AN EVALUATION OF ECONOMIC AND DEMOGRAPHIC DATA USEFUL IN WATER RESOURCES PLANNING

A Report Submitted to the:

U.S. Army Engineer Institute for Water Resources
Kingman Building
Fort Belvoir, Virginia 22060

INSTITUTE FOR WATER RESOURCES

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by

Regional Economic Analysis Division
Bureau of Economic Analysis
United States Department of Commerce

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The report describes the kinds of socio-economic data available from the Department of Commerce, particularly at the Bureau of Economic Analysis, which may be useful for meeting the requirements under different planning tasks. It includes selected data samples and data sources, and discusses briefly several data problems such as the use of OBERS projects, data integration, and data for normative forecasting.

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PREFACE

This report was prepared at the request of the Institute for Water Resources, under the terms of an agreement of June 21, 1974 and a revised research plan of September 16, 1974. Its purpose is to provide a detailed description of many economic and demographic data files available for use in water resources planning and to address some of the concerns expressed to the Bureau of Economic Analysis by field personnel of the U.S. Army Corps of Engineers regarding the applicability and accessibility of the data for problem identification, forecasting, and impact assessment. We are grateful for the assistance we received from these individuals.

Under the supervision of Daniel H. Garnick, Chief of the Regional Economic Analysis Division, John H. Stierna, Howard L. Friedenberg, and Ronald L. Drake had primary responsibility for the study. Significant contributions were also made by David W. Cartwright, Eugene R. Janisch, Kenneth Johnson, Edward A. Trott, Jr., and James M. Younger.

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CHAPTER I

INTRODUCTION

In its efforts to plan and evaluate alternative ways of conserving and developing water resources, the U.S. Army Corps of Engineers requires a wide spectrum of information. The Congress and the Executive Branch, reflecting public concerns, have required the Corps to incorporate environmental, social, and regional economic effects into a planning process that, previously, had long been dominated by benefit/cost ratios and considerations of national economic gains. The data problems generated by these additional planning requirements are diverse. The development, accession, and correct use of such diverse kinds of data, each with its conceptual, institutional, and geographic peculiarities, have placed greater burdens on available planning resources.

At the same time that data requirements for planning are increasing, greater efforts are being made for more effective public participation, plan formulation, and evaluation of alternatives. These elements of planning sometimes compete with data collection activities for available planning resources. Clearly, either more resources must be made available for planning, or greater efficiency must be achieved in data collection and analysis than has existed in the past.

This study by the Bureau of Economic Analysis (BEA) concerns data. It identifies, describes, and evaluates selected data series available for use in water resources planning studies undertaken by the Corps of Engineers. The report concentrates on socio-economic data that are available on the Federal level for subnational areas within the United States.

This report does not tell planners how to do their job, nor does it provide a comprehensive catalog of all data that may be helpful to water resource planners. With this reference manual, however, planners may be able to save time and other resources otherwise consumed in identifying, selecting, and adjusting relevant data series needed in establishing base conditions and alternative forecasts. Definitions, measurement concepts, time frames, and geographic coverage of various economic and demographic data series have been significant technical problems impeding or slowing the forecasting and analysis efforts of field planners, thus diverting energy from other planning tasks.

Summary Review of Planning Tasks

Water resources planning in the Corps of Engineers follows certain tasks and steps specified by the Office of the Chief of Engineers (OCE).[1/]

[1/] Department of the Army, Office of the Chief of Engineers, Planning Process: Multiobjective Planning Framework, ER 1105-2-200, May 12, 1975.

These tasks and steps, summarized below, provide the planning framework and, thus, indirectly specify data needed in the planning process.

Problem Identification

Like planning in general, the identification of planning objectives is an iterative process that leads to a refined description of resource problems. Using data on hand, planners develop preliminary problem statements and area profiles and refine them as more data, including that on public concerns and desires, are collected and analyzed. The end product of problem identification, therefore, is a carefully developed set of planning objectives that can serve as a basis for formulating and evaluating alternative solutions to specified problems. To assist field offices in undertaking problem identification, OCE has enumerated the following steps:

(1) Identify public concerns. A broad range of economic, social, and environmental concerns can be identified through discussion with agencies, interest groups, and the public. These concerns, in turn, form the basis for identifying the resource management problems to be addressed.

(2) Analyze resource management problems. These public concerns are then analyzed, using existing authority and related policy, to determine the range of resource management problems to be addressed.

(3) Define the study area. The character and range of resource management problems to be studied should be used as a basis for defining the geographic area to be studied.

(4) Describe the base conditions. The study area should be described in terms of existing water and land uses and other economic, social, and environmental characteristics. Its description should verify actual and potential resource management problems.

(5) Project future conditions. Drawing on previously developed information, a number of reasonable alternative future conditions should be projected. One of these representing the "most probable future," should be used as a basis for analyzing future conditions.

(6) Establish planning objectives. Water and land resource needs, concerns, opportunities, and constraints (net of outputs obtained under the "without" condition) will be analyzed as a basis for establishing planning objectives for the study.

Formulation of Alternative Solutions to the Problem

The planning process is intended to formulate alternative plans for water and related resource problems. More specifically, it is concerned with disclosing alternative solutions to the planning objectives. This task should consider all possible alternatives, including nonstructural and "no development" plans. The systematic process for the formulation of alternatives, as set forth by OCE, is as follows:

(1) Identify management measures. The full range of technical and institutional measures for achieving each of the planning objectives should be set forth. This will result in a preliminary description of the different management measures that are applicable to a given study.

(2) Categorize applicable management measures. The range of measures should be analyzed fully to determine the applicable structural and nonstructural measures which address themselves to one and to more than one planning objective. The measures should be compared with each other to determine which are conflicting and which complementary.

(3) Develop plans. Linking or combining different measures into systems comprising alternative plans initially involves choosing measures which address a number of objectives. To these basic systems are added, incrementally, complementary measures addressing additional objectives. This process should yield a number of complete management systems for achieving the planning objectives. The analysis of the complementary and competitive interactions among the measures will permit the planner to identify and minimize conflicts, maximize compatibility, and insure completeness to the fullest extent possible. Subsequent impact assessment and evaluation will narrow the range of alternatives and establish a basis for effective choice among the various plans.

(4) Consider plans originated by other interests. Where legitimate plans have been proposed by other interests (both governmental and non-governmental), they should be included in the planning process.

Impact Assessment

Impact assessment is the identification and measurement of the timing, location, and magnitude of the economic, social, and environmental changes that would occur, relative to the base condition, if alternative water and related land development plans were implemented. The steps for impact assessment, recommended by OCE, are:

(1) Determine sources of impacts. Those components of the alternative plans that might impact on the elements of the base condition should be identified and described.

(2) Identify and trace impacts. Impacts are identified by analyzing and forecasting how causative factors could cause significant changes from base conditions.

(3) Specify incidence of impacts. The geographic location (whether inside the project area or elsewhere) and duration of changes in base conditions should be identified.

(4) Measure impacts. The magnitudes of changes in base conditions should be quantified in monetary or nonmonetary units, or concisely characterized in a written description.

Evaluation

Evaluation is the process of determining the value of each plan's impact on the "without condition" and comparing planning alternatives. As each iteration of planning discloses impacts, the process provides a sufficient basis for evaluating these impacts and determining which ones to use as inputs to the next iteration, thus formulating alternative ways for reducing adverse impacts and maximizing beneficial impacts.

The steps recommended by OCE for use in the evaluation planning task are:

(1) Appraise planning objective fulfillment. Determine if and how much the alternative plans contribute to the planning objectives.

(2) Appraise system of accounts contributions. Each plan is analyzed in terms of contributions to the four accounts--national economic development, environmental quality, regional development, and social well-being.

(3) Apply specified evaluation criteria. Other Federal criteria, which provide a basis for choosing among alternative plans, are acceptability, certainty, completeness, effectiveness, efficiency, geographical scope, NED benefit/cost ratio, reversibility, and stability. Use should be made of sensitivity analysis, alternative futures, and risk and uncertainty analysis in determining certainty, stability, and reversibility.

(4) Perform trade-off analysis. Trade-off analysis, a comparison of alternative plans, uses those planning objectives that reflect the desires of affected groups and the evaluation that results from applying the appropriate evaluation criteria. It should identify plans serving a wide range of interests, including the Federal interest. The comparison should allow for dissimilar units in measuring impacts, including adjustments-to-data series, where possible.

(5) Designate NED and EQ plans. Using the specified criteria, designate that alternative plan or plans to be known as the national economic development and environmental quality plans.

These planning tasks and steps, taken together, provide the procedural approach recommended by OCE to integrated water resources planning. Explicit data requirements for these planning tasks are not provided, because data needs will vary depending on the type of resource problem being studied.

The Use of Data in Water Resources Planning

Water planning requires data for three broad types of uses. First, to describe and analyze a problem situation, and thus provide a basic understanding of the dimensions and implications of the problem. Second, to forecast the problem or area conditions, and thereby provide a grasp of future implications of the problem being investigated. And third, to evaluate alternative means of solving the problem or improving the situation, and thus provide a basis for choice from among available alternatives.

The choice of data and their proper use provide the planner with a medium to accomplish these ends. Participants in the planning and decision-making process frequently consider specific quantitative findings when they assess the reliability and effectiveness of alternative courses of action or make judgments on the reasonableness and usefulness of planning reports. For example, forecasted population growth is perhaps the most crucial variable in justifying water supply facilities. Similarly, forecasts of waterway traffic are needed for navigation studies, especially by type of cargo.

The results of the planning process, and the information on which it is based, must be communicated to the public and its elected or appointed representatives--those responsible for considering the plan. Thus, data must place the proposed actions in perspective to the decision-maker's concerns and understanding.

In the context of water planning, data can mean either an empirical quantitative value or an explicit, narrative description of a specified variable. The latter interpretation of data is common in environmental assessments, while the former is prevalent in economic analysis and benefit/cost estimation. This report stresses the empirical dimension of socio-economic data.

Dimensions of Data Needs in Water Planning

The nature of needed data varies widely by type of study, characteristics of the area, and the specific phase of the study. It is possible, however, to generalize several of the specific data concerns into three broad groups: (1) socio-economic data, (2) resource data and their expanded topical coverage, and (3) small-area data. This section briefly describes some of the common types of data needs in Corps water planning, even though the data considered in this report only partially cover these needs.

Socio-Economic Data

Virtually all Corps studies require some data on the economic and demographic trends, structure, and characteristics of the study area. Although planners generally "custom build" this background profile, many of the same data components are included in study after study: population levels, density, personal income, per capita income, employment, industrial structure, unemployment rate, and the like. Indeed, various data series may be integrated into multipurpose profiles. Many of these components are forecasted as part of the problem identification task of planning,

often with the use of OBERS data as an initial alternative future.[2/]

To assist both the analysis of existing conditions and forecasts of future conditions, data series available to Corps personnel could be enriched by use of more detailed socio-economic data series. Several examples can be cited. Age and sex specific data series on population and population migration may disclose that trend extrapolation of total population would be erroneous in some areas. This is especially so for recreation studies, where age and sex have a significant bearing on recreation demand. The use of more detailed data on industrial trends could enhance analysis of commodity movements or industrial water use.

Many types of socio-economic data are already being used, and many more are available. The need for these additional data series stems from the complexity of the resource problems that planners must face.

Resource Data

The broadening of resource concerns that must be studied as part of the planning process has created the need for data that provide better coverage of functional water problems. Examples are as follows:

(1) Water quality. Many of the data sources used by the Corps could be supplemented by more data on water quality. Planners question whether the range of present indicators is sufficiently broad to measure water quality.

(2) Land use. Data are being sought on land use, especially as they relate to flood problems or needs for, and location of, waste treatment facilities.

