

Progress on Developing PECAS Model Data

**San Diego Association of
Governments**

August 8, 2008

Forecasting at SANDAG

- Regional Transportation Plan (RTP)
 - Federal air quality law
- 30 years of modeling based on land use patterns and city/county land use plans
 - Ignored land economics

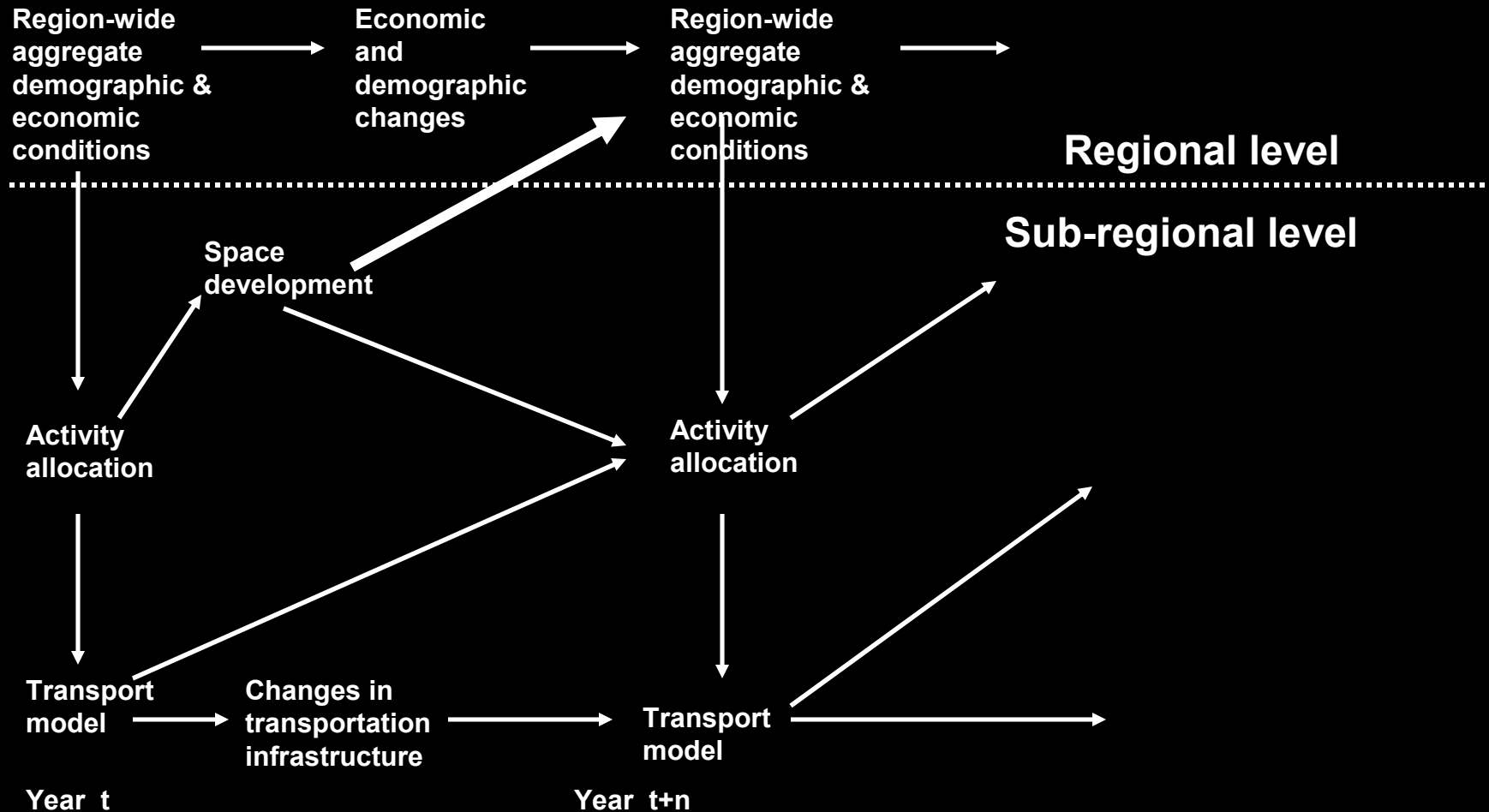
PECAS

- DRAM-EMPAL models successful but not designed to model redevelopment
- PECAS incorporates land economics, and therefore is capable of modeling redevelopment

PECAS Overview

- **P**roduction, **E**xchange, and **C**onsumption **A**llocation **S**ystem
- Integrated land use-transportation modeling framework
- Applies land economics and travel costs in forecasting spatial distribution of development

Structure of PECAS



PECAS Structure



- Activity Allocation (AA)

- Spatially defined Input-Output model of a regional economy
- Interactions between producers and consumers (“Activities”) and the goods exchanged (“Commodities”)

- Space Development (SD)

- Develops floorspace in response to rent information from AA
- Provides feedback on floorspace quantities to AA

Development Roadmap

Phase 1

Design, develop, calibrate, test, and interpret coarse detail model

Specifications

- Seven zones
- Eight to ten household types
- Eight to ten industrial sectors

Phase 2

Expand upon the first model, adding greater complexity and increased scale

Specifications

- 40-50 zones
 - 12-16 household types
 - 15-20 industrial sectors
- +Capable of some simulation

Phase 3

Refine the second model, and shape for a finalized, full-featured San Diego model

Specifications

- 150 zones
 - 20-30 household types
 - 80 industrial sectors
- +Full simulation capability

July 2007

July 2008

Jan 2009

Fall 2010

SANDAG Model 1 Status Report

- Database structure in place
 - Allows scalability for future model iterations
- Model running
- Next step is model calibration
- Data collected (but always doing more data work...)

