

Appendix Q - Attachment 1

Appendix Q1 Impact Analysis for PLANning (IMPLAN) Model Documentation

This appendix documents the Impact Analysis for PLANning (IMPLAN) model used to evaluate the regional economic impacts in the EIS.

Q1.1 IMPLAN Model

Regional economic impacts are concerned with the effects of changes in the economy of a region. The magnitudes of the economic impacts are determined by the interactions between linkages within the local/regional economy and the leakages from this economy to the larger economy. Economic linkages are the relationships between industries, businesses, factors of production (e.g., labor and capital), and government created by trade and other exchange, such as taxes, within and among regions. Economic linkages create multiplier effects in a regional economy as money is circulated by trade. The magnitudes of impacts resulting from economic linkages are limited by the amount of leakage that occurs within the region. Economic leakages are a measure of the income shares spent outside of the region. Thus, the more the economic leakage, the less the multiplier effect. Generally, the smaller the regional economy, the higher the economic leakage. For example, the economic leakages for a county are larger than those for the state, which are larger than those for the nation.

A number of regional economic analysis modeling systems (consisting of data as well as analytical software) are available for use in regional economic analysis, such as Regional Economic Models Inc. (REMI), Regional Industrial Multiplier System II (RIMS II), and IMPLAN.

IMPLAN is an input-output (I-O) database and modeling software used to estimate economic impacts of changes in final demand or spending associated with the project alternatives. An I-O analysis describes and analyzes the relationship among industries.

Q1.1.1 IMPLAN Development History

IMPLAN was originally developed by the U.S. Forest Service in cooperation with the Federal Emergency Management Agency and the U.S. Department of the Interior (DOI), Bureau of Land Management to assist in land and resource management planning. In 1984, the U.S. Forest Service partnered with the University of Minnesota to expand and update IMPLAN data products. The updated IMPLAN software remained with the U.S. Forest Service. Beginning in 1993 through 2013, development of the IMPLAN was under exclusive rights of the Minnesota IMPLAN Group, Inc. (MIG, Inc.), located in Stillwater, Minnesota. MIG, Inc. licensed and distributed the software to users. In 2013, MIG Inc. was purchased by IMPLAN Group LLC, which relocated the offices to Huntersville, North Carolina.

Q1.1.2 IMPLAN Model Assumptions

The IMPLAN model is the most widely used I-O impact model system in the United States. IMPLAN analyzes the relationship among industries.

IMPLAN is a static model that estimates impacts for a snapshot in time when the impacts are expected to occur, based on the makeup of the economy at the time of the underlying IMPLAN data. IMPLAN

measures the initial impact to the economy but does not consider long-term adjustments as labor and capital move into alternative uses. This approach is used to compare the alternatives. Realistically, the structure of the economy will adapt and change; therefore, the IMPLAN results can only be used to compare relative changes between alternatives and cannot be used to predict or forecast future employment, labor income, or output (sales).

Any given industry typically purchases goods and services from, and sells goods and services to, another industry within a given geographic area, which in turn, sells to or buys from other industries or supplies final consumers. Figure Q1-1, Economic Linkages in a Hypothetical Industry, shows the general flows of money between industries and consumers that is captured by IMPLAN.