(3) Navigation. Field desires for increased topical coverage of data include information on container-adaptable cargo, which implies data on tonnages shipped by four-digit SIC codes, by mode.

[2/] U.S. Water Resources Council, 1972 OBERS Projections, Regional Economic Activity in the U.S., Vol. 1: Concepts, Methodology, and Summary Data; Vol. II: BEA Economic Areas; Vol. III: Water Resources Regions and Subareas; Vol. IV: States; Vol. V: Standard Metropolitan Statistical Areas; Vol. VI: Non-SMSA Portions of BEA Economic Areas; Vol. VII: Non-SMSA Portions of Water Resources Subareas (Washington, D.C.: Government Printing Office, 1974). The OBERS program is a joint undertaking of the BEA and the Economic Research Service, U.S. Department of Agriculture.

(4) Flood control. Planners working on flood control studies are seeking better historical data on structures and their contents, partly from the knowledge that many manufacturing establishments have more machinery per unit of floor space. With historical data of this type, an empirical basis exists for improving forecasts of future flood damages.

In the quest for data providing greater topical coverage of natural resources, planners have expressed the need for translators that can link economic and demographic changes to resource issues, thus enabling the use of the more readily available data as a basis for the analysis of immediate concerns--water resource problems.

All of these specific data concerns suggest the need for data series providing expanded topical coverage of water problems.

Small Area Data

A common concern of planners is the lack of adequate geographic detail for many data series, especially projections. The dimension of the need for greater geographic detail evolves from the gradual shift away from broad framework studies to specific sub-basin and project analyses. These smaller area studies, including the more recent urban wastewater studies, require small area data. Data needed on a local area basis include population forecasts, consistent annualized income trends, industrial trends, urban land use, recreation demand, and the like. Planners are concerned that excessive accuracy and rigidity may be implied by the use of these data in water planning. Nevertheless, they still seek whatever may be available for small geographic areas.

Small area data may mean county level projections, neighborhood level (perhaps census blocks) social data, or land use information for specific lots. These kinds of data may be available from local sources, or they may be adapted from centralized sources, such as the Corps SIRAP system.

These three dimensions fall short of what might be disclosed by a comprehensive field survey of data needs. They do, however, suggest several concerns that are addressed in this report. Greater topical coverage of resource issues, beyond the scope of this study, perhaps merits separate consideration by the Corps.

CHAPTER II

SOCIO-ECONOMIC DATA AVAILABLE FOR WATER PLANNING

Water resources planning studies are often confronted by data problems which impedge forecasting and analysis efforts. After summarizing the most common of these, this chapter identifies and evaluates various demographic and economic data sources and series, many of which may help in dealing with the data problems. Specific technical facets of each data series are considered because of the frequent difficulties encountered in field use of data.

Frequently Encountered Data Problems

The most common data problems include lack of appropriate data, inconsistent measurement and definitions for similar data series, obsolete data, inconsistent time frames, inadequate geographic detail on coverage of data, difficulties in accessing needed data, and inadequate forecasts of future conditions.

Lack of appropriate data is always a problem. Field surveys, although costly, are often used to obtain needed data, especially for items like tonnages of specific kinds of waterway shipments. Frequently, however, many data series are available, although they might not conform to the specific needs of a study. For example, although local area population forecasts are not generally available, disaggregating projections for larger areas (e.g., OBERS) or developing alternative forecasts from a more comprehensive historical series is appropriate for overcoming this kind of data deficiency. Use of proxy variables can also help overcome some data deficiencies. For example, industrially detailed labor and proprietors' income data (discussed below) can serve as a proxy for industrial output in water supply and water quality studies. In flood control studies, personal income (see below) can serve as a proxy for value of structure or for value of the contents of structures.

Although the use of proxies in place of the needed data can fill some of the existing information gaps, particular attention to definitions and coverage of proxy data is crucial to their effective use. For example, although data on the characteristics of the population should be considered in assessing recreation demand, data on the actual use of recreation facilities are even more crucial.

Many data series have definitions and measurement concepts inconsistent with a particular application in water planning. The problem arises because certain data have come into general use, although their origin is based on a specific use or concern. For example, Census data on the industrial distribution of the work force may not be the appropriate series in ascertaining industrial structure for a water supply study of an area,

because Census data are measured at the location of residence (rather than work) of the labor force. Land use data suffer from a wide array of different classification systems for different geographic areas. Definitions and measurement concepts can be problems in developing historical estimates and forecasts of per capita water use because of seasonal fluctuations in population levels in some areas that are not detectable in the midyear annual estimates of population. To help the planner in his choice of data, the discussion below stresses the measurement concepts underlying particular data series.

The lag between the point in time at which data are collected and published and the point for which an analysis must be performed is often a serious problem for planning. This is particularly true when a region (e.g., an urbanized area) is in a stage of rapid change. Census population and economic data for 1970, for example, may not adequately reflect the current situation. However, in many cases selected current data (discussed below) can be used to suggest whether or not fundamental changes have occurred. Armed with this information, the planner is in a better position to judge the applicability of the Census data and to update his analysis to reflect the most recent situation, if it has a material bearing on project evaluation.

The problem of inadequate geographic coverage of selected data series takes various forms. For example, although demographic data from the Census are available for almost all possible geographic configurations on a consistent basis, annual demographic estimates are not as flexible geographically. Annual labor force and unemployment data do not cover many small towns and rural areas. Consistent land use data seldom are available beyond the limits of particular counties. Block level Census data do not always exhaust a standard metropolitan statistical area (SMSA), thus forcing planners to make adjustments in some studies. Forecasting problems are compounded when historical data are available for only part of the area under study. The data discussion below focuses on the geographic coverage of specific data series to help planners address this problem.

Easy access to data has been a persistent problem for field personnel. Manual extraction of data from published sources is time consuming. Use of computerized data systems frequently requires use of huge data dictionaries and some form of specialized training in data retrieval methods--especially for customized data profiles. Blending Census demographic data from the past four decades for use in time series analysis and forecasting requires extracting data from different computerized files--each of which may have certain peculiarities in terms of definitions, coverage, and formats. Some of the data files covered in this chapter have already been blended over time and space to help solve this problem.

Inadequate forecasts of economic and demographic conditions pose another problem for planners. Long-range population forecasts made in the mid-sixties may not have considered falling birth rates and related

slowing of economic expansion. Similarly, long-range economic forecasts made more recently may not have considered the full regional implications of military base closings. Even current forecasts may not consider urban saturation in some areas, thus leading to erroneous estimates of water needs or water transportation requirements.

All of the above data problems consume time and resources in water planning studies. Accordingly, the subsequent discussion of data sources is designed to assist planners in understanding the advantages and limitations of these data series and their potential usefulness in overcoming some data problems.

Demographic Data

Most demographic data series originate at the U.S. Bureau of Census. Many of these series are available in SIRAP and in the BEA (see Table II-1). The items selected for discussion below are basic to most local area demographic profiles used in the planning process.

Population Size

Sources for the enumeration or estimates of population differ because of contrasts in data collection methods, geographic configurations, time periods of coverage, and organizations under which programs have originated.

Bureau of the Census information

Census, which provides a residential population count every decade, determines the official number of residents of almost any geographic configuration desired:

The United States	Places (incorporated and unincorporated places of 2,500 persons or more)
Census divisions (broad regions)	
States	Places of less than 2,500 persons
Counties	Minor civil divisions
SMSA's	Census tracts
Urbanized areas	Blocks (in metropolitan areas)

Table II-1. Selected Demographic Data and Their Sources for Use in Water Planning

Type of measure	How measured	Usual original source	Availability in computer system *
Population	Count of persons for specific year and over specified time period	Census	S B
	Area population as percent of U.S.	Derived	S B
	Percent change in population	Derived	S B
Population density	Persons per sq. mile	Census	S B
	Urban land per 10,000 urban population	BEA	B
Characteristics of the pop.	Persons by race	Census	S B
	Persons by sex	Census	S B
	Persons by age	Census	S B
	Persons by family relationship	Census	S B
Population movements	Net population change exclusive of births and deaths	Census	B
	Geographic movement of persons	Census	S B
	Geographic movement of workers by selected economic and demographic characteristics	Social Security	B

* Data exist in retrievable form in computerized system.
S = SIRAP system.
B = BEA's information system.
Source: Bureau of Economic Analysis, Regional Economic Analysis Division.

Residential population is defined as all inhabitants at their usual place of residence on April 1 of the Census year. Persons living temporarily abroad are counted at their usual place of residence, while persons residing overseas for an extended period of time are included only in the national count of the residential population. The residential count also includes persons residing in such institutions and government installations as colleges and universities, boarding schools, certain hospitals, prisons, and military bases. Thus, the Census count of a flood plain would include persons domiciled in a home for the aged, but the Census would count children attending a neighboring day care center at the homes of their parents.

Bureau of Economic Analysis population files

Long-term trends can be assembled from various Census files, or they can be obtained directly from the BEA or Census. The BEA maintains a 73,800 record file of Census population counts, imputed net migrations, and net migration rates by cohorts of sex, race, and age. This county level file contains five values covering the 40-year interval between the Censuses of 1930 and 1970.

This data series by itself lacks sufficient observations to project population time series. It also suffers from the 10-year time interval between Census counts. A community may have "peaked" in population growth sometime between 1960 and 1970, yet Census data would reveal only 1960 and 1970 figures, both below the peak. Clearly, as in this case, projections or forecasts based only on Census trends can be in error.

Current population reports

Annual population estimates, published by Census, contain county level data prepared by the various states.[1/] Although only estimates (sometimes severely revised following the decennial census), these data nevertheless permit updating the most recent decennial Census counts.

The annual estimates data are available also from the BEA. Data from the Census counts and the current population reports can be merged to show both long-term and short-term trends in an area's population, thus providing a more comprehensive basis for forecasting, although, by itself, still inadequate. Table II-2 shows the type of data available for Marquette County, Michigan.

Population Density

Density is a measurement of the concentration of population within a specific geographic area.

1/ Bureau of the Census, Current Population Reports, Federal-State Cooperative Program for Population Estimates, Series P-26, various issues.

Table II-2. Examples of Population Data Available from Census and *Current Population Reports*, Marquette County, Michigan

Year	Population: Census Counts (April 15)	Population: Current Population Estimates (July 1)
1910	46,739	
1920	45,786	
1930	44,076	
1940	47,144	
1950	57,654	
1960	56,154	
1962		59,900
1965		61,100
1966		60,300
1967		61,600
1968		61,200
1969		62,900
1970	64,686	64,900
1971		67,000
1972		68,100
1973		68,600

Source: Bureau of Economic Analysis, Regional Economic Analysis Division

Bureau of the Census information

The published Census volumes contain various types of density statistics, based on official Census counts, and urban area land data, developed by the Bureau's Geography Division and employing consistent criteria and measurement concepts. The 1970 Census of Population, for example, includes population density of counties only (see Table 9, Chapter A). The 1970 U.S. Summary (Publication PC(1)-A1), on the other hand, includes population density for 1960 and 1970 for each urbanized area in the Nation, including the densities of its central city and the surrounding urban territory (see Table 20). It also contains the density of individual places with 2,500 inhabitants or more (see Table 31). These data, however, unlike other density data, use locally reported land area data in addition to official Census population figures. Moreover, they are sometimes invalid, as when city engineers, managers, and other local officials, reporting on land area, include water area and surrounding rural territory serviced by the city, and unintentionally include other extraneous information.

The City and County Data Book contains data for states, counties, SMSA's, urbanized areas, large cities, and large unincorporated places. These data are also available on tape, directly from Census, and from several other sources, including the BEA and the Corps' SIRAP system.

Private information

A private corporation has developed 1970 population density data, by Census tract. The National Planning Data Corporation, of Ithaca, New York, has used an electric planimeter to measure the area of the 35,000 Census tracts in the United States. When the company merged the land area data with Census tract population counts, it created a unique density data file. To obtain necessary identification, the tract density data are used in conjunction with the Census Bureau's metropolitan map series, which is published with the Block Statistics volumes [Series HC(3)] of the 1970 Census.