Phase 1

- 44 Zones
- 7 Space types
 - Residential, Employment, Military, Public, Open Space (incl. Agri.), Transportation and Utilities, Vacant
- 3 Household Types (Low, Med., High \$)
- 12 primary Activities and Commodities
 - Plus categories for \$ flows such as government transfers

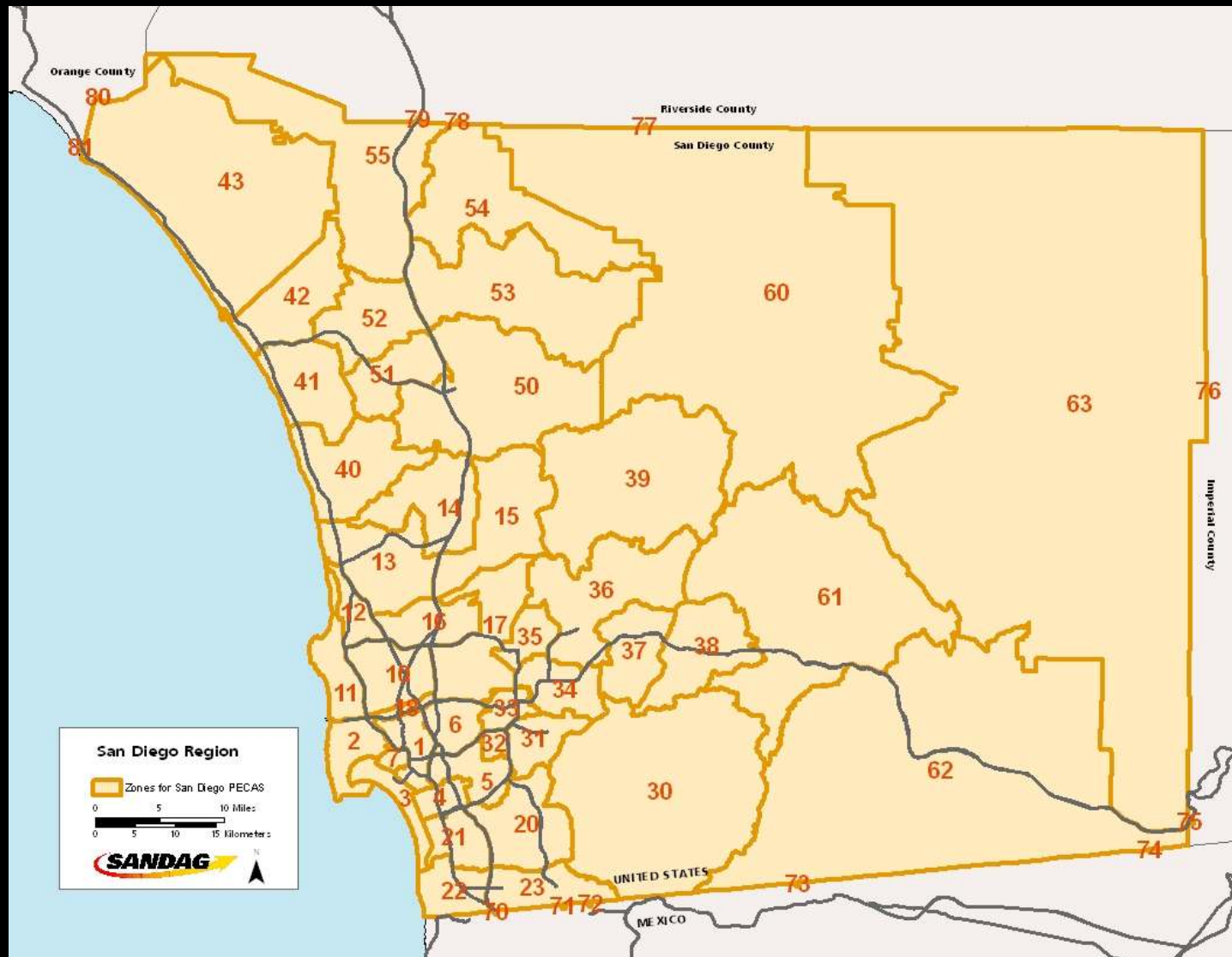
Data Successes and Challenges

- Three main sub-categories:
 - Data for characteristics “on the ground” in base year
 - Data from the regional long-range forecast, Demographic and Economic Forecasting Model (DEFM)
 - Policy data, e.g., future zoning, parking policies, environmental mitigation, building fees, etc.

Spatial Detail

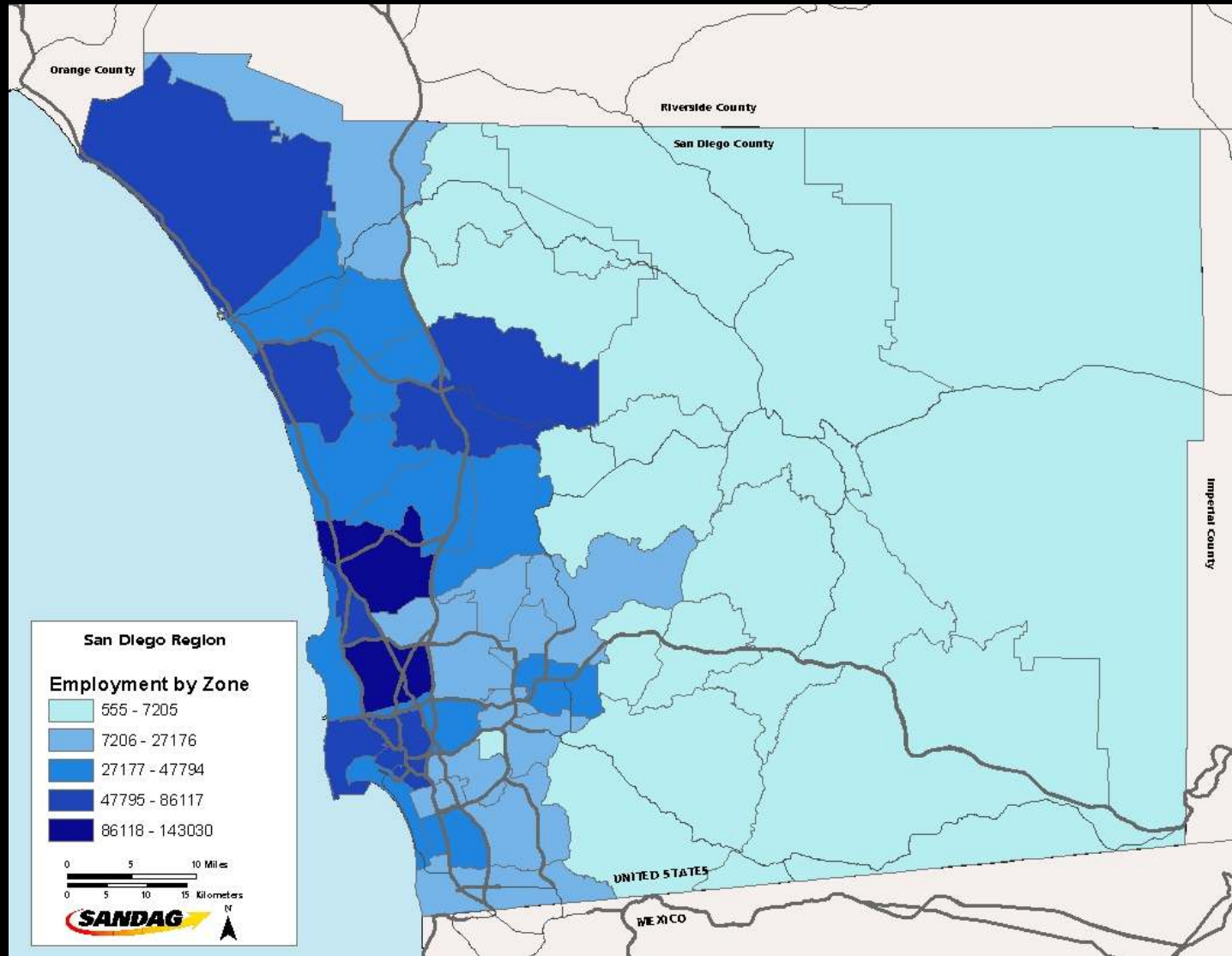
- Much work to-date has focused on parcel-level detail
 - Parcel-level detail allows flexibility to disaggregate in later model iterations
- 1st model contains:
 - 44 internal zones (aggregated from parcel)
 - Plus 6 external zones