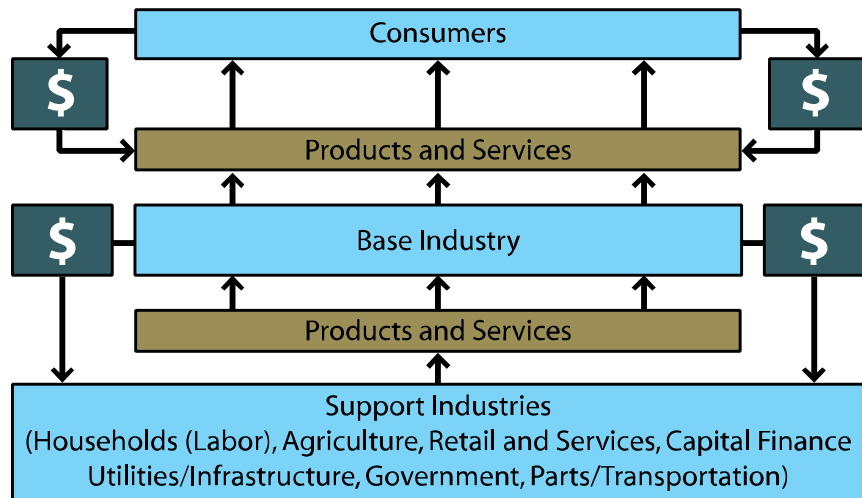


Figure Q1-1. Economic Linkages in a Hypothetical Industry

IMPLAN uses these inter-industry linkages and provides a tool to estimate the total economic effects within a region from a change in final demand to one economic sector. The industry linkages are estimated by economic multipliers (e.g., a multiplier of 2.0 indicates that each dollar of direct sale generates another dollar of secondary sales in the regional economy; a multiplier of 3.0 indicates that each dollar of direct sale generates an additional \$2 of secondary sales in the regional economy, and so on). Total economic effects include:

- **Direct effects** – changes in final demand
- **Indirect effects** – changes in expenditures within the region in industries supplying goods and services
- **Induced effects** – changes in expenditures of household income

IMPLAN estimates impacts on an annual basis. If the project effects occurred over a shorter period of time, there would be fewer economic effects. This analysis presents estimates of impacts to value of output, labor income, and employment. The 2017 IMPLAN data sets were used for this analysis, since this was the most recent dataset available at the time when preparation of this EIS commenced.

Q1.1.2.1 IMPLAN Data

As discussed previously, the 2017 IMPLAN data set was used in this analysis. IMPLAN develops and releases data each year. IMPLAN data is developed from the system of national accounts for the United States based on data collected by the U.S. Department of Commerce's Bureau of Economic Analysis, the U.S. Department of Labor's Bureau of Labor Statistics, and other federal and state government agencies. The 2017 data set used in this analysis, uses the 15th comprehensive, or benchmark update of the National Income and Product Accounts (NIPAs) (IMPLAN 2018).

Data is collected for 536 distinct producing industry sectors of the national economy corresponding to the 2017 North American Industry Classification System (NAICS). Industry sectors are classified on the basis of the primary commodity or service produced. Corresponding data sets are also produced for each county in the United States, allowing analyses at the county level and for geographic aggregations such as clusters of contiguous counties, individual states, or groups of states. Initially, MIG Inc., and now the IMPLAN Group LLC, provide annual IMPLAN I-O datasets representing the state of the economy for any region. Since these data rely on the release of federal economic data, the release of the IMPLAN I-O dataset typically lags by a year or two.

Data provided for each industry sector include outputs and inputs from other sectors, value added, employment, wages and business taxes paid, imports and exports, final demand by households and government, capital investment, business inventories, marketing margins, and inflation factors (deflators). These data are provided both for the 536 producing sectors at the national level and for the corresponding sectors at the county level. Data on the technological mix of inputs and levels of transactions between producing sectors are taken from detailed input-output tables of the national economy. National and county level data are the basis for IMPLAN calculations of input-output tables and multipliers for local areas.

Q1.2 Regional IMPLAN Model Analysis

The regional economic analysis was conducted using results from the agricultural production and municipal and industrial (M&I) water use impact analyses. The incremental impact results, estimated by the Statewide Agricultural Production (SWAP) and CWEST economic models, were input into the regional IMPLAN models as the direct change caused by each of alternative as compared to the No Action Alternative and the Second Basis of Comparison. The IMPLAN models were then used to estimate the secondary (indirect and induced) regional employment, income, and output.

Q1.2.1 Modeling Objectives

IMPLAN modeling in this EIS was conducted to evaluate regional economic impacts of changes to M&I water supply costs (estimated using CWEST Model) and changes to irrigated agricultural revenue (estimated using SWAP Model). Modeling objectives included the evaluation of the following potential impacts:

- Effects on regional employment
- Effects on regional labor income
- Effects on regional total economic output

Q1.2.2 Study Areas

Models of the multi-county regions identified in the Background Information section of Appendix Q, *Regional Economics Technical Appendix*, were used to measure impacts in terms of total changes in employment, income and economic output in these regions.