Bureau of Economic Analysis information

A somewhat different formulation of density is available from the BEA's urban land information system, which provides "urban density." The urban territory of each county has been estimated, using control totals provided by the Census Bureau, and divided into the urban population. This measurement, unfortunately, is provided for 1970 only. Because the area of developed land within a county is difficult to obtain, planners usually rely on county density (total population divided by total land area) and apply this figure to all areas comprising the county--a far less meaningful measure of population concentration.

Urban land area includes land in Census defined places and unincorporated urban territory, such as the developed fringe surrounding central cities of 50,000 inhabitants or more. Extended cities (those with large amounts of rural territory, as in the case of Chesapeake, Virginia or Oklahoma City,

Oklahoma) have been separated into urban and rural components to maintain as accurate a measure of urban territory as possible. This measure of urban land has a one-to-one correspondence with urban population--thus providing the best available information on urban density, by county, for 1970.

The land data are arrayed by the following groups:

- Total land area
  - Urban land
    - In urbanized areas
      - Within communities
      - Outside of communities
    - Outside of urbanized areas
  - Nonurban land

Urban land is that area devoted to aggregate urban uses, including residential, industrial, commercial, and institutional uses. Urban land within communities in urbanized areas includes all Census defined places of at least 2,500 persons. Urban land outside of communities in urbanized areas includes land in very small places (less than 2,500 inhabitants) and unincorporated territory, such as the developed urban fringe. Urban density is arrayed for these same groupings, thus providing a measure of density differences between the dense central cities and the developed fringe.

The system also provides a measure of urban land use per unit of population, which can be used to indicate potential demands for urban land associated with alternative forecasts of population. Of course, other important determinants of land use such as land prices, household income levels, zoning policies, and availability of utilities are not explicit in this approach toward estimating future urban land requirements.

Because this system contains only 1970 data, time series analysis is not possible. However, cross-sectional density analysis can be undertaken, especially to address similarities and contrasts among different parts of the country.

Characteristics of the Population

Census data for 1970, by county, on characteristics of the population, such as age, sex, race, and family relationship, are available from the BEA (see Table II-3). Moreover, BEA is evaluating data on magnetic tape from the 1952, 1956, 1962, 1967, and 1972 City and County Data Books to determine the availability of comparable data for previous years. Interregional comparisons of these data may be useful in assessing regional differences in consumer tastes.

Table II-3. General Characteristics of the Population

Race

All persons.....
White.....
Negro.....
Percent Negro.....

Age by sex

Male, all ages.....
Under 5 years.....
3 and 4 years.....
5 to 9 years.....
5 years.....
6 years.....
10 to 14 years.....
14 years.....
15 to 19 years.....
15 years.....
16 years.....
17 years.....
18 years.....
19 years.....
20 to 24 years.....
20 years.....
21 years.....
25 to 34 years.....
35 to 44 years.....
45 to 54 years.....
55 to 59 years.....
60 to 64 years.....
65 to 74 years.....
75 years and over.....

Female, all ages.....
Under 5 years.....
3 and 4 years.....
5 to 9 years.....
5 years.....
6 years.....
10 to 14 years.....
14 years.....
15 to 19 years.....
15 years.....
16 years.....
17 years.....
18 years.....
19 years.....
20 to 24 years.....
20 years.....
21 years.....

Female, all ages cont'd
25 to 34 years.....
35 to 44 years.....
45 to 54 years.....
55 to 59 years.....
60 to 64 years.....
65 to 74 years.....
75 years and over.....

Relationship to head of household

All persons.....
In households.....
Head of household.....
Head of family.....
Primary individual.....
Wife of head.....
Other relative of head.....
Not related to head.....
In group quarters.....
Persons per household.....

Type of family & number of own children

All families.....
With own children under 18 years.
Number of children.....

Husband-wife families.....
With own children under 18 years.
Number of children.....
Percent of total under 18 years

Families with other male head.
With own children under 18 years.
Number of children.....

Families with female head.....
With own children under 18 years.
Number of children.....
Percent of total under 18 years
Persons under 18 years.....

Marital status

Male, 14 years old and over...
Single.....
Married.....
Separated.....
Widowed.....
Divorced.....

Female, 14 years old and over.
Single.....
Married.....
Separated.....
Widowed.....
Divorced.....

Source: Bureau of the Census, Census of Population 1970.

Population Movements

Population changes (and the nature of these changes) are critical elements in resource planning. Those resulting from births and deaths, for example, exhibit a relatively stable and predictable pattern, while those due to large migratory movements show growth or decline patterns which vary considerably over time. In Table II-4 the numerical and percentage change in total population and the components of change from 1970 to 1973 are shown for selected metropolitan areas. The population declines in Akron, Charleston, and Pine Bluff were due to net outmigration, while in Boston the net migration was offset by a large natural increase in population. Most areas experiencing net population increases were strongly influenced by net migration. Demographic structures may vary significantly among areas of otherwise similar types, however, owing to gross migration flows, even when net flows are small or negative; e.g., the movement of poor blacks from the Southeast to New York during a period in which New York showed net outmigration. Age structures, as well as economic conditions, will also change under such circumstances. Discussion of gross migration flows and economic and demographic characteristics is included in the section on the Migration Analysis Data System.

Bureau of the Census information

The 1970 Census of Population indicates whether a person lived in a different house five years earlier, and if so, whether that house was in a different county or state (see Chapter C, Table 119). A sample stub would contain the following items:

Residence in 1965

Persons, 5 years old and over 1970

Same house as in 1970

Different house

In central city of the SMSA
In other part of the SMSA
Outside the SMSA
North and West
South

Abroad

Table II-4. Population Change for Selected Standard Metropolitan Statistical Areas by Components of Changes, 1970-73 1/

SMSA 2/	Population Change 1970-73		Components of Change 1970-73	
	Number	Percent	Natural Increase 3/	Net Migration
Akron, Ohio	-4,500	-0.7	17,600	-22,100
Albuquerque, N. Mex.	41,900	12.6	13,900	28,100
Atlanta, Ga.	132,900	8.3	62,200	70,800
Atlantic City, N.J.	10,000	5.7	1,000	9,000
Boston, Mass.	41,900	1.2	48,800	-6,900
Charleston, W. Va.	-900	-0.4	4,600	-5,500
Denver-Boulder, Colo.	126,600	10.2	40,300	86,300
Las Vegas, Nev.	32,900	12.0	11,500	21,400
Pine Bluff, Ark.	-500	-0.6	2,500	-3,000
San Diego, Calif.	111,700	8.2	39,600	72,100
Yakima, Wash.	4,200	2.9	3,600	600

1/ Data for 1973 provisional

2/ SMSA's as currently defined by the Office of Management and Budget

3/ Excess of births over deaths

Source: Bureau of the Census, Current Population Reports, Series P-25.

While an evaluation of these data will yield propensities to change residence--a helpful indicator for many kinds of studies (e.g., urban studies)--they do not show flows from county to county. The same data, on a county basis exclusively, are available, however, for the black population (see Chapter C, Table 125) and for Spanish-speaking persons (see Chapter C, Table 130).

Net migration files

More complete population migration data are available from the BEA and other groups. The BEA file contains imputed net migration and net migration rates, for each county in the U.S., on the basis of sex, race, and age cohorts. Net migrations have been estimated by subtracting excesses of births over deaths from total population changes for each decade between 1930 and 1970.

The data sets available are illustrated in Table II-5. Migration data are stratified into male and female, white and nonwhite, and specific age groupings. Earlier years have nine age groups, but 1950-60 and 1960-70 data include 16 age groupings. The data are expressed both as absolutes and as percentages of a specific population cohort. For example, a county with a 1960 white male population of 1,000 persons, age 15 through 19, and 200 net migrants in that cohort between 1960 and 1970, would have a migration rate of .20 (i.e., 200/1,000).

Economic Data

Both the analysis of long-term economic change and the analysis of current economic conditions are important concerns of local area planners. Data series helpful in each of these tasks are summarized in Table II-6.

Analysis of Long-Term Economic Change

The planning process has long been hampered by a scarcity of local area economic data consistent among industries within a region, among regions, and over time. Several series that help fill this gap are discussed below.

BEA personal income

Personal income is the most comprehensive measure available to planners for assessing a study area's long-term economic development within a consistent national framework. By relating the area's rate of income growth to the national growth rate, planners can measure directly the extent to which the area shares in national economic growth, or how it fares relative to other sections of the Nation.

Table II-5. Net Migration of the Population by Color, Sex, and Age Groupings, Sample Area

Age*	Total			White			Nonwhite		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total	351,539	128,735	222,804	- 179,939	- 103,711	- 76,228	531,478	232,446	299,032
10+	351,539	128,735	222,804	- 179,939	- 103,711	- 76,228	531,478	232,446	299,032
0-9	---	---	---	---	---	---	---	---	---
10-14	79,556	40,849	38,707	5,762	3,345	2,417	73,794	37,504	36,290
15-24	32,331	- 63,538	95,869	- 118,507	- 121,617	3,110	150,838	58,079	92,759
25-34	413,842	211,976	201,866	222,499	124,853	97,646	191,343	87,123	104,220
35-44	96,280	53,718	42,562	26,308	20,261	6,047	69,972	33,457	36,515
45-54	- 1,772	4,836	- 6,608	- 28,971	- 7,037	- 21,934	27,199	11,873	15,326
55-64	- 82,488	- 30,088	- 52,400	- 94,305	- 33,512	- 60,793	11,817	3,424	8,393
65-74	- 140,076	- 72,950	- 67.126	- 140,437	- 71,940	- 68,497	361	- 1,010	1,371
75+	- 46,134	- 16,068	- 30,066	- 52,288	- 18,064	- 34,224	6,154	1,996	4,158

* Age at end of decennial period.

Source: Bureau of Economic Analysis, Regional Economic Analysis Division

Table II-6. Selected Economic Measures and Their Sources for Use in Water Planning

Type of Measure	How Measured	Usual Original Source	Availability in Computerized System*
Long-term economic change			
Income	Total personal income ($)	BEA	S B
	Personal income by source	BEA	B
	Distribution of income by source, as percent of national distribution	Derived	B
	Per capita income	BEA	S B
	Change in per capita income	Derived	B
	Per capita income as percent of national average	Derived	B
	Labor and proprietors' income, by industry	BEA	B
	Percent distribution of labor and proprietors' income, by industry	Derived	B
	Location quotients based on labor and proprietors' income, by industry	Derived	B
Employment	Employment, by industry, according to place of work	BEA	B
	Wages and salaries per wage-and-salary employee	BEA	B
	Employment, by industry, according to place of residence	Census	B
Current conditions			
Income	Quarterly personal income, by state	BEA	B
	Families, by income-size group	Census	S B

Type of Measure	How Measured	Usual Original Source	Availability in Computerized System*
Employment	Employment, by occupation	Census	S**B
	Employment, by detailed industry, by place of residence	Census	B
	Unemployment	BLS	Not available in either S or B

* Data exist in retrievable form in computerized system.
S = SIRAP system.
B = BEA's information system.
** Only selected occupations available in SIRAP.

Source: Bureau of Economic Analysis, Regional Economic Analysis Division.

Personal income comprises the current income from all sources received by the residents of a study area. It is measured after deduction of personal contributions to social security, government retirement, and other social insurance programs but before deduction of income and other personal taxes. It includes income received from business, Federal and state and local governments, households and institutions, and foreign governments. It consists of wages and salaries; various types of supplementary earnings, termed "other labor income;" the net incomes of owners of unincorporated businesses; net rental income, dividends, and interest; and government and business transfer payments.