Map of SD Pecas 1 Zones

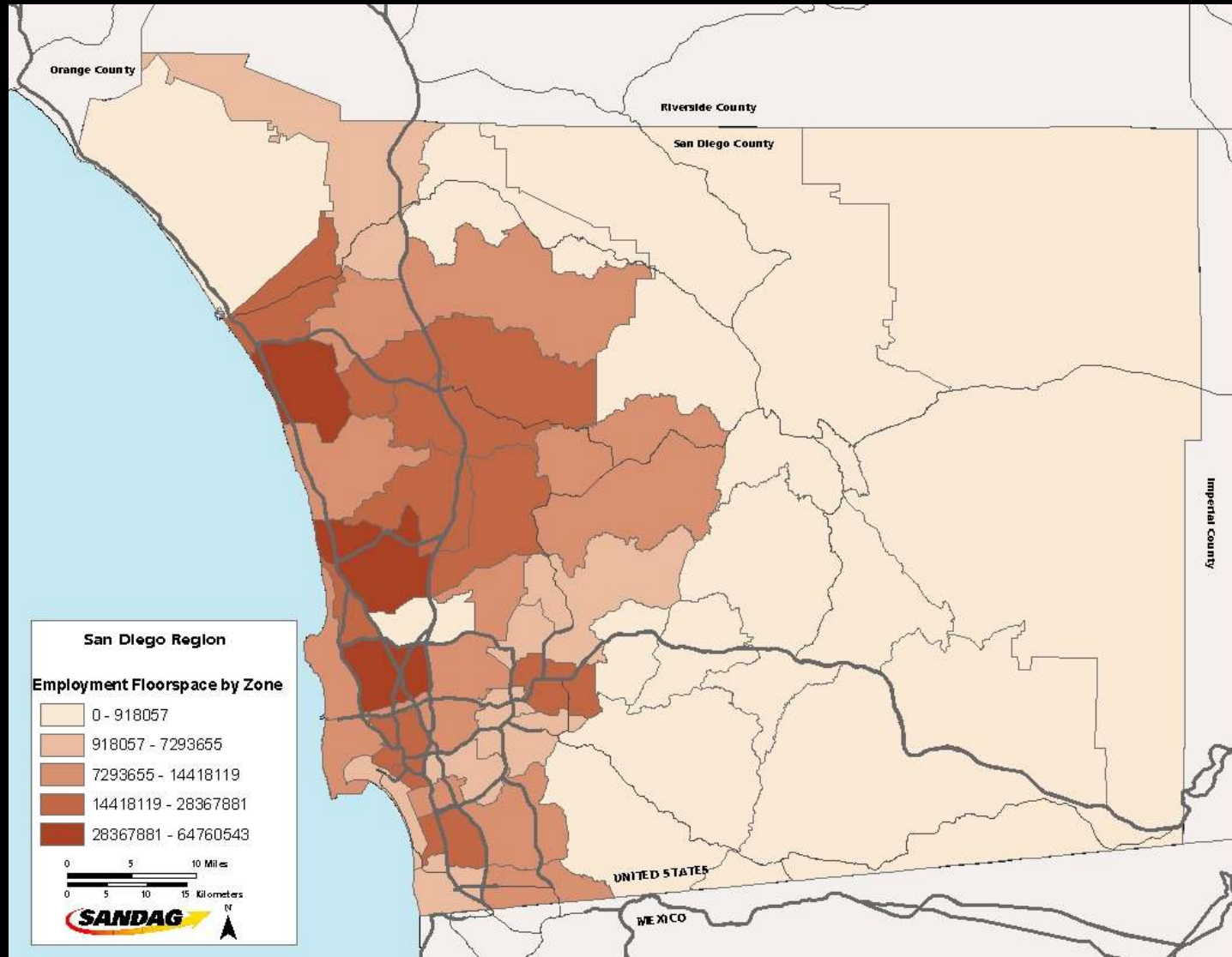


Base Year Characteristics

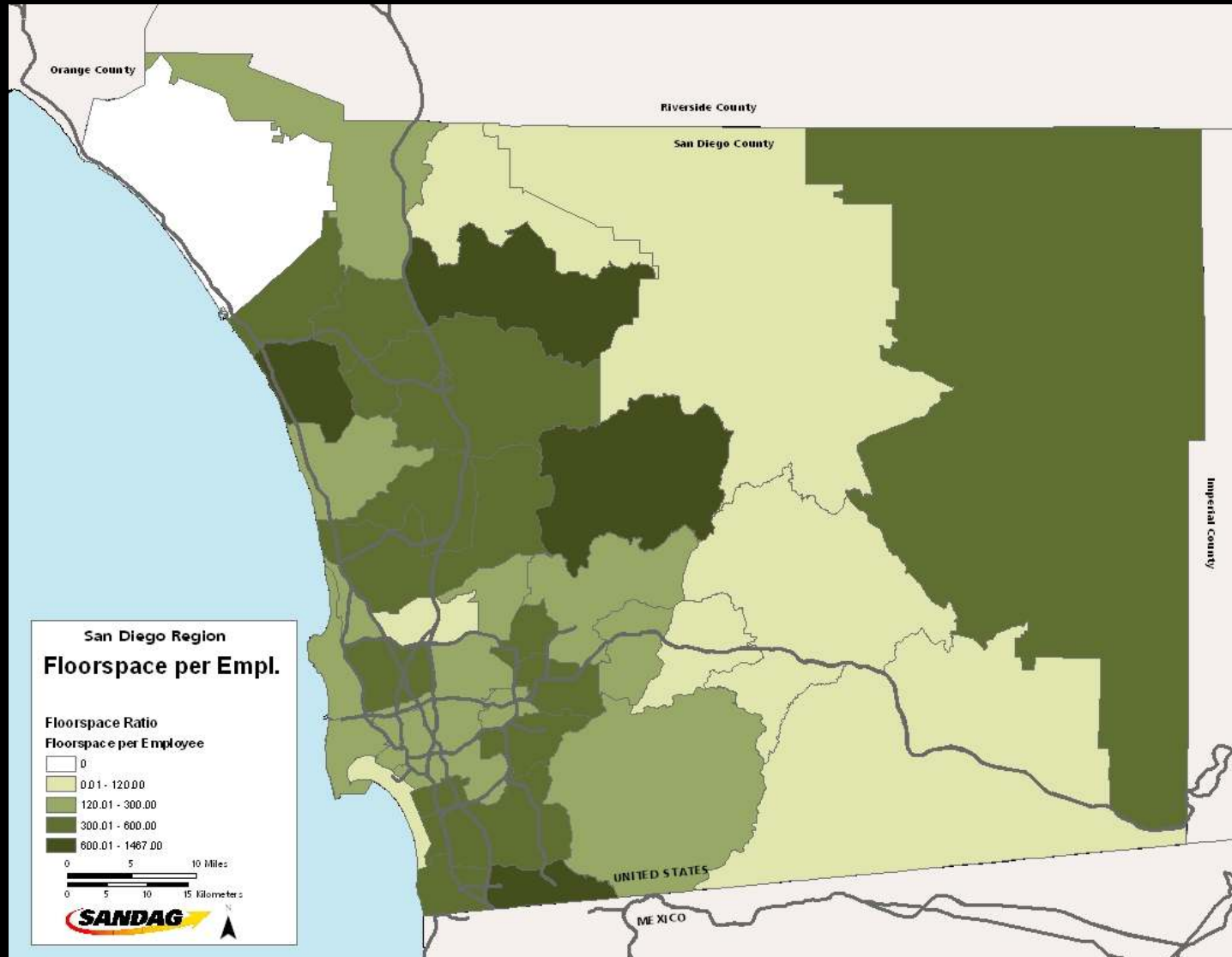
Employment by Zone



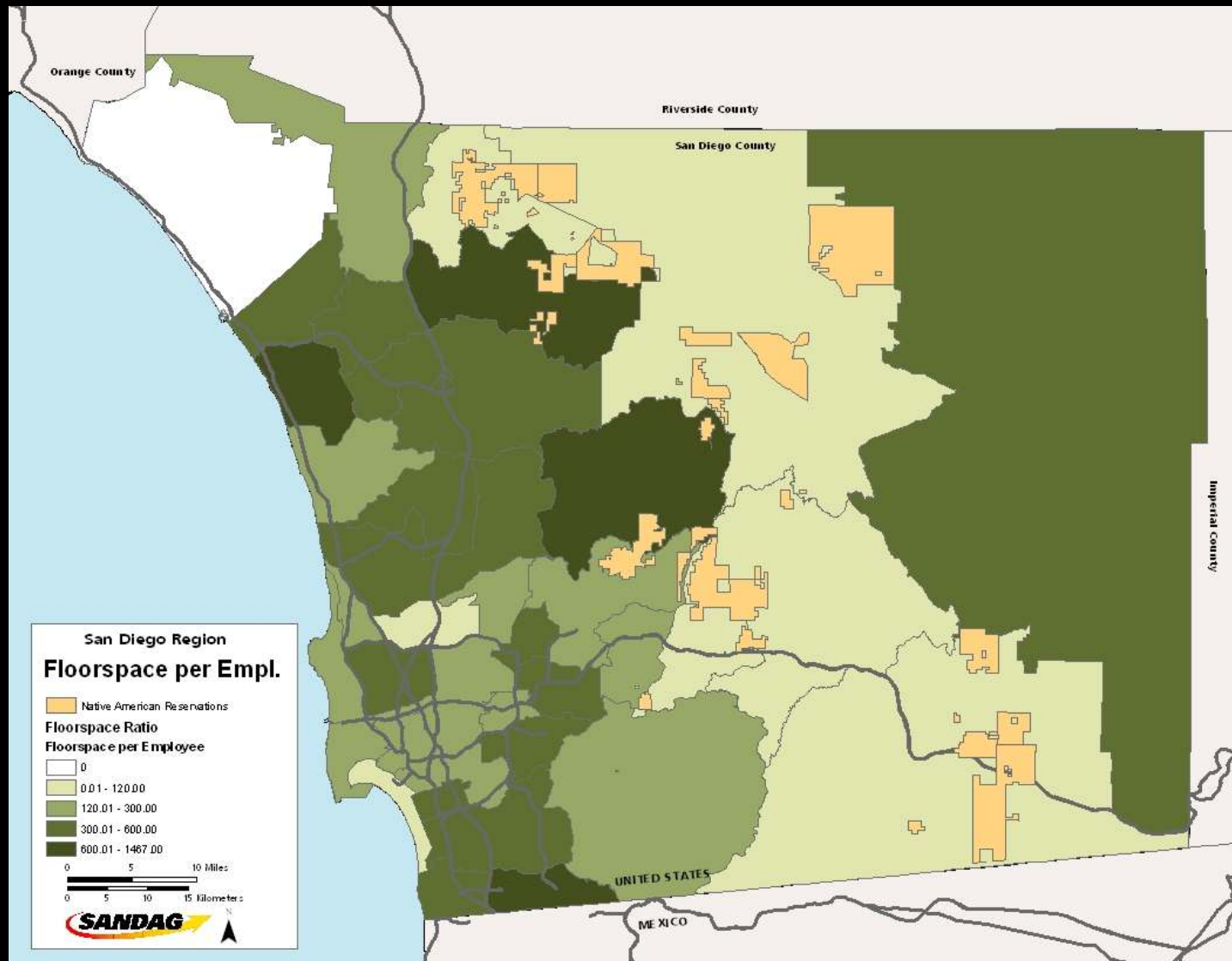
Employment Floorspace by Zone



Troubleshooting Floorspace Data



