up to 6 counties, 6 cities, and 6 school districts)
Service rates
Housing selection rates
State tax and expenditure rates
County tax and expenditure rates
City tax and expenditure rates
School district tax and expenditure rates
Capital investment expenditure rates

MODEL STRUCTURE

The MEDAM model is composed of four submodels: an economic (input-output) module, a demographic module, a service requirements module, and a fiscal impact module (Figure 1).

The economic module uses an input-output framework to estimate the level of business activity (gross business volume) for each economic sector required to satisfy a specified level of sales to final demand. Project-related expenditures must be provided by the user for each of the first five years after the project start date and every fifth year for the next 20 years. Also, for the same years, the user must estimate the number of project construction and operational workers. This provides for an impact analysis over a 25-year period.

Application of the project expenditures to the input-output model interdependence coefficients (multipliers) yields estimates of business activity (gross receipts) for each sector of the economy. Dividing the business volume of each sector by the productivity ratio (gross business volume to employment ratio) for that sector gives estimates of secondary (indirect and induced) employment. For the initial implementation of MEDAM in North Dakota, interdependence coefficients and productivity ratios from the North Dakota Input-Output Model were used (Coon and Leistritz 1989). For a discussion of alternatives for obtaining similar coefficients for other states or regions, see Otto and Johnson (1993).

The demographic module uses a combination of user-supplied and model-generated data. The user provides estimates of project construction and operational employment, while estimates of project-related secondary employment come from the economic module (Figure 1). The user estimates the percentage of workers of each type (i.e., construction, operational, and secondary) who will inmigrate to the area, the percentage of relocating construction workers who will bring families to the area, and the percentage of the workers of each type who will locate in each of the affected jurisdictions. The model uses these data, together with information regarding typical demographic profiles of workers of each type and their families and the incidence of multiple job holding per household, to compute estimates of project-related population by age and gender for each of the affected jurisdictions.

The services module is the third major component of MEDAM. This module contains a set of default per capita service requirements that are used to estimate additional service needs likely to be associated with a specific project. Service requirements estimated by the model are only those associated with the impact population (i.e., additional or inmigrating population associated with the specific project).