BEA's local area personal income estimates are the product of a complex estimating procedure in which county series for about 325 income items are assembled, processed, adjusted, and collated. Most of the data used are obtained from records maintained by government agencies for their own purposes, usually to administer a program, such as unemployment insurance or social insurance. Some are obtained from private sources, such as the American Hospital Association or the American Association of Railroads.

To measure personal income in local areas, a choice regarding the geographic location of the income recipient must be made. Should personal income be measured according to where the recipient performed the work for which the income was received or according to where the recipient lived? For property income and transfer payments, which, on the average, account for about 25 percent of personal income, place of residence is the only concept appropriate for measuring income received. For labor and proprietors' income (wages and salaries, proprietors' income, and other labor income), either place of work or place of residence can be used. Data considerations require that labor and proprietors' income be measured first on a place of work basis by industry. However, in order to make an area's labor and proprietors' income consistent with its property income and transfer payments, it must be converted to a place of residence basis. This conversion is done by means of an all industry estimate of the net flow of commuters' earnings, termed the residence adjustment. For example, in 1972 the residence adjustment to labor and proprietors' income in the Nassau-Suffolk SMSA was a positive $2.15 billion, due mainly to Long Island commuters working in New York City.

BEA's estimates of personal income by type of payment are available, for SMSA's and for all counties of the nation, for 1929, 1940, 1950, 1959, 1962, and annually from 1965 to the present.[2/] Personal income is measured in either current dollars or constant 1967 dollars--the latter the result of adjusting for price changes, using the national deflator for personal consumption expenditures between each specific year and the base year 1967. The price adjustment (i.e., the use of constant dollars) is deficient,

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2/ See Bureau of Economic Analysis, Survey of Current Business, April 1975.

primarily because regional differences in price levels for similar goods and services can distort the constant dollar income series. A good basis for constructing regional price level adjustments, unfortunately, is not available at this time.

In accordance with the estimating conventions developed for the National Income and Product Accounts, BEA's local area income estimates for the most recent year entail revisions in the estimates for the two preceding years. Another possible source of revisions in historical estimates is the acquisition of improved and/or updated local area data series, which underlie the income estimates.

In addition to enabling planners to gauge a study area's long-term economic development, personal income is a good measure of the relative size of the consumer market, because most personal consumption expenditures are made out of personal income. The labor and proprietors' income component serves to identify the type and quantity of industry present in an area and, therefore, is an indirect indicator of industrial markets. The property income and transfers components can be used to identify local areas which serve as retirement communities; for example, in 1972 the share of total income accounted for by these components was 52 percent in the Sarasota, Florida SMSA but only 25 percent in the nation as a whole.

When expressed on a per capita basis, personal income is an indicator of economic welfare. The BEA estimates per capita personal income, for SMSA's and for all counties, for 1929, 1940, 1950, 1959, 1962, and annually from 1965 to the present. County population estimates for decennial years have been taken from the decennial censuses and adjusted proportionately to Census' midyear state estimates of population. For noncensal years after 1970, the local area population figures have been obtained from Census through that agency's cooperative program with the various states. For noncensal years prior to 1970, BEA performed its own substate distributions of Census' midyear state estimates.

Planners should be wary of unusually high or low levels of per capita income in particular local areas. For example, a high per capita income (i.e., a level which is many percentage points above the national average level) may be illusory, as when a construction project brings in a large number of high paid workers who live near the site, who are included in the population count, but who send a substantial portion of their wages to dependents living in other counties. Similarly, unusual increments in farm income, such as in 1973, may be reflected in unsustainable surges in per capita income in counties where farm proprietorships dominate the local economy.

Labor and proprietors' income

Industrially detailed estimates of labor and proprietors' income enable planners to analyze the factors responsible for long-term changes in a study area's total personal income. (This component, after all,

constitutes about three-fourths of total income in most areas.) Used in this fashion, labor and proprietors' income should be on a place of work, rather than a place of residence, basis, because interindustry relationships will display greater regularity.

Additionally, labor and proprietors' income, by industry and place of work, can serve as a proxy for regional output in many industries. The work, can serve as a proxy for regional output in many industries. The planner can gauge the suitability of the measure for the industry under analysis by comparing the labor and proprietors' income component for the U.S. as a whole in a given industry with gross national product originating (GPO) in that industry. Close movements between the two would indicate the suitability of area labor and proprietors' income by place of work as a proxy for GPO. While the BEA does not regard such a proxy satisfactory for purposes of analyzing differential area productivity, many analysts use simple expansions of labor and proprietors' income as measures of area GPO. The BEA is currently exploring the possibility of more accurate measures of state GPO by 2- and 3-digit industry detail, for selected years.

The BEA estimates local area labor and proprietors' income at three different levels of industrial detail--1-digit SIC, 2-digit SIC, and combinations of 2-digit SIC. 3/ The latter two levels are available, for states and for BEA economic areas, for 1950, 1959, 1962, and annually from 1967 to the present (see Tables II-7 and II-8). The 1950, 2-digit data, however, were estimated on a somewhat different definitional basis from that underlying the estimates for 1959 forward. Similarly, in 1972 several changes were made in the SIC classifications.

Available for SMSA's and for all counties of the nation, the 1-digit estimates can be aggregated to whatever geographic configuration the planner desires (see Table II-9). The years covered are 1929, 1940, 1950, 1959, 1962, and annually from 1965 to the present--the same years for which total and per capita personal income estimates are available.

In using the industrially detailed labor and proprietors' income estimates to analyze the factors underlying a study area's total income performance, it is helpful to view an economy as composed of two types of industries--basic and nonbasic. Basic industries are those which play a major role in stimulating an area's development. In the production of its basic industries, an area has special economic advantages relative to other areas. Thus, much of an area's basic industry output tends to be exported to other areas (in return for outputs in which the area's product mix is deficient) or is otherwise composed of income generated from outside the area economy. Basic industry growth, in turn, tends to engender growth in supportive or local service (nonbasic) activities, such as trade, utilities, transportation, finance, and services.

3/ Estimates for combinations of 2-digit SIC industries are used primarily for the OBERS projections, discussed below.

Table II-7. Sample Stub Showing 2-Digit SIC Level of Industrial Detail

- Total labor and proprietors' income
  - Agriculture, forestry and fisheries
    - Agriculture
      - Farm
      - Agricultural services
    - Forestry, fisheries and other
      - Forestry and fisheries
      - Rest of world
  - Mining
    - Coal mining
      - Anthracite mining
      - Bituminous and other soft coal mining
    - Crude petroleum and natural gas
    - Mining excluding fuels
      - Metal mining
      - Mining and quarrying of nonmetallic minerals
  - Contract construction
    - General building contractors
    - Heavy construction contractors
    - Special trade contractors
  - Manufacturing
    - Food and kindred products
    - Textile mill products
    - Apparel and other fabricated textile products
    - Printing, publishing and allied industries
    - Chemicals and allied products
    - Lumber and furniture
      - Lumber and wood products excl. furniture
      - Furniture and fixtures
    - Machinery
      - Machinery except electrical
      - Electrical machinery
    - Transportation equipment
      - Motor vehicles and motor vehicles equipment
      - Transportation excluding motor vehicles
    - Other manufacturing
      - Paper and allied products
      - Petroleum refining and related products
      - Primary metals industries
      - Fabricated metals plus ordnance
      - Fabricated metal products
      - Ordnance
      - Miscellaneous manufacturing
      - Tobacco manufacturers
      - Leather and leather products

- Rubber and miscellaneous plastic products
- Stone, clay and glass products
- Instruments
- Miscellaneous manufacturing (1959 forward)

Transportation, commercial plus public utilities
- Transportation
  - Railroad transportation
  - Motor freight transportation and warehousing
  - Other transportation services
  - Local suburban and highway passenger
  - Air transportation
  - Pipeline transportation
  - Transportation services including carrier affiliates
  - Water transportation
- Communications
- Electric, gas and sanitary services

Wholesale and retail trade
- Wholesale trade
- Retail trade
  - Eating and drinking places
  - Other retail trade
    - Building materials and farm equipment
    - Retail general merchandise
    - Food stores
    - Automotive dealers and service stations
    - Apparel and accessory stores
    - Furniture and home furnishings stores
    - Miscellaneous retail stores

Finance, insurance, and real estate
- Banking
- Credit agencies other than banks
- Sec. and com. brokers, dealers, exchanges and services
- Insurance carriers including insurance solicitors
- Insurance agents, brokers and services
- Real estate
- Combination of real estate, insurance, loan and law offices
- Holding and other investment companies

Services
- Business services
  - Lodging places plus personal services
    - Lodging places
    - Personal services
  - Business and repair services
    - Miscellaneous business services
    - Auto repair, auto services and garages
    - Miscellaneous repair services
  - Amusements and recreation services

- Amusement and recreation services excluding motion pictures
  - Motion pictures
- Private households

Professional services
- Medical and other health services
- Legal services
- Private educational services
- Nonprofit membership organizations
- Museums
- Miscellaneous professional services

Total government
- Civilian government
  - Federal civilian
  - State and local
- Federal military

Source: Bureau of Economic Analysis, Regional Economic Measurement Division

Table II-8. Sample Stub Showing Industries for which OBERS Projections of Labor and Proprietors' Income Are Available

Total labor and proprietors' income

Agriculture, forestry and fisheries.....
  Agriculture.....
  Forestry and fisheries.....

Mining.....
  Metal.....
  Coal .....
  Crude petroleum and natural gas .....
  Nonmetallic, except fuels.....

Contract construction.....

Manufacturing.....
  Food and kindred products.....
  Textile mill products .....
  Apparel and other fabric products.....
  Lumber products and furniture .....
  Paper and allied products .....
  Printing and publishing .....
  Chemicals and allied products .....
  Petroleum refining .....
  Primary metals.....
  Fabricated metals and ordnance.....
  Machinery, excluding electrical .....
  Electrical machinery and supplies.....
  Motor vehicles and equipment .....
  Transportation equip., excl. mtr. vehicles.....
  Other manufacturing .....

Trans., comm. and public utilities.....
  Railroad transportation .....
  Trucking and warehousing.....
  Other transportation and services.....
  Communications .....
  Utilities (elec., gas, sanitary) .....

Wholesale and retail trade.....

Finance, insurance and real estate.....

Services.....
  Lodging places and personal services.....
  Business and repair services.....
  Amusement and recreation services.....
  Private households .....
  Professional services .....

Cont'd.

Government.....
   Federal government.....
   State and local government.....
   Armed forces.....

Source: Bureau of Economic Analysis, Regional Economic Analysis Division

Table II-9. Sample Stub Showing One-Digit SIC Level of Industrial Detail

Farm labor and proprietors' income

Government labor income
   Federal civilian
   Military
   State and local

Private nonfarm labor and proprietors' income
   Manufacturing
   Mining
   Contract construction
   Transportation, communication and public utilities
   Wholesale and retail trade
   Finance, insurance and real estate
   Services
   Other

Source: Bureau of Economic Analysis, Regional Economic Measurement Division

In some areas, a particular industry may function in both a basic and a nonbasic manner. For example, recreation services in the Miami area accommodate the business community and local residents but, more importantly, generate income from out of town visitors. To estimate the basic portion of the area's services, compare the share of Miami's total income accounted for by services with the share of national income accounted for by services at the national level. The ratio between these two percent shares is called the location quotient. A location quotient of 1.0 indicates that a specific industry's share of an area's total income is on par with the national pattern. A higher value reveals that the industry is more important to the area's economy than it is to the nation's. In 1971, the location quotient of services in the Miami economic area was 1.3, and the difference in income between this figure and a quotient of 1.0 can serve as a proxy for the basic portion of Miami's services industry.