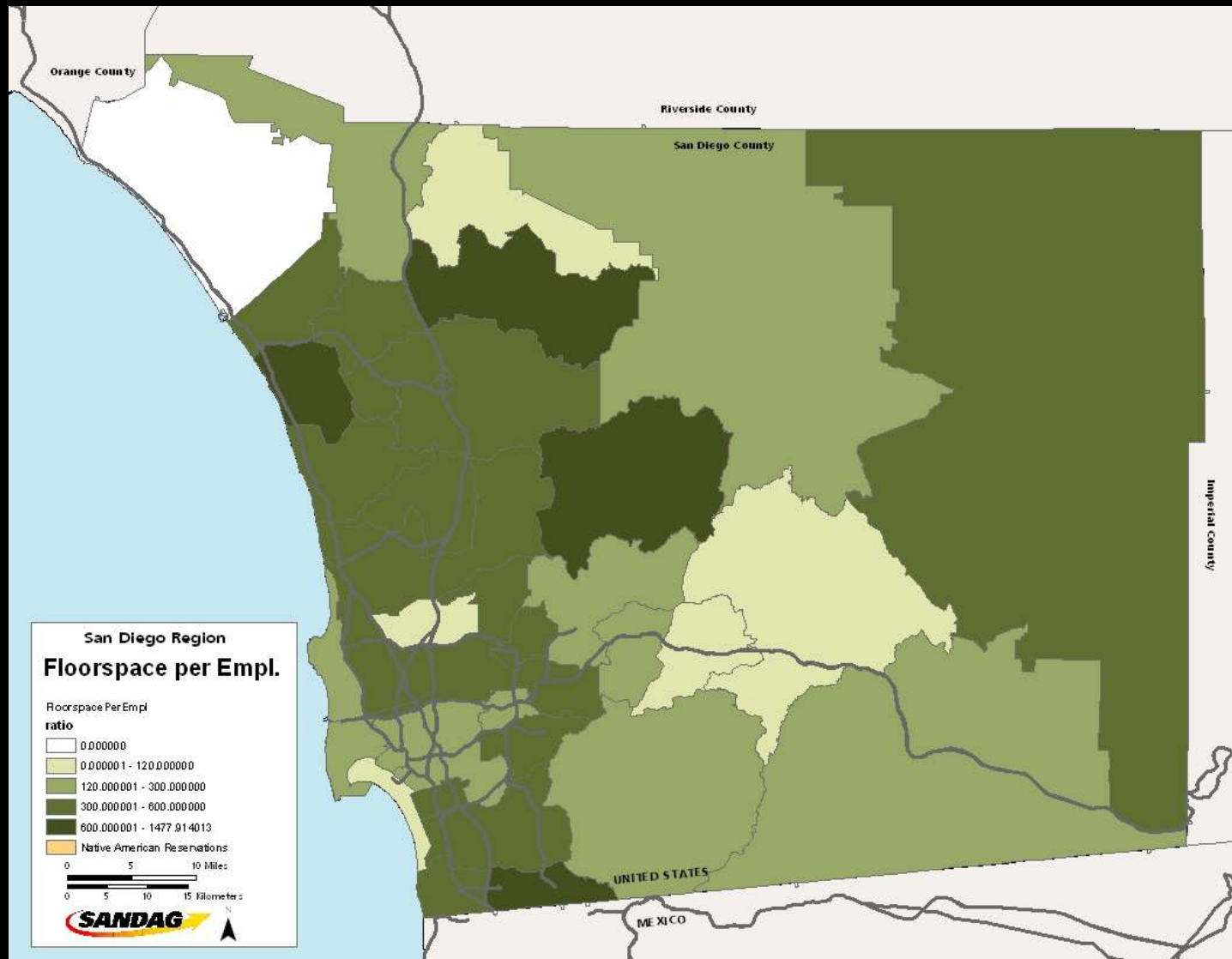
Floorspace per Employee Ratios



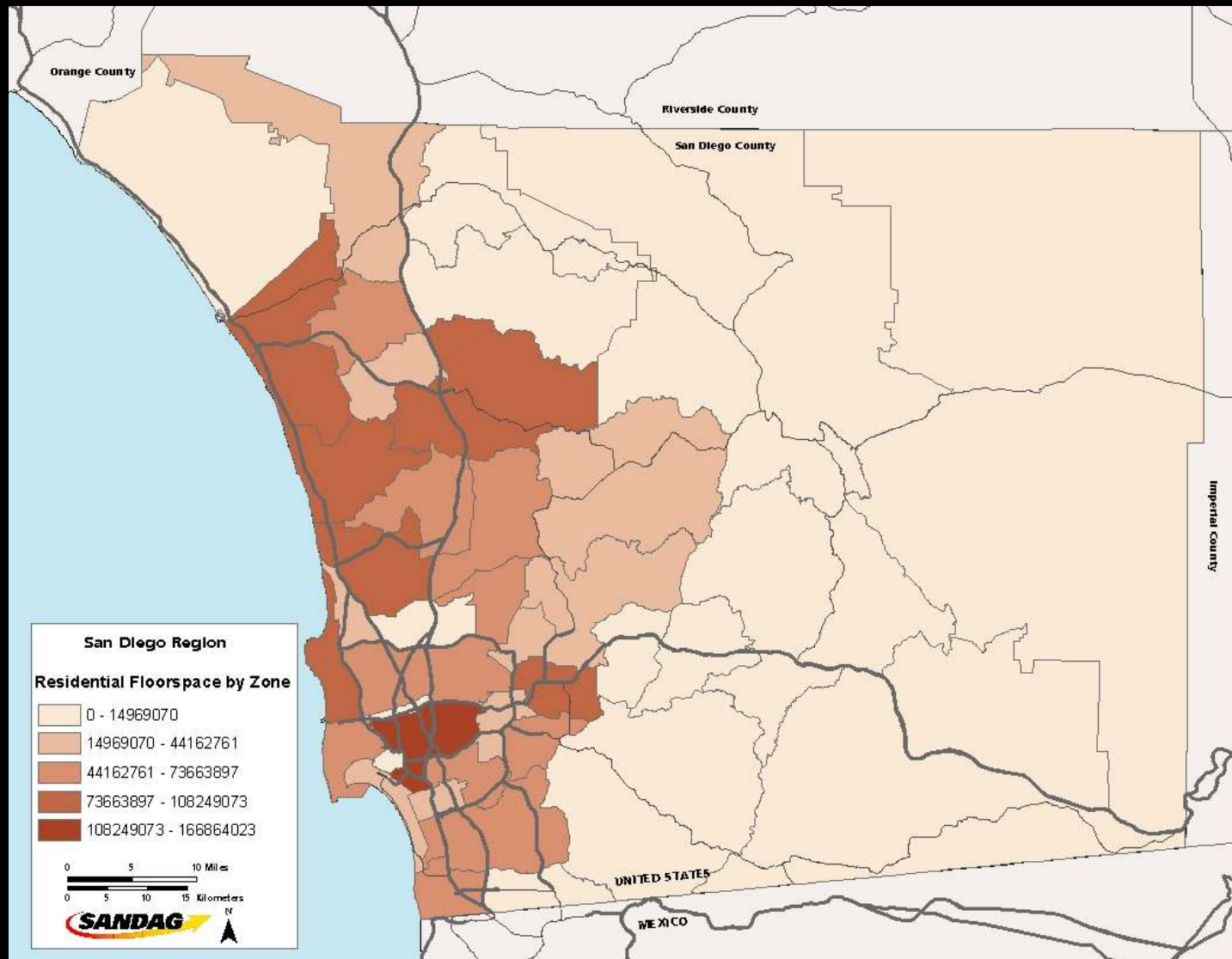
Other Floorspace Challenges

- Tribal lands
- Federal lands
- Other public lands:
 - Gaps in data being filled in by contacting local jurisdictions
 - Using proxy (sq ft per employee and employment record data for now)

Floorspace per Empl. (Revised)



Residential Floorspace by Zone



Timeshares and Resorts

- Multiple-counting of floorspace for each unit because of fractional unit ownership issues