SWAP and CWEST model outputs are not categorized by counties. SWAP results are provided by SWAP regions that could extend beyond the county boundaries. For example, SWAP Region V05 includes portions of Butte, Yuba, Placer and Sutter Counties. SWAP results were inputted into Sacramento Valley and San Joaquin Valley Region IMPLAN Model. Table Q1.2-1 below summarizes the IMPLAN model, Counties in the IMPLAN Model and the SWAP results inputted in the IMPLAN Model.

CWEST results are provided by M&I contractors that could extend across two or more counties. For example, Antelope Valley-East Kern Water Agency extends across Kern and Los Angeles counties. CWEST results were inputted into the IMPLAN Models based on the location of the water contractors. Table Q1.2-1, IMPLAN Models Regions, Counties and SWAP/CWEST Result Inputs, summarizes the IMPLAN model, counties in the IMPLAN model and CWEST results inputted in the IMPLAN model.

Table Q1.2-1. IMPLAN Models Regions, Counties and SWAP/CWEST Result Inputs

IMPLAN Model/Regions	Counties in IMPLAN Model	SWAP Results inputted in the IMPLAN Model	CWEST Results inputted in the IMPLAN Model
Trinity River Region	Trinity Humboldt Del Norte	-	-
Sacramento River Region	Butte Colusa El Dorado Glenn Nevada Placer Plumas Shasta Sutter Tehama Yuba	SWAP Region V01 SWAP Region V02 SWAP Region V03A/B SWAP Region V04 SWAP Region V05 SWAP Region V06 ¹ SWAP Region V07 SWAP Region V08	<ul style="list-style-type: none"> • Yuba City • Fixed City of Redding • Fixed City of Shasta Lake and Shasta CWA • City of Folsom • El Dorado ID • City of Roseville • Placer County WA
San Joaquin River Region	Stanislaus Madera Merced Fresno Tulare Kings Kern	SWAP Region V09 ² SWAP Region V10 SWAP Region V11 SWAP Region V12 SWAP Region V13 SWAP Region V14A/B SWAP Region V15A/B SWAP Region V16	<ul style="list-style-type: none"> • Kern County W.A. (Reaches 3, 9-13B) • City of Avenal • City of Coalinga • City of Huron • Fresno • Lindsay • Orange Cove • All other FK contractor
Delta Region	Contra Costa Sacramento San Joaquin Yolo	-	<ul style="list-style-type: none"> • CCWD • Solano County W.A. • Fixed City of West Sacramento • Stockton East • City of Tracy • San Juan W.D. • Sac County WA

IMPLAN Model/Regions	Counties in IMPLAN Model	SWAP Results inputted in the IMPLAN Model	CWEST Results inputted in the IMPLAN Model
San Francisco Bay Area Region	Alameda Santa Clara San Benito Napa	–	<ul style="list-style-type: none"> • Zone 7 Table A & A21 • ACWD Table A & A21 • Santa Clara Table A & A21 • San Benito • Napa County F.C.&W.C.D.
Central Coast	San Luis Obispo Santa Barbara	–	<ul style="list-style-type: none"> • San Luis Obispo Co. F.C.&W.C.D. • Santa Barbara Co. F.C.&W.C.D.
Southern California	Ventura Los Angeles Orange San Diego Riverside San Bernardino	–	<ul style="list-style-type: none"> • MET • Castaic Lake WA • Antelope Valley-East Kern W.A.³ • Palmdale & Little Rock Creek • Mojave W.A. • San Geronio • Desert W.A. • Coachella Valley W.D. • San Bernardino • Crestline-Lake Arrowhead W.A.

¹ SWAP Region V06 extends across Sutter, Sacramento, Yolo and Contra Costa Counties. This region was modeled in Sacramento Valley Region Model.

² SWAP Region V09 extends across San Joaquin and Contra Costa Counties. This region was modeled in San Joaquin Valley Region Model.

³ Antelope Valley-East Kern W.A extends across Kern and Los Angeles Counties. This M&I contractors was modeled in the Southern California Region Model.

ACWD = Alameda County Water District

CCWD = Contra Costa Water District

CWA = county water agency

F.C.&W.D. = flood control and water conservation district

ID = irrigation district

IMPLAN = IMpact Analysis for PLANning

SWAP = Statewide Agricultural Production

WA = water agency

Zone 7 = Zone 7 Water Agency

Q1.2.3 Modeling and Assumptions

IMPLAN models of each region were used to estimate the secondary employment and income impacts associated with changes in irrigated agricultural production and M&I water costs. Each regional model follows county lines and incorporates, to the extent allowed by available data, the distinct sector characteristics of the region modeled.