The basic/nonbasic approach to analyzing an area's income performance is illustrated in Table II-10. Between 1950 and 1972, total personal income (not shown in the table) in the sample area grew by 38 percent--well below the national rate of 149 percent. Growth in each of the area's basic industries at rates below those of their national counterparts underlay the slow overall performance. For example, income in mining, the area's key basic industry, grew less than one-third as fast regionally as nationally. Slow growth in the basic industries helps explain the area's slow nonbasic industry growth (76 percent versus 172 percent in the U.S.).

Also available as part of BEA's labor and proprietors' income file are the detailed farm income and expenditure accounts underlying the estimation of farm income (see Table II-11). These are available, for SMSA's and non-SMSA counties, for 1929, 1940, 1959, 1962, and annually from 1965 to the present.

BEA employment file

In order to have employment data available by place of work--and therefore compatible with the BEA's industrially detailed income data--the BEA developed an employment file from administrative records similar to those used in deriving income information. These employment data, comprising an annual series from 1967 on, are stratified into two broad groups: one of proprietors (the self-employed) and the other of wage and salary earners. Information on the latter group is presented on a summary division level, for SMSA's and non-SMSA counties, and on a more detailed 2-digit SIC level, for states and BEA economic areas. The content of the summary level data file is shown in Table II-12.

At the local area level the BEA employment series can be used, together with the income series, to measure average wage rates for wage and salary workers, by industry. (Unfortunately, a complete industry detail for the number of proprietors is lacking.) Wage rate comparisons can be made among industries within an area and within an industry among areas. Intertemporal

Table II-10. Labor and Proprietors' Income and Percent Change by Selected Industrial Sectors, 1950 and 1972, United States and Sample Study Area

Industries	1950 Absolutes	1950 Distrib. of total income	1950 Distrib. of basic income	1972 Absolutes	1972 Distrib. of total income	1972 Distrib. of basic income	1950-72 Percent Change
	In thousands of constant 1967 dollars						
United States							
Total	257,495,000	100.0	...	613,001,000	100.0	...	138.1
Basic	108,976,000	42.3	100.0	208,701,000	34.0	100.0	91.5
Agri., forest., fish., & other	23,468,000	9.1	21.5	22,282,000	3.6	10.7	-5.1
Mining	5,129,000	2.0	4.7	6,000,000	1.0	2.9	17.0
Manufacturing	74,707,000	29.0	68.6	165,034,000	26.9	79.0	120.9
Armed forces	5,672,000	2.2	5.2	15,385,000	2.5	7.4	171.2
Nonbasic	148,519,000	57.7	...	404,300,000	66.0	...	172.2
Contract construction	15,370,000	6.0	...	38,582,000	6.3	...	151.0
Transp., comm., & pub. util.	21,047,000	8.2	...	44,919,000	7.3	....	113.4
Wholesale and retail trade	48,774,000	18.9	...	100,520,000	16.4	...	106.1
Finance, insurance, and real estate	10,887,000	4.2	...	33,000,000	5.4	...	203.1
Services	28,797,000	11.2	...	92,765,000	15.1	...	222.1
Federal civilian government	9,302,000	3.6	...	27,326,000	4.5	...	193.8
State and local government	14,342,000	5.6	...	67,188,000	11.0	...	368.5
Sample area							
Total	37,146	100.0	...	48,648	100.0	...	31.0
Basic	23,148	62.3	100.0	24,018	49.4	100.0	3.8
Agri., forest., fish., & other	6,987	18.8	30.2	5,940	12.2	24.7	-15.0
Mining	10,242	27.6	44.2	10,739	22.1	44.7	4.9
Manufacturing	3,324	8.9	14.4	4,325	8.9	18.0	30.1
Armed forces	132	.4	.6	348	.7	1.5	163.6
Part basic (transp., comm., & pub. util)	2,463	6.6	10.6	2,666	5.5	11.1	8.2
Nonbasic	13,998	37.7	...	24,630	50.6	...	76.0
Contract construction	1,081	2.9	...	3,138	6.4	...	190.3
Wholesale and retail trade	4,918	13.2	...	5,820	12.0	...	18.3
Fin., insur., & real estate	515	1.4	...	963	2.0	...	87.0
Services	2,220	6.0	...	4,730	9.7	...	113.1
Federal civilian government	868	2.3	...	1,292	2.7	...	48.8
State & local government	1,362	3.7	...	5,120	10.5	...	275.9
Part-nonbasic (transp., comm., & pub. util)	3,034	8.2	...	3,567	7.3	...	17.6

.... Data not applicable

Source: Bureau of Economic Analysis, Regional Economic Analysis Division

Table II-11. Sample Stub Showing Farm Income and Expenditures Accounts

- Realized net income - farm proprietors
- Total net income - farm proprietors
- Total net income - all farms (incl. corp.)
  - Total gross income - all farms
    - Cash receipts - livestock
      - Meat animals and other livestock 1965 fwd.
      - Dairy products
      - Poultry
    - Cash receipts - crops
      - Truck crops and melons
      - Fruit and nuts
      - Greenhouse, nursery and forest products 1965 fwd.
      - Other field crops
  - Total government payments
  - Other income
    - Home consumption
    - Imputed rent
    - Rent received by farm landlords
    - Change of inventory
  - Total production expenses - all farms
    - Major production expenses - part I
      - Expenditures for feed
      - Expenditures for livestock purchases
      - Rent paid to farm and nonfarm landlords
    - Major production expenses - part 2
      - Expenditures for seed
      - Expenditures for fertilizer and lime
      - Expenditures for hired labor
    - Repair and operation of capital items
    - Depreciation, interest, insurance and taxes
    - Other
- Total net income - corporations
- Statistical discrepancy - all farms
- Change of inventory - farm proprietors
- Total gross income minus government payments - all farms

Source: Bureau of Economic Analysis, Regional Economic Measurement Division

Table II-12. Sample Stub of BEA Employment, by Industry

- Total employment
  - Number of proprietors
    - Farm proprietors
    - Nonfarm proprietors
  - Wage and salary employment
    - Farm
    - Nonfarm
      - Government
        - Civilian
        - Military
      - Private nonfarm
        - Manufacturing
        - Mining
        - Construction
        - Transportation, comm., public utilities
        - Trade
        - Finance, insurance and real estate
        - Services
        - Other

Source: Bureau of Economic Analysis, Regional Economic Measurement Division

analysis, however, is somewhat limited by the relatively short span of years for which estimates are available.

Census employment, 1940-70

For analyzing long-term employment trends, BEA has assembled consistent Census employment data for 1940, 1950, 1960, and 1970. Employment data are provided for 31 industries for counties, states, and BEA regions (see Table II-13). This file is unique because of its intertemporal comparability, achieved by adjusting the data to account for the different age cutoff used for 1970 (16 rather than 14 years old) and for the "industry not reported" item of the Census. This file is far more convenient for planners' forecasting than a data base established by assembling Census publications from various years and manually compiling the data.

Analysis of Current Conditions

Quarterly personal income by state

BEA quarterly estimates of state personal income constitute the most up-to-date time series covering total economic activity in each of the states on a uniform basis. Seasonally adjusted quarterly data from 1948 to the present are available for the major sources of personal income, with the labor and proprietors' income component presented in 1-digit industrial detail. Furthermore, manufacturing income is disaggregated into durable and nondurable components.

This series is valuable to planners because it provides a timely measure of the impact of industrial developments and government programs on states. Moreover, the seasonal adjustment, by removing the effect of seasonal patterns, helps planners better to understand and evaluate income trends and cyclical patterns.

Census family income

Census publishes reported family money income data for states, SMSA's, counties, and certain types of inhabited places. Because they are available for specific groups, such as blacks, persons of Spanish heritage, and others, these data can be very helpful in conducting planning studies. Among the various types of money income included are wage and salary and nonfarm and farm self-employment.

These income data cover the calendar year preceding each Census (thus, the most recent, available from both SIRAP and BEA, are for 1969). If unusual events cause significant income changes for a particular year, a true representation of income is not possible. Further, the 10-year time increment between Census years can result in major problems for the planner.

Table II-13. Sample Stub of Census Employment, by Industry, 1940-70

Agriculture, agricultural services, forestry and fisheries

- Agriculture and agricultural services
- Forestry and fisheries

Mining

Contract construction

Manufacturing

- Food and kindred products
- Textile mill products
- Apparel and other fabricated textile products
- Lumber, wood products, and furniture
- Printing, publishing, and allied industries
- Chemicals and allied products
- Machinery, all
  - Machinery except electrical*
  - Electrical machinery, equipment, and supplies*
- Motor vehicles and motor vehicle equipment
- Transportation equipment except motor vehicles
- Other and miscellaneous manufacturing
  - Paper and allied products*
  - Petroleum refining and related industries*
  - Primary metals industries*
  - Fabricated and not specified metals*
  - Miscellaneous manufacturing*

Transportation, communication, and public utilities

- Railroads and railway express
- Trucking and warehousing
- Other transportation
- Communication
- Electric, gas, water, and sanitary services

Wholesale and retail trade

- Wholesale trade
- Food and dairy products stores
- Eating and drinking places
- Other retail trade

Finance, insurance, and real estate

(Continued)

Services

Lodging places and other personal services
Business and repair services
Entertainment and recreation services
Private households
Professional services

Total government

Public administration
Federal military

* 1940 data not available.

Source: Bureau of Economic Analysis, Regional Economic Analysis Division.

Family money income data are formulated to show the number of families in each of 16 income groups. Median and mean incomes are shown, by county, for each type of household, including those with female heads and those comprised of unrelated individuals or of female unrelated individuals. These data also provide per capita money income estimates.

The Census per capita money income estimates are less comprehensive than the BEA annual series described above. Unlike the BEA series, Census data do not include food provided at work or grown for own use on farms, imputed value of owner occupied dwellings, income of nonprofit institutions, and value of services provided by certain financial institutions without specific service charges, among other factors.

Employment, by occupation

Census data also include an occupational breakdown, by county, which provides a profile of the employed labor force. These data are available from the BEA in their entirety and from SIRAP in a more aggregated form. A sample of available data is shown in Table II-14. Data show total employed and employed females, both 16 years and older. Employed males, 16 and older, can be derived. Data for 14 and 15 year olds, although more aggregated, are also shown, to permit comparison to earlier Census data.

227-industry employment file

A more detailed file of Census employment information is available from the BEA. Data on employed persons, aged 14 and over, for 227 industries have been extracted from Census records. These data, available for 1970 only, provide as much industry as possible from the Census records.

A respondent who does not indicate the type of industry he works in is assigned to an industry group determined by the industry the last person with similar characteristics worked in. This procedure, therefore, adjusts for nonreporting of industry affiliation. These data can be retrieved on a county basis and aggregated to whatever multi-county configuration the planner desires.

Bureau of Labor Statistics unemployment data

The Bureau of Labor Statistics provides monthly estimates of the insured unemployed for states and for 150 major labor areas. Insured unemployment represents the number of persons reporting a week of unemployment under an unemployment insurance program. Excluded from coverage, in general, are those persons engaged in agriculture, domestic service, unpaid family work, self-employment, and work for selected nonprofit organizations and some state and local governments.

Monthly data on the rate of insured unemployment for states and labor areas are also available. This rate is the number of insured unemployed expressed as a percent of average covered employment in a 12-month period ending six to eight months prior to the week of reference.