Other Data Challenges in San Diego

- Military facilities (bases, barracks, and family housing) is a user input

Spatial Distribution of Activity

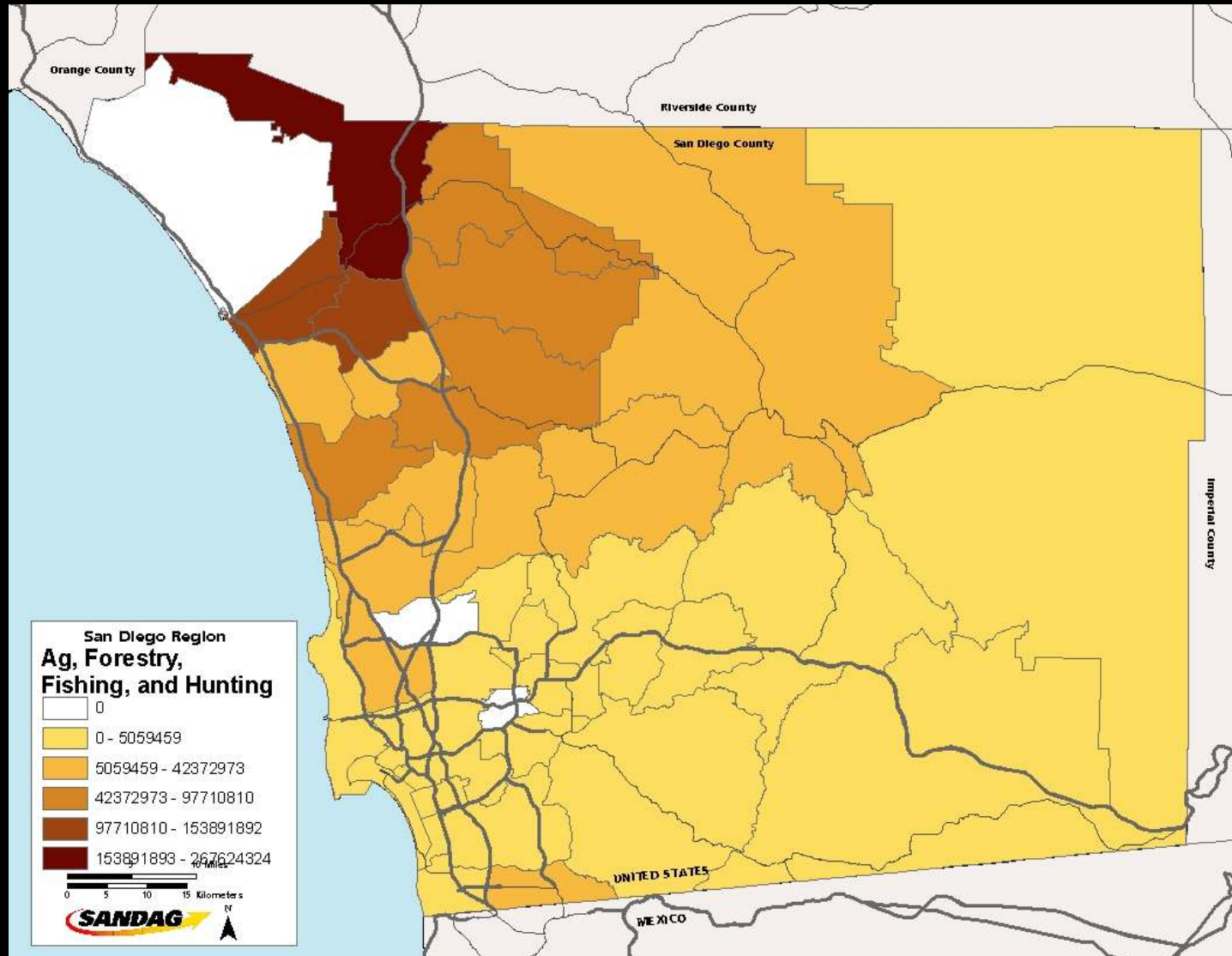
Activities

ID	Name	\$ (millions)
1	Ag Forestry Fishing and Hunting	\$1,170.0
30	Mining Utilities Non-Bldg Constr	\$8,287.6
33	Construction of Buildings	\$12,228.5
46	Manufacturing	\$36,329.7