The primary assumption attributable to IMPLAN concerns linkages among regions. Each of the IMPLAN models is a single-region model. Other than assumptions on imports, exports, and regional purchases, the models do not explicitly recognize inter-regional interdependencies among sectors. It is believed that the regions defined for the IMPLAN models are sufficiently large so that each is relatively self-sufficient as an economic entity.

Q1.2.3.1 M&I Water Costs Analysis

The long-term average year condition M&I cost estimates out of the CWEST model were used as input into the relevant IMPLAN sector within each of the regions. This analysis assumes that increased costs of water supply estimated from CWEST could be passed on to regional water users. This is a conservative assumption and water agencies may not pass on all cost increases to water customers and could find other ways to fund water supply cost increase. If water supply cost increases are not passed on to water customers, this would result in lower impacts to the regional economy.

Since M&I water supply cost estimates out of the CWEST model include changes in water supply costs for all M&I water customers including residential units, commercial buildings, large landscapes (parks, golf courses etc.) and industrial customers. M&I annual water supply costs estimates from the CWEST model was divided into effects to residential, commercial, and industrial customers using the split percentages in Table Q1.2-2 below. The split percentages in Table Q1.2-2, Urban Applied Water Breakdown by Residential/Commercial and Large Landscape, were developed based on 2010 Urban Applied Water Use as reported in the California Water Plan.

Table Q1.2-2. Urban Applied Water Breakdown by Residential/Commercial and Large Landscape

	Large Landscape	Commercial	Industrial	Residential
Sacramento River Region	9%	14%	11%	66%
San Joaquin River Region	7%	8%	15%	71%
Bay-Delta Region	8%	12%	16%	64%
Central Coast Region	9%	16%	6%	69%
San Francisco Bay Area Region	6%	20%	7%	67%
Southern California Region	11%	15%	3%	71%

Source: DWR 2010.

As discussed previously, annual water supply cost changes to residential customers could be passed on to customers through a water rate change. This water rate change could result in a change in disposable income to household. These effects were modeled as an institution spending pattern to household in the IMPLAN models. Non-discretionary spending such as rent, childcare, health care etc. were removed from the spending pattern as changes to disposable income would not affect non-discretionary spending patterns.

Annual water supply costs changes to commercial customers could also be passed on to customers through rate changes. This could result in changed spending in the commercial sectors. These effects were

modeled as an institutional spending pattern to State/Local Government non-education spending in the IMPLAN model.

Annual water supply cost change to industrial customers were not analyzed using IMPLAN.

Q1.2.3.2 Irrigated Agricultural Production Analysis

Incremental changes in agricultural production over the long-term condition (81-year simulation period analyzed in this EIS) were used as input into the relevant agricultural sector within each of the regions. Table Q1.2-3, Mapping SWAP Model Results to IMPLAN Sectors, shows the aggregated crop categories from the SWAP model and the IMPLAN sector to which each of these crop categories was assigned. These effects were modeled as industry changes in the specific IMPLAN sectors.

Table Q1.2-3 Mapping SWAP Model Results to IMPLAN Sectors

Crop Category	IMPLAN Sector
Grains	Sector 2 – Grain farming
Field Crops	Sector 10 – All other crop farming
Forage Crops	Sector 10 – All other crop farming
Vegetable, truck	Sector 3 – Vegetables and melon farming
Orchards and Vineyards	Sector 4 – Fruit farming

Q1.3 References

California Department of Water Resources (DWR) 2010. Water Supply & Balance Data Interface, Lite ver. 9.1. Available here: <https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/WaterPortfolios/InterfaceTool/California-Water-Plan-Water-Supply-and-Balance-Tool.zip?la=en&hash=4EAE7C8C7F179FCB84FBE97370B795A94B2A7D2F>

IMPLAN Group, LLC (IMPLAN). 2018. 2018 Data Release Notes. Huntersville, NC. Available: <https://implanhelp.zendesk.com/hc/en-us/articles/360011728033-2017-Data-Release-Notes>.