Table II-14. Sample Stub of Census Information on Occupation of Employed Persons, by County, 1970

Total employed, 14 years old and over

Professional, technical, and kindred workers
- Engineers
- Physicians, dentists, and related practitioners
- Health workers, except practitioners
- Teachers, elementary and secondary schools
- Technicians, except health
- Other professional workers

Managers and administrators, except farm
- Salaried: Manufacturing
  - Retail trade
  - Other industries
- Self-employed: Retail trade
  - Other industries

Sales workers
- Retail trade
- Other than retail trade

Clerical and kindred workers

Craftsmen, foremen, and kindred workers
- Automobile mechanics, including body repairmen
- Mechanics and repairmen, except automobile
- Metal craftsmen, except mechanics
- Construction craftsmen
- Other craftsmen

Operatives, except transport
- Durable goods manufacturing
- Nondurable goods manufacturing
- Nonmanufacturing industries

Transport equipment operatives

Laborers, except farm
- Construction laborers
- Freight, stock, and material handlers
- Other laborers, except farm

Farmers and farm managers

Farm laborers and farm foremen

Service workers, except private household
- Cleaning service workers
- Food service workers
- Health service workers
- Personal service workers
- Protective service workers

Private household workers

(Continued)

Table II-14. (Continued)

Female employed, 16 years old and over

Professional, technical, and kindred workers
  Nurses
  Health workers, except nurses
  Teachers, elementary and secondary schools
  Technicians, except health
  Other professional workers
Managers and administrators, except farm
Sales workers
  Retail trade
  Other than retail trade

Clerical and kindred workers
  Bookkeepers
  Secretaries, stenographers, and typists
  Other clerical workers
Craftsmen, foremen, and kindred workers
Operatives, except transport
  Durable goods manufacturing
  Nondurable goods manufacturing
  Nonmanufacturing industries
Transport equipment operatives
Laborers, except farm
Farmers and farm managers
Farm laborers and farm foremen

Service workers, except private household
  Cleaning service workers
  Food service workers
  Health service workers
  Personal service workers
  Protective service workers
Private household workers

Male employed, 14 and 15 years old

White-collar workers
Blue-collar workers
Farm workers
Service workers, including private household

Female employed, 14 and 15 years old

White-collar workers
Blue-collar workers
Farm workers
Service workers, except private household
Private household workers

Source: Bureau of the Census, Census of Population, 1970.

Analysis of the Relationship Between Economic Change and Demographic Change

The data discussed above enable planners to assess a study area's demographic and economic characteristics and how these change over time. The Migration Analysis Data System maintained by the BEA permits the analyst to investigate linkages between economic change and demographic change. It consists of several migration analysis files derived from the Social Security Administration's 1-percent Continuous Work History Sample (CWHS) and a system for tabulating these data for studies of changing work force structure and migration patterns. It is a micro-system, i.e., it contains information over time for the same individual workers rather than for aggregations of workers, and, thus, permits direct analysis of the effects of particular public policies on specific groups of workers. No other data source provides comparable detail for work force mobility studies.

The Migration Analysis Data System provides a variety of flexible tabulating options, including the following (see Tables II-15 to II-17):

1) Work force. These tabulations describe an area's work force in terms of sex, race, age, industry of employment, and wage class. Observations at three chosen points in time permit the analyst to observe trends in the work force structure.

2) Migration Summary. These tables present the components of change or a lack of change in an area's employment: inmigrants (by origin); outmigrants (by destination); nonmigrants; new entrants to the Social Security covered work force; and departers from the covered work force. These tabulations can be cross-classified by age, sex, race, industry of employment, and wage class. Furthermore, the mean wages at the beginning and end of each time period are shown for each class of worker.

3) Migration Matrix. This option provides a 10 X 10 matrix tabulation where the locational characteristics of a given work force at the beginning of a specified time period are presented in rows and the locational characteristics at the end of the time period are presented in columns. The matrix can be cross-classified by age, race, sex, industry of employment, and wage class. The matrix may also be used in income mobility studies by showing the movements of workers from one wage class to another and in migration studies by showing these movements from one industry to another or from one size of city to another size of city.

TABLE II-15.

WORKFORCE STRUCTURE
BASED ON SOCIAL SECURITY CONTINUOUS WORK HISTORY SAMPLE (1%)
FIRST QUARTERS OF 1963, 1964 AND 1965

AREA - 313 - MICHIGAN

	1963			1964			1965		
	THOUSANDS OF WORKERS	% OF TOTAL	MEAN WAGES	THOUSANDS OF WORKERS	% OF TOTAL	MEAN WAGES	THOUSANDS OF WORKERS	% OF TOTAL	MEAN WAGES
TOTAL COVERED WORK FORCE	2,388.5	100.0	5,227	2,480.8	100.0	5,497	2,627.4	100.0	5,612
MALE	1,602.7	67.1	6,253	1,664.9	67.1	6,604	1,757.2	66.9	6,732
FEMALE	785.8	32.9	3,135	815.9	32.9	3,239	870.2	33.1	3,250
WHITE AND OTHER	2,190.2	91.7	5,334	2,266.1	91.3	5,609	2,383.2	90.7	5,739
BLACK	198.3	8.3	4,050	214.7	8.7	4,323	244.2	9.3	4,377
WORK FORCE BY AGE									
LESS THAN 25	364.0	15.2	2,688	405.9	16.4	2,913	476.1	18.1	3,093
25 - 29	245.1	10.3	4,810	253.8	10.2	5,080	271.2	10.3	5,276
30 - 34	253.3	10.6	5,592	250.2	10.1	5,960	256.7	9.8	6,277
35 - 39	285.9	12.0	6,012	290.0	11.7	6,302	295.7	11.3	6,512
40 - 44	300.3	12.6	6,130	312.4	12.6	6,472	323.1	12.3	6,569
45 - 49	302.0	12.6	5,929	301.2	12.1	6,240	304.3	11.6	6,446
50 - 54	241.7	10.1	5,763	258.8	10.4	6,152	271.1	10.3	6,374
55 - 59	190.9	8.0	5,833	193.9	7.8	6,102	204.4	7.8	6,243
60 AND OVER	205.3	8.6	5,137	214.6	8.7	5,456	224.8	8.6	5,643
MEDIAN AGE		40			40			39	
WORK FORCE BY INDUSTRY									
UNCLASSIFIED	2.9	.1	4,173	5.1	.2	3,948	5.1	.2	5,047
AGRICULTURE	4.2	.2	2,022	5.0	.2	3,004	5.4	.2	3,026
MINING	13.6	.6	5,523	13.6	.5	5,707	13.8	.5	6,430
CONTRACT CONSTRUCTION	87.3	3.7	4,595	94.0	3.8	5,552	107.0	4.1	5,990
MANUFACTURING	1,037.8	43.4	6,523	1,066.0	43.0	6,919	1,135.3	43.2	6,751
TRANSP., COMM. & PUBLIC UTILS.	108.6	4.5	6,178	110.7	4.5	6,425	116.1	4.4	6,620
WHOLESALE & RETAIL TRADE	495.2	20.7	3,749	515.8	20.8	3,883	543.7	20.7	3,976
FINANCE, INSURANCE & REAL EST.	90.4	3.8	4,713	89.7	3.6	4,932	98.1	3.7	5,189
SERVICES	445.6	18.7	3,955	474.1	19.1	4,111	499.2	19.0	4,173
GOVERNMENT	102.9	4.3	4,886	106.8	4.3	4,890	103.7	3.9	5,367
WORK FORCE BY WAGE CLASS									
UNDER 2,000	464.2	19.4	917	466.1	18.8	907	494.4	18.8	903
2,000 - 2,999	219.5	9.2	2,509	216.8	8.7	2,507	228.3	8.7	2,511
3,000 - 3,999	239.0	10.0	3,507	228.4	9.2	3,502	239.1	9.1	3,500
4,000 - 4,999	268.5	11.2	4,506	262.4	10.6	4,504	262.3	10.0	4,510
5,000 - 5,999	308.4	12.9	5,501	291.7	11.8	5,505	294.2	11.2	5,497
6,000 - 6,999	271.4	11.4	6,471	287.2	11.6	6,474	289.3	11.0	6,477
7,000 - 7,999	207.4	8.7	7,465	220.4	8.9	7,474	236.7	9.0	7,475
8,000 - 8,999	129.7	5.4	8,461	158.3	6.4	8,455	173.0	6.6	8,473
9,000 - 9,999	91.1	3.8	9,455	107.7	4.3	9,460	123.1	4.7	9,474
10,000 - 14,999	144.2	6.0	11,581	184.7	7.4	11,698	218.0	8.3	11,686
15,000 - 24,999	44.0	1.8	18,967	55.0	2.2	18,023	67.3	2.6	18,605
25,000 AND OVER	1.1	.0	32,553	2.1	.1	32,543	1.7	.1	32,100
MEDIAN WAGE		5,009			5,228			5,304	

SOURCE: BUREAU OF ECONOMIC ANALYSIS, REGIONAL ECONOMIC ANALYSIS DIVISION.

TABLE II-16.
MIGRATION SUMMARY
BASED ON SOCIAL SECURITY CONTINUOUS WORK HISTORY SAMPLE (1%)
FIRST QUARTER OF 1960-65-70

WHITE MALES — MANUFACTURING

AREA = 57000 - SOUTH CAROLINA

	1960 - 1965					1965 - 1970				
	THOUSANDS OF WORKERS	% OF TOTAL	1960 MEAN WAGES	1965 MEAN WAGES	% CHANGE MEAN WAGES	THOUSANDS OF WORKERS	% OF TOTAL	1965 MEAN WAGES	1970 MEAN WAGES	% CHANGE MEAN WAGES
INITIAL COVERED WORK FORCE	128.0	100.0	4,085			141.9	100.0	5,094		
INMIGRANTS	11.0	8.6	4,961	6,866	38.4	13.4	9.4	5,654	8,562	51.4
OUTMIGRANTS	12.9	10.1	4,118	5,384	30.7	16.7	11.8	5,383	8,509	58.1
NET MIGRATION	-1.9	-1.5				-3.3	-2.3			
NONMIGRANTS:										
SAME INDUSTRY	83.6	65.3	4,269	5,540	29.8	87.7	61.8	5,453	7,608	39.5
LEFT THIS INDUSTRY	13.3	10.4	3,712	4,692	26.4	15.4	10.9	4,053	5,616	38.6
ENTERED THIS INDUSTRY	10.3		2,406	4,650	93.3	14.2		3,628	6,309	73.9
NET MILITARY AND OTHERS	4.2	3.3				3.3	2.3			
ENTERED COVERED WORK FORCE	31.8	24.8		3,522		30.5	21.5		4,733	
LEFT COVERED WORK FORCE	17.2		3,501			20.8		4,278		
FINAL COVERED WORK FORCE	141.9	110.9		5,094		150.4	106.0		6,947	
INMIGRANTS FROM:		100.0					100.0			
REST OF U.S.	7.2	65.5	5,330	6,998	31.3	7.6	56.7	6,277	9,673	54.1
NORTH CAROLINA	2.6	23.6	4,804	7,362	53.2	4.0	29.9	5,364	7,478	39.4
GEORGIA	1.2	10.9	3,085	4,999	62.0	1.8	13.4	3,673	6,281	71.0
MILITARY AND OTHER	5.2		1,699	4,652	145.0	4.6		1,992	6,271	214.8
OUTMIGRANTS TO:		100.0					100.0			
REST OF U.S.	6.7	51.9	3,858	5,509	42.8	9.1	54.5	5,617	8,774	56.2
NORTH CAROLINA	4.2	32.6	4,170	5,307	27.3	4.9	29.3	5,452	8,336	51.8
GEORGIA	2.0	15.5	4,883	5,126	5.0	2.7	16.2	4,398	7,927	80.2
MILITARY AND OTHER	1.0		3,330	2,342	-29.7	1.3		2,503	3,825	52.8

SOURCE: BUREAU OF ECONOMIC ANALYSIS, REGIONAL ECONOMIC ANALYSIS DIVISION.

TABLE II-17.