391	Transport and Warehousing	\$11,897.1
401	Comm. Retail Goods & Services	\$24,858.3
431	Services	\$87,262.1
464	Education and Health	\$11,590.2
495	Government and non-NAICS	\$21,324.0
503	State and Local Education	\$3,580.7

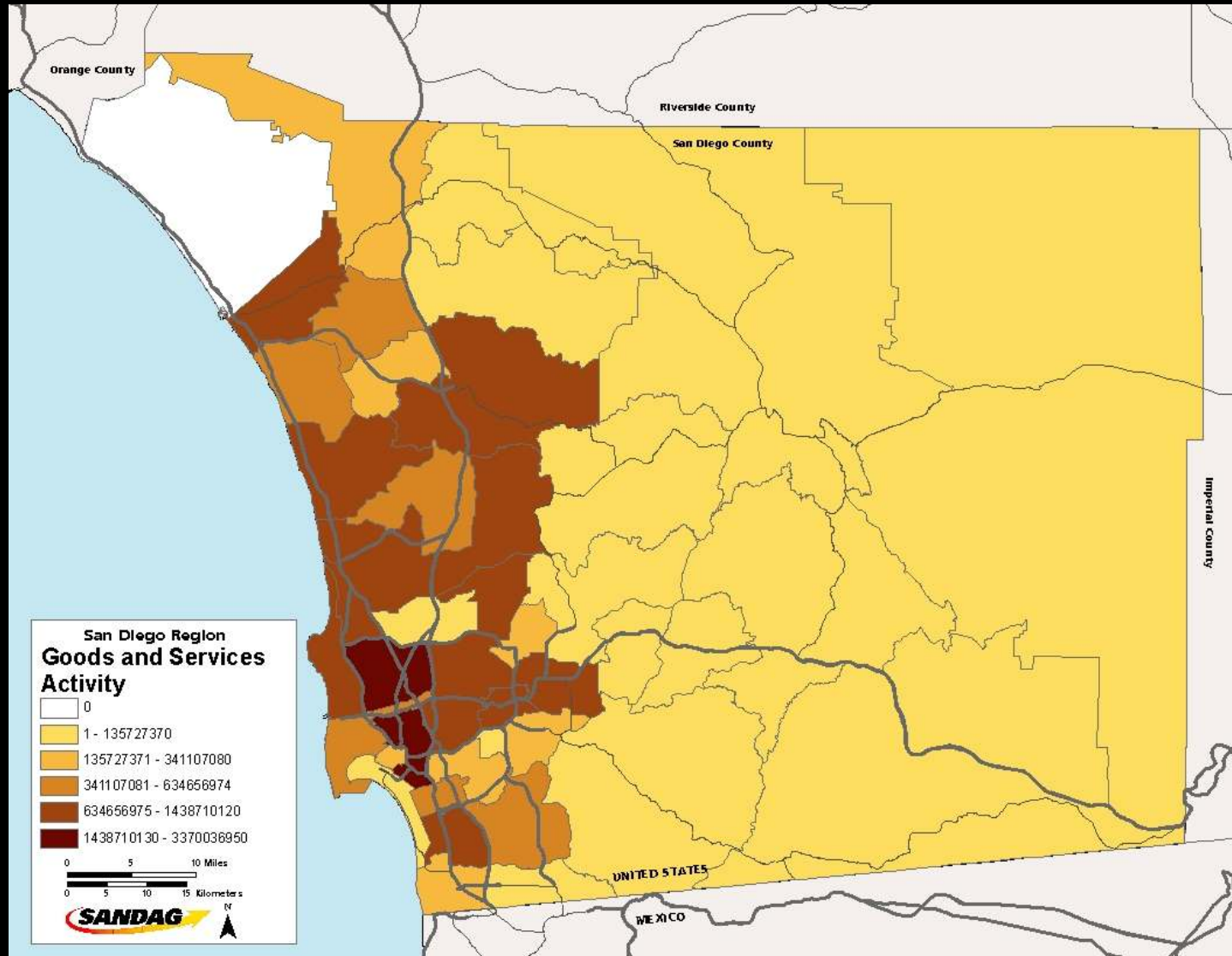
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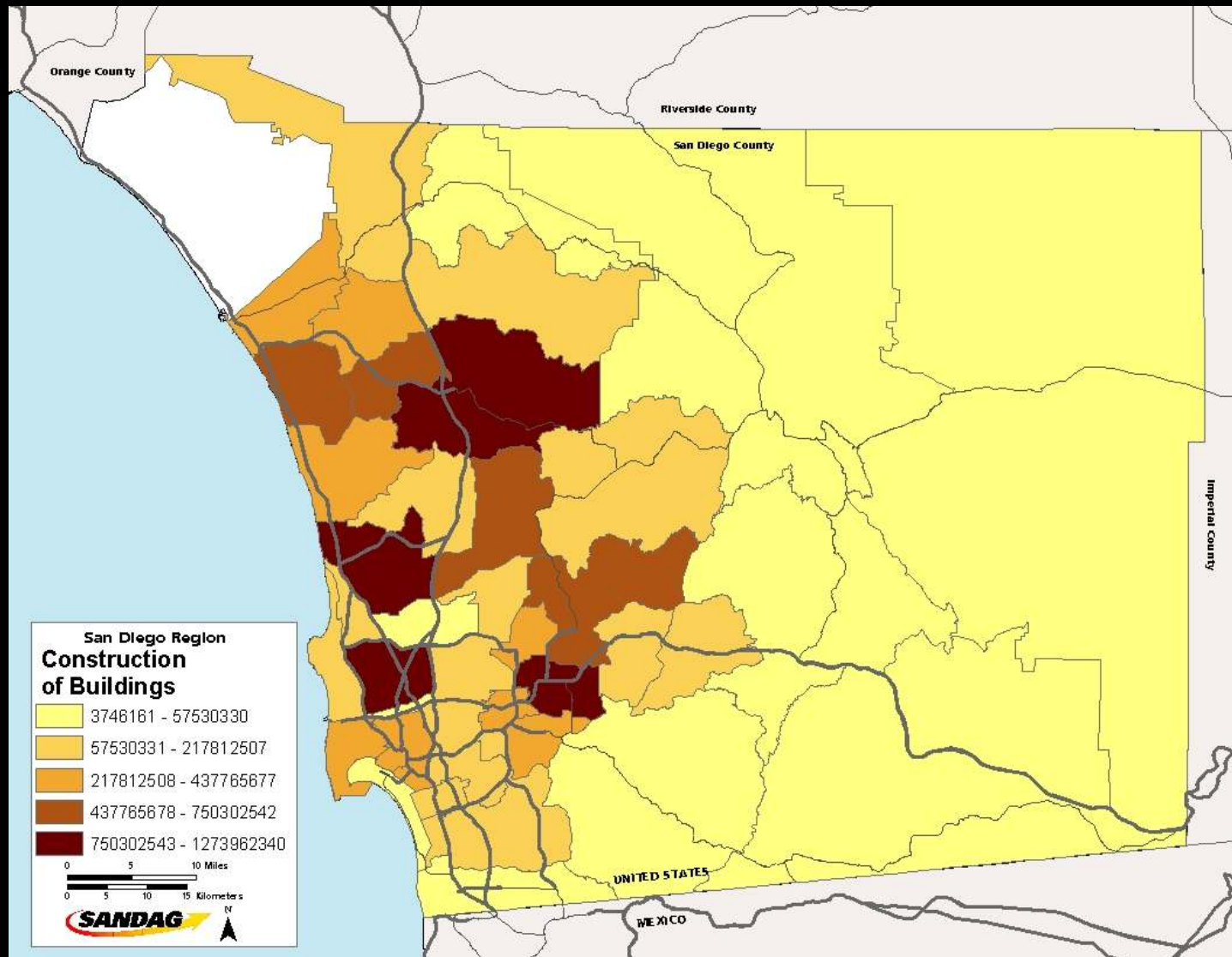
Agriculture Activity