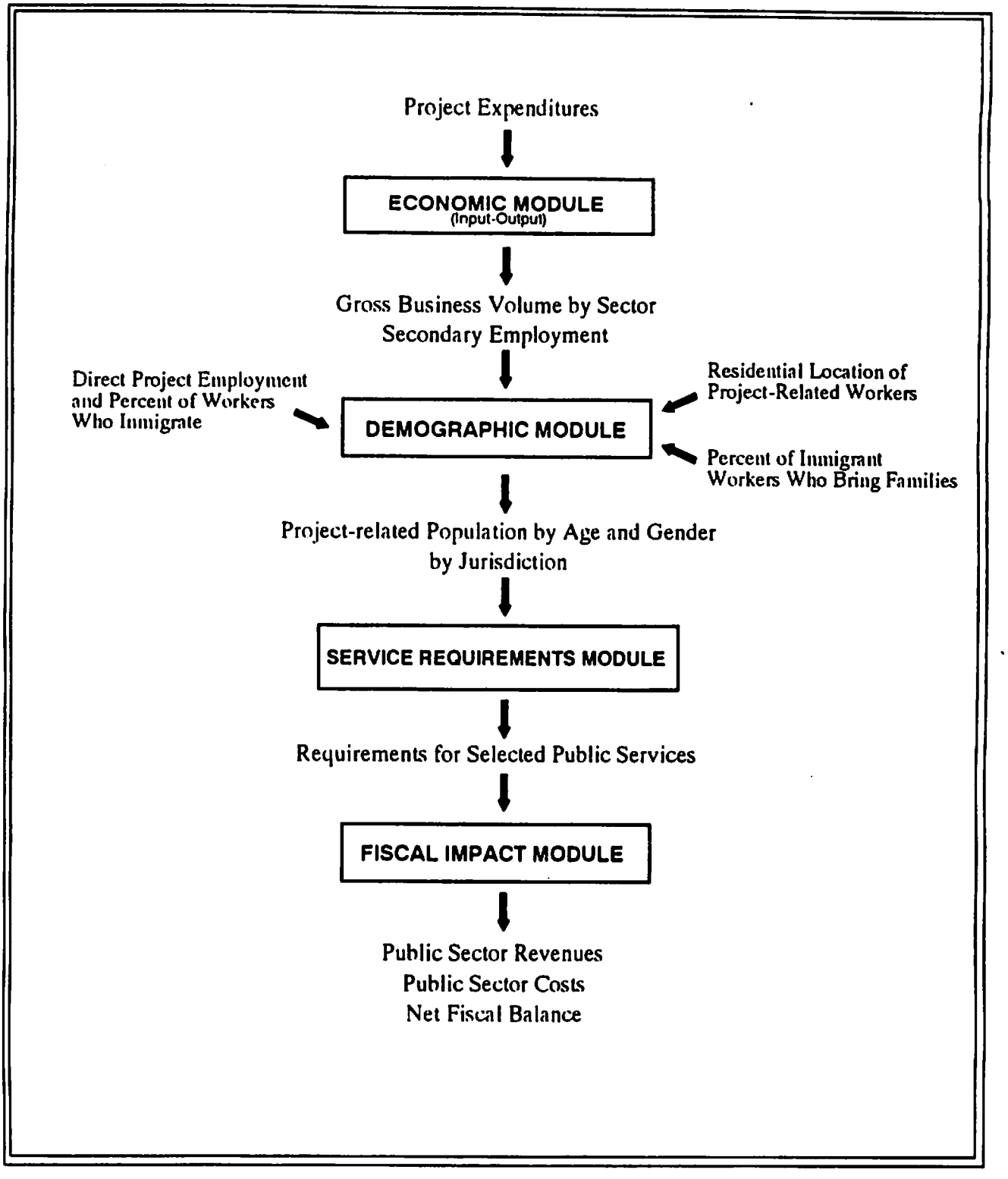

Figure 1. Conceptual Overview of MEDAM Data and Output Flow

The final component of MEDAM is the fiscal impact module. This module develops estimates of additional revenues and expenses for state government, county government, city government, and school districts that result from a specific project. The user's specification of jurisdictions of interest determines the counties, cities, and school districts for which fiscal analyses will be conducted. The user also is required to determine if each level of government will have adequate infrastructure or if capital expenditures will be required. State and local government default revenue and expense estimates are incorporated in the fiscal module. Users can alter any of these default rates. In sum, the fiscal module provides estimates of additional project-related revenues, costs, and net fiscal balance (the difference between revenues and costs) and a summary of any capital expenditures.

MODEL LIMITATIONS AND CONCLUSIONS

The development of integrated socioeconomic assessment models represents an ambitious attempt to understand better and simulate realistically the processes of economic growth/decline and community change. The MEDAM model makes some of the impact assessment capabilities embodied in such systems available to microcomputer users. In order to accommodate the limited data processing and storage capabilities of many microcomputers, some capabilities commonly found in mainframe systems are not available in MEDAM. In particular, MEDAM does not incorporate baseline projections of the various socioeconomic indicators, but rather provides estimates of project impacts only. Users who desire to compare project impacts with estimates of baseline (without project) conditions will need to undertake additional analysis outside the MEDAM system.

A second limitation is that MEDAM allows for assessment of impacts of a single project only. Assessing the cumulative impacts of multiple projects would require analysis outside the MEDAM framework.

In addition, analysts who have experience using mainframe models will find that some assessment steps which are often internalized within mainframe systems require user-supplied information for MEDAM analysis. For example, the percentage of each worker type who will inmigrate to the area and their place (jurisdiction) of residence are calculated within the SEARS model, but require user inputs and, hence, explicit analysis when using MEDAM.

The rationale for imposing these limitations was to ensure the feasibility of implementing the model on microcomputers, including those with limited data processing and storage capacity. The SEARS mainframe model code required 369K core storage and 10 workspaces using direct access files and its data files required 475 tracks of IBM 3350 disc space (Hamm et al. 1984). Clearly, some streamlining is required to adapt such systems for microcomputer use.

In addition, the MEDAM model is subject to the limitations that affect integrated socioeconomic impact assessment systems generally. These limitations include those imposed by data bases (often not as detailed and/or current as desirable), by problems inherent in small area analysis, and by model scope (i.e., some variables and relationships that may be relevant in simulating conditions likely to occur in rural areas may be excluded).

Finally, any model's projections are only as accurate as the assumptions on which its components are based. Any changes in the factors upon which model assumptions are based may have consequences for the model's accuracy.

In summary, while offering a flexible tool for socioeconomic impact assessment, MEDAM must be used with full recognition of its limitations and of the assumptions on which it is based. If used with care, however, such models may be useful tools for impact assessment and thus may provide valuable input for planning and policymaking.

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