MIGRATION MATRIX
EMPLOYMENT AND MEAN WAGES, 1965 - 1970

BLACK MALES WHOLESALE TRADE 70
TABULATION 1

WORKERS FROM:	REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6	REGION 7	REGION 8	REGION 9	MILITARY AND OTHER	NON-MIGRANTS	LEFT LABOR FORCE	COVERED WORK FORCE 1965
REGION 1													
WORKERS (000)	.7								.2				.9
MEAN WAGES 1965	3,541								3,470				3,526
MEAN WAGES 1970	5,716								5,555				
% CHANGE	61.4								60.1				
REGION 2													
WORKERS (000)		.2							.3				.5
MEAN WAGES 1965		1,615							3,003				2,448
MEAN WAGES 1970		6,875							5,003				
% CHANGE		325.7							66.6				
REGION 3													
WORKERS (000)			.1										.1
MEAN WAGES 1965			2,600										2,600
MEAN WAGES 1970			5,540										
% CHANGE			113.1										
REGION 5													
WORKERS (000)					.2								.2
MEAN WAGES 1965					4,290								4,290
MEAN WAGES 1970					2,775								
% CHANGE					-35.3								
REGION 6													
WORKERS (000)									.2	.2			.4
MEAN WAGES 1965									9,555	5,300			7,428
MEAN WAGES 1970									12,010	9,790			
% CHANGE									25.7	84.7			
REGION 7													
WORKERS (000)							17.7	.6	.9	.2			19.4
MEAN WAGES 1965							4,018	3,255	4,196	4,635			4,009
MEAN WAGES 1970							6,220	4,503	5,979	6,960			
% CHANGE							54.8	38.3	42.5	50.2			
REGION 8													
WORKERS (000)							1.0						1.0
MEAN WAGES 1965							4,157						4,157
MEAN WAGES 1970							5,969						
% CHANGE							43.6						
REGION 9													
WORKERS (000)	.1	.1			.1		3.1						3.4
MEAN WAGES 1965	2,960	130			5,560		1,839						1,931
MEAN WAGES 1970	8,340	660			2,960		4,840						
% CHANGE	181.8	407.7			-46.8		163.2						
MILITARY & OTHER													
WORKERS (000)					.1		.8	.1		.3			1.3
MEAN WAGES 1965					1,190		2,425	4,850		3,933			2,865
MEAN WAGES 1970					5,460		5,205	9,750		11,860			
% CHANGE					358.8		114.6	101.0		201.6			
ENTERED LABOR FORCE													
WORKERS (000)		.1	.1	.1	.1		10.6			.9			
MEAN WAGES 1965													
MEAN WAGES 1970		1,200	7,020	5,390	22,080		4,188			4,200			
% CHANGE													
COVERED WORK FORCE 1970													
WORKERS (000)	.8	.4	.2	.1	.5		33.2	.7	1.6	1.6			
MEAN WAGES 1970	6,044	3,903	6,280	5,390	7,210		5,410	5,253	6,497	6,680			

SOURCE: BUREAU OF ECONOMIC ANALYSIS, REGIONAL ECONOMIC ANALYSIS DIVISION.

An example of a use of the Migration Analysis Data System is one which may be taken from the New York Office of Planning Services. The Office acquired BEA data to better understand the trend evidenced in the Census Bureau's population and migration estimates, which indicated an increasing rate of outmigration from New York State. The BEA data helped answer the following questions:

1) How large are the gross flows of migrants to and from New York?

2) What are the characteristics of the outmigrants and inmigrants in terms of sex, race, age, industry of employment, and wage rates?

3) What are the directions of the gross flows, i.e., the destinations of outmigrants and origins or inmigrants?

4) What are the gross flows for each New York planning district? Specifically, is the net outflow confined to the New York City metropolitan area, or does it include other areas of the state?

As a result, migration assumptions used in the state's demographic projections were changed.

Users of the Migration Analysis Data System should be aware of its limitations as well as its strengths. Migration and work force estimates derived from a 1-percent sample generally are inadequate for small economic and geographic units like small counties. Cross-classifications of the migration data by sex, age, and race are statistically significant only for large areas. This constraint will be eased considerably with the establishment of a 10 percent sample, currently under development in the BEA, funded by an interagency cooperative effort under the management of the U.S. Department of Housing and Urban Development.

Another limitation relates to social security coverage. The major groups of workers excluded from coverage are: employees of exempt nonprofit organizations which do not elect coverage; ministers and members of religious orders who do not elect coverage; most Federal, state, and local civilian workers; railroad workers covered by the Railroad Retirement Act; and self-employed persons. In the latter case, however, the Social Security Administration maintains a file of self-employed persons from which a comparable 1-percent annual sample is selected and forwarded to BEA. Moreover, BEA is acquiring sample data for workers covered by Civil Service and Railroad Retirement legislation.

A final limitation concerns multi-establishment employers. The Social Security Administration issues employer identification numbers referring to the legal entity of an employer's firm and requests that employers report their employees by establishment code numbers. To the extent that not all employers comply with this request, employees may be coded improperly. Attempts, however, are being made to correct these improper county or industry codings.

Social Data

Several types of demographic and economic data cited above relate to the measurement of social well-being for local areas. For example, a local area/national comparison of Census family income data formulated to show the percentage of families in each of 16 income groups (see above page 39), would indicate above or below average concentrations of families at particular income levels. BEA's Migration Analysis Data System permits analysis of changes in workers' well-being attributable to industrial and/or geographical mobility (see above, page 47). Other regional indicators of social well-being include data on education, health, housing, and public assistance.

Education

Census data for 1970, on the number of school years completed by persons 25 years old and older, by sex and race, are available from the BEA for counties and groups of counties. Persons are distributed among the following eight levels of educational attainment:

No school years completed

Elementary: 1 to 4 years
5 to 7 years
8 years

High school: 1 to 3 years
4 years

College: 1 to 3 years
4 years or more

For any local area, the number of persons in each category may be expressed as a percent of all persons 25 years old and older. Such a distribution may then be compared with its national counterpart in order to highlight educational characteristics unique to an area.

Health

Health data for local areas are sparse. Using both the 1970 Census and the 1972 City and County Data Book, the BEA can assemble, for counties and groups of counties, the following indicators:

Number of hospital beds

Total medical and paramedical personnel
- Physicians, dentists, and related practitioners
- Medical and other health workers, except practitioners

Each of these measures can be expressed on a "per 100,000 population" basis, in order to facilitate the assessment of relative differences among local areas.

Housing

From the 1970 Census of Housing, the BEA can assemble data, for counties and groups of counties, on the following characteristics of the total number of year-round housing units:

- Occupancy status
  - Owner occupied
  - Renter occupied
  - Vacant
- Number of units in structure
  - Single-unit structures
  - Multiunit structures
    - 2-4 units
    - 5-9 units
    - 10 or more units
- Number of rooms comprising a unit
  - 1
  - 2
  - 3-5
  - 6 or more
- Number of persons per room
  - 1.00 or less
  - 1.01 - 1.50
  - 1.51 or more
- Plumbing facilities
  - With all plumbing facilities (i.e., hot piped water, flush toilet, and bathtub or shower)
  - Lacking one or more plumbing facilities
- Date of construction
  - 1960 or later
  - 1950-59
  - 1949 and before

A percentage distribution of the number of units in each subcategory within each characteristic (e.g., within occupancy status, the percentages accounted for by owner occupied, renter occupied, and vacant units) can be calculated. These distributions can be compared with one another in order to ascertain what constitutes a typical year-round housing unit in a local area. Interregional comparisons of these distributions also can be made.

Data from the 1972 City and County Data Book can be assembled on the basis of the number of families and primary individuals residing in particular types of housing. For example, data on families and individuals can be distributed between the number owning and the number renting their units of residence, and between those with housing having complete plumbing facilities and those with housing lacking one or more plumbing facilities.

Public Assistance

BEA can assemble, from the 1972 City and County Data Book, the following profile of a local area's public assistance situation, as of February 1972:

Total population
- Percent receiving old age assistance
- Percent receiving aid for dependent children

Total public assistance payments ($)
- Percent derived from old age assistance
- Percent derived from aid for dependent children

Average aid per recipient of old age assistance ($)

Average aid per family with dependent children ($)

Uses of OBERS Projections in Local Area Planning

The data discussed thus far relate to historical and current domographic, economic, and social conditions. This section, on the OBERS projections, and the following one, on data useful in impact assessment, are concerned mainly with using these historical and current data to gauge a region's future.

The OBERS economic projections are conditional forecasts, presenting specified industrial and geographic detail for a variety of subnational areas. Because it is impossible to foresee industrial and/or consumer needs, these projections must be based on extensions of relevant past relationships. They represent estimates of economic activity expected to occur during the projection period, if assumed conditions and historical relationships prevail. The explicit assumptions represent those conditions thought to have the greatest probability of realization. The OBERS projections, due to their comprehensive nature, introduce a maximum amount of objectivity and measurability into the planning process and allow the user to appraise their validity. For a detailed description of the methodology, see Volume I of the OBERS report.

OBERS projections were designed for use in the Water Resources Program at the national level, and certain geographic and/or industrial details desired for local planning may not be included. Planners often require disaggregation of the projections into smaller geographic units (usually counties or small groups of counties), and the OBERS framework provides useful control totals for such efforts. Technical advice and assistance with these projections are available from the staff involved in the OBERS program.

Closely related to the concept of a nationally consistent set of projections are the availability and compatibility of a set of alternative futures within the overall system. Alternative futures based exclusively on a variation of assumptions are best measured by an impact analysis system, which is discussed in the next section. On the other hand, alternative futures may be related to regional developments (such as the opening or closing of a military base), which occur after the OBERS data are prepared and which are obvious to the users of the projections. It is at this point that the BEA monitoring system fits into the overall OBERS program.

This system measures the relationships, at the economic area and state levels and at all industrial levels, between current data and the economic trends projected on the basis of less recent data. This enables BEA to provide users of the OBERS projections with current information on level shifts and new industrial developments, and, hence, provides the user with information necessary to realistically apply the basic OBERS output. The use of the monitoring system will identify the key sources of volatility in the historical data in order to better define historical trends. In addition, the system will identify and critically evaluate key elements in the current projection methodology and the modeling work-in-progress and, thus, provide BEA with the ability to make a lucid and timely response to questions raised by the rapidly increasing variety of users. At the same time, BEA will benefit from exchanges with users, in that input from local planners with knowledge of local conditions is vital in preparing subnational projections.

If the purpose of a small area study were merely to track economic and demographic growth patterns, then the study would be complete once the economic base data were finished. Most studies, however, involve deciding present and future courses of action, and this, in turn, requires that data be available or translatable into a form which has relevance to the particular problem at hand. For example, a study requiring data on domestic and commercial water consumption cannot use the OBERS data directly. Instead, since consumption varies with the demographic and industrial mix of an area, the planner must develop necessary relationships between these OBERS results and water consumption and, hence, translate the basic data into the necessary measure.

Among areas of interest for which geographically specific conversions have been designed are, apart from industrial water use, output (tonnages) shipped via water transportation and pollution emissions.

These conversions require the additional projection of relevant conversion factors, and it is, of course, essential that careful reviews and controls be included in the process. As with geographic disaggregation of the OBERS results, technical advice and assistance with conversion analyses are available from the BEA staff involved in the OBERS program.

The OBERS projections effort is a continuing program, and new expansions are currently being developed. Among them are plans to provide the following: increased industrial detail; new measures of economic conditions, such as gross product originating; shorter time intervals between projection points; and a major expansion of the amount of demographic detail included. As the needs for additional kinds of data become apparent, the program will continue to change accordingly.

Data and Tools for Regional Impact Assessment

One dimension of the economic impact of a project or planning alternative is the impact that is incident upon the region directly associated with the project. For analytical purposes, it is useful to consider this impact as two separate elements--the initial impact and the secondary impact.

The initial impact is defined as the change in industrial activity occurring in that industry or group of industries directly affected by the project. In regional analysis, in an economic base or input-output framework, this change is represented by a change in exports from the region. The second element, that of secondary impacts, summarizes additional rounds of regional economic activity that are generated by the initial impact.