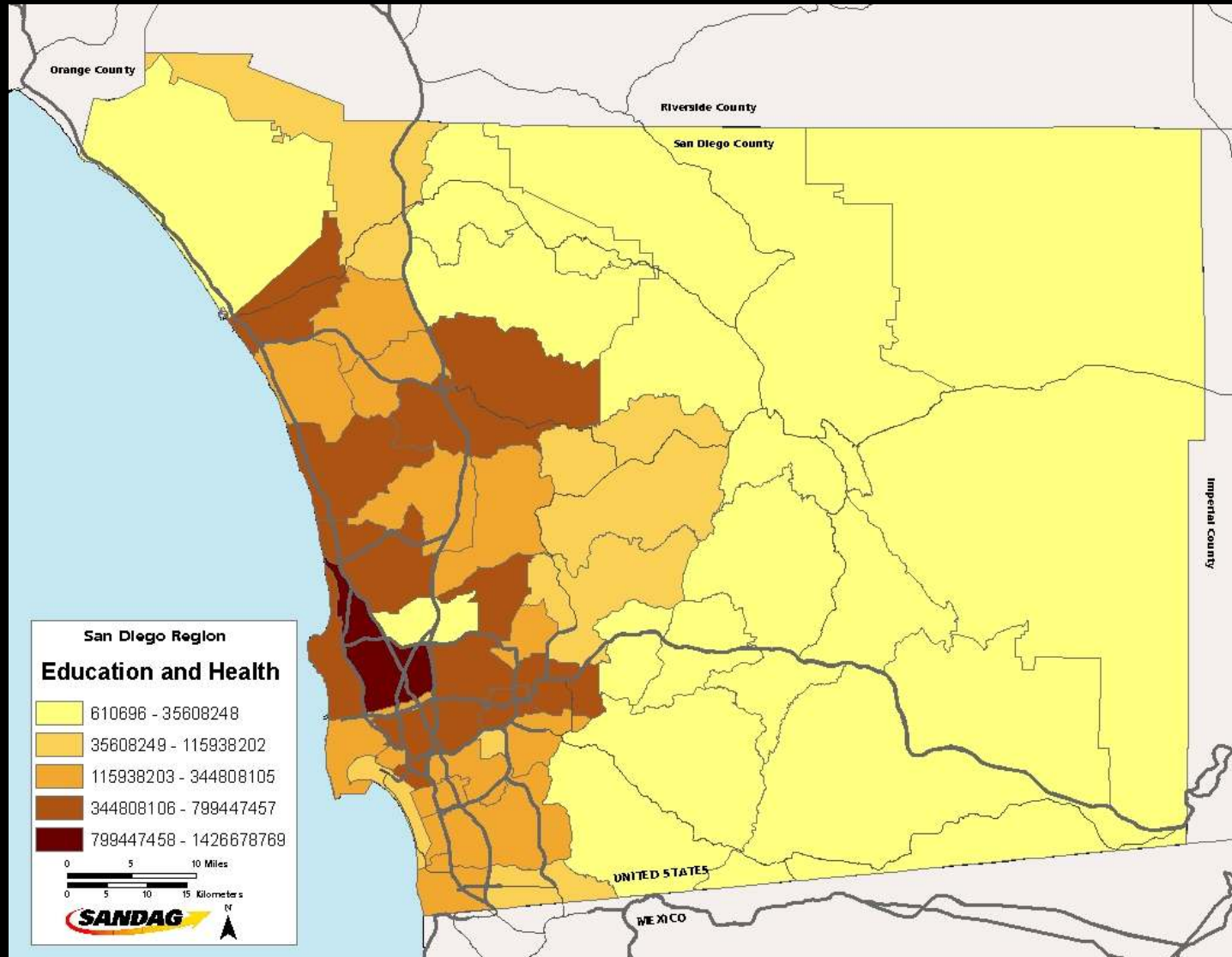
Retail Activity