Data bases and analytical tools for forecasting each of these elements are discussed below. The Manufacturing Industry Location Model (MILM) is directed at the task of estimating initial impacts; the Regional Industrial Multiplier System (RIMS) is designed to estimate secondary impacts. Both tools integrate and transform a number of regional and national data bases and present them in a form more directly usable for regional economic impact assessment.

Manufacturing Industry Location Model

The task of estimating intial impacts is essentially one of determining the point at which the project influences a region's industrial activity. Although this task is not readily systematized, the MILM can provide a means for estimating these initial effects, by industry, for projects that affect transport costs.

The MILM evaluates the regional economic implications of actions which would alter the existing pattern of interregional transport costs. It relies upon a wide variety of data on the regional distribution of economic

activity, including interregional shipment data and the National Input-Output Model. Essentially, it is an industrial location model which expresses the relative competitive advantage enjoyed by each region, with respect to each industry and as a function of the geographic distribution of input supplies, markets for outputs, and the structure of transportation costs. The working hypothesis of the model is that industries locate in those regions which offer the greatest total access to markets and supplies. The model estimates changes in regional final demand.

The MILM has been used to analyze the regional implications of changes in waterborne shipping costs. It could also be used to evaluate the initial impacts of major highway construction, the closing or opening of rail lines, or other actions which would alter the existing pattern of interregional transportation costs. Further, given that the cost of energy is of crucial importance to the transportation industry, the MILM could also be used to evaluate the regional economic impacts of energy policies and problems influencing the structure of transportation costs.

The analysis of the model proceeds in two stages, the first of which is qualitative, and the second, quantitative. In the qualitative stage the entire set of manufacturing industries is examined to determine which among them are sensitive to transport costs. Once a subset of transport oriented industries has been identified, a qualitative analysis is performed to estimate the parameters of location behavior specific to each industry. Using these estimated functional relationships, the model evaluates the impact on the distribution of economic activity that would result from a forecasted change in transportation costs.

Regional Industrial Multiplier System

A number of analytical tools can be applied to the task of forecasting secondary regional impacts once the initial impacts have been estimated. Fundamentally, this task is performed with the use of multipliers, expressing the relationship between an initial change--one in exports or final demand--and the total change in the region that the initial change generates. Alternative types of multipliers can be used, including base service multipliers, and those obtained from an input-output model, each having both advantages and disadvantages.

Base service multipliers are relatively inexpensive to estimate, although they do not permit the planner to draw precise conclusions concerning the relative effects of alternative courses of action. The input-output approach, on the other hand, permits the analysis of alternatives, since the product of this analysis is an industry specific multiplier. The construction of an input-output model for a region, however, is, at best, an expensive and time consuming task.

The BEA has developed a procedure for estimating regional multipliers with some of the advantages of both the base service and input-output approaches. This is the Regional Industrial Multiplier System (RIMS), a system of interrelated data files and computer programs designed to estimate industry specific output multipliers. Given an initial impact of the project, these multipliers can be used to estimate total regional impacts.

The RIMS provides multipliers, conceptually similar to those obtained from and I-O model, for use on any county or multicounty region, without the necessity of constructing an I-O model. Therefore, a considerable saving in study resources can be realized, permitting greater attention to the more arduous and demanding task of estimating initial impacts. Output changes thus derived can be converted to regional earnings and employment changes, using appropriate ratios (e.g., the ratio of earnings to gross output and of employment of gross output).

The multiplier estimating procedure follows from the decomposition of the multiplier into two components: (1) the direct component and (2) the indirect and induced component. The former is estimated by regionalizing a column from the most recent (1967) National Input-Output Model, using 1973 BEA county earnings data and 1973 County Business Patterns four-digit county data. The second component is based upon a relationship with the direct component which takes into account the economic size and industrial structure of the region.

In addition to the multiplier and its components, the output of the system includes a disaggregation of the direct component, by two-digit SIC industry (Table II-18). At a preliminary stage in the estimation procedure, furthermore, it is possible to introduce additional information, thus providing a means for obtaining specialized field knowledge of a particular industry or region and, thereby, enriching the estimating procedure.

Table II-18. RIMS Sample Output, Industry 2041
(Flour and Other Grain Mill Products),
Ten-County Area of Nebraska*

SIC code	Industry	Direct coefficient
01	Farms	.4504
15-17	Contract construction	.0020
20	Food and kindred products	.0563
26	Paper and allied products	.0010
27	Printing and publishing	.0001
35	Machinery, except electrical	**
42	Motor freight transp. & warehousing	.0403
48	Communication	.0011
49	Public utilities	.0035
50	Wholesale trade	.0667
52-59	Retail trade	.0010
60	Banking	.0011
62	Security and commodity brokers	**
63	Insurance carriers	.0001
65-66	Real estate	.0011
72 + 76	Personal and misc. repair services	.0006
73	Miscellaneous business services	.0050
75	Auto repair services	.0005
81 + 89	Legal and misc. professional services	.0004
84 + 86	Museums and nonprofit organizations	.0002
	Households	.1310
Sum of direct coefficients		.7624

Direct component of multiplier ..	.762
Indirect-induced component of multiplier	.230
Output multiplier	1.992

** Less than .00005

* These results are estimated for a specific region, given its industrial structure.

Source: Bureau of Economic Analysis, Regional Economic Analysis Division.

CHAPTER III

EMERGING DATA ISSUES

The demographic and economic data discussed in Chapter II are useful for some, but not all, planning purposes. For planning tasks such as the establishment of base conditions, this usefulness might be enhanced via the integration of these diverse data series into computerized profiles, which provide options with respect to time frames, geographic coverage, and detail of information needed. For such emerging planning concerns as normative futures forecasting, however, data issues cannot be entirely resolved in the absence of workable concepts.

Data Integration into Multi-Purpose Profiles

Most basin or project studies require basic profiles of existing conditions and projected trends. These profiles often stress economic and demographic elements and their relationships to the problem under study. While, traditionally, numerous data series are used in the preparation of reasonably complete descriptions of areas under study, the present approach requires the planner to search out one or more specific data series that will address his particular area of concern. Chapter II showed the multiplicity of data series on specific demographic and economic topics, many of which require the use of separate sources. Clearly, these various series can be better integrated for display and review, in general, and for planning, in particular.

No all purpose system is proposed here.[1/] A fully integrated management scheme goes well beyond the mandate or capabilities of any one existing Federal agency. Nor would such a scheme progress within the existing framework of data generation and use. However, even under existing conditions, more integration for multi-purpose profiles is feasible and requires only little within agency centralization.

The development of a system for producing profiles for use by planners, at least insofar as demographic and economic data are concerned, is at hand. To integrate these data into a profile system, the following elements need consideration:

(1) A profile system should be multi-purpose, to enable planners to choose the time frames, scope, and detail of information needed. For example, an urban or industrial study may benefit from maximum industrial detail whereas a beach erosion study may need, at most, only one-digit SIC detail.

[1/] The requirements of such a system are discussed in Edgar S. Dunn, Jr., Social Information Processing and Statistical Systems--Change and Reform, (New York: John Wiley and Sons, 1974).

(2) A profile system should provide capability for at least some of the basic data transformations needed for the planning process. Examples might include average annual percentage change over the relevant time frame and ratios related to national levels and/or other aggregates, useful for comparative analysis.

(3) A profile system should have already accounted for technical data problems to the maximum extent possible, such as definitional inconsistencies, time frame disparities, and boundary changes.

(4) A profile system should be amenable to geographic aggregation without introducing measurement inconsistencies into the resulting data.

(5) The accession of profiles should not require that planners have extensive background and expertise in computer systems.

Such a profile system would provide basic data for the first step in planning for studies undertaken in the field. Subsequent steps in the planning process would entail extension of the profiles to include the appropriate additional topical or detailed data required to address the particular problem under study. The availability of profiles, therefore, would not preclude planners from collecting data; rather, planners could focus their collection efforts on more refined data needs.

In addition to the advantages of a relatively standardized data base for beginning each study and the cost savings provided by centralized development and maintenance, an integrated system of data profiles would further the use of some data that may not be well-known to field planners. A profile system would also tend to facilitate work among different field offices and agencies involved in joint study efforts.

Data for Normative Forecasting[2/]

Normative forecasting incorporates information other than trend data and historical relationships. In this connection, two categories of data requirements are emerging: (1) the nonrecurrent data inputs necessary for using this approach and (2) data that can serve as a basis for evaluating the internal consistency of the resulting forecasts.

[2/] Normative forecasting is used here to represent a variety of qualitative and holistic forecasting techniques such as Delphi, scenario writing, life ways analysis, and morphological analysis.

Normative forecasting methods may embrace broad economic, social, and technological phenomena that are not easily measured. Frequently, required data must be extracted from a heterogeneous mix of sources ranging from Census data to public opinion sampling, or perhaps the beliefs and perceptions of selected experts. Specific data needs and sources depend on the forecasting method selected for use.

The effective use of normative futures techniques requires review and evaluation of the "reasonableness" of the forecasts in terms of the premises upon which they are based. Forecasts can be evaluated by analysis of some of their implications for economic and social characteristics that are exogenous to the forecasting technique. For example, if population and personal income are forecast independently, the reviewer might wish to evaluate the implied per capita income by comparing this result to current data and trends. Similarly, disaggregation of characteristics--such as the disaggregation of industrial activity by industry or the separation of population data into age-sex cohorts--can be used to test the validity of summary measures. Here, also, historical data and trends can be employed to evaluate the resulting forecast.

Whether as input to the forecasting effort or for evaluation of the results, the needed data often can be drawn from available series, such as those described in Chapter II, or from the information that might be included in area specific profiles.

Concluding Note

Planners, faced with data needs covering a wide range of conceptual and functional concerns, should benefit from the catalog of data sources and their use contained in Chapter II. Although these data may not always meet planners' precise needs, many of the series could be creatively adapted for constructive use. Moreover, the various series could be synthesized to provide systematic profiles of the demographic and economic conditions of particular study areas. Such standardized data packages could be assembled in a central location, thereby eliminating the development of costly and redundant software by field offices.

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Chief Census Research and Technical Advisor	Eli S. Marks	-7650
Chief Mathematical and Statistical Advisor	Harold Nisselson	-2562

Subject Matter Contacts

Area Measurement and Centers of Population	GEO	Lawrence Taylor	-5437
Boundaries and Annexations	GEO	David Cristy	-5437
1970 Census Geography	GEO	Donald Hirschfeld	-2668
Census Use Study Publications	CCUS	Sharon Johns	-7094
Computer Graphics and Computer Mapping	GEO	Frederick Broome	-7442
Computer Graphics and Computer Mapping--Specific User Applications	CCUS	Alex Kennedy	-7533
GBF/DIME System	GEO	Jeffery Koch	-7315
GBF/DIME System--Specific User Applications	CCUS	Alex Kennedy	-7533
GBF/DIME System Conferences	GEO	Jacob Silver	-5702
GBF/DIME Workshops	CCUS	John Kavaliunas	-5277
Geographic Statistical Areas	GEO	Richard Schweitzer	-5126
Geographic Uses of Earth Resources Satellite Technology:			
United States	GEO	Alice Winterfeld	-7291
International	GEO	Robert Durland	-5720
Law Enforcement Assistance Program--Use of GBF/DIME System	GEO	Bruce Strahan	-7742
GE-50 Series Maps	GEO	Conrad Thoren	-5035
Revenue Sharing Geography	GEO	Donald Hirschfeld	-2668
Survey Methodology Information System	SRD	Patricia Fuellhart	-7474
Urban Atlas	GEO	Richard Schweitzer	-5126

Listing of Telephone Contacts for Data Users compiled by Mathilda R. Bowman (telephone 301/763-5512), User Training Branch, Data User Services Division, Bureau of the Census.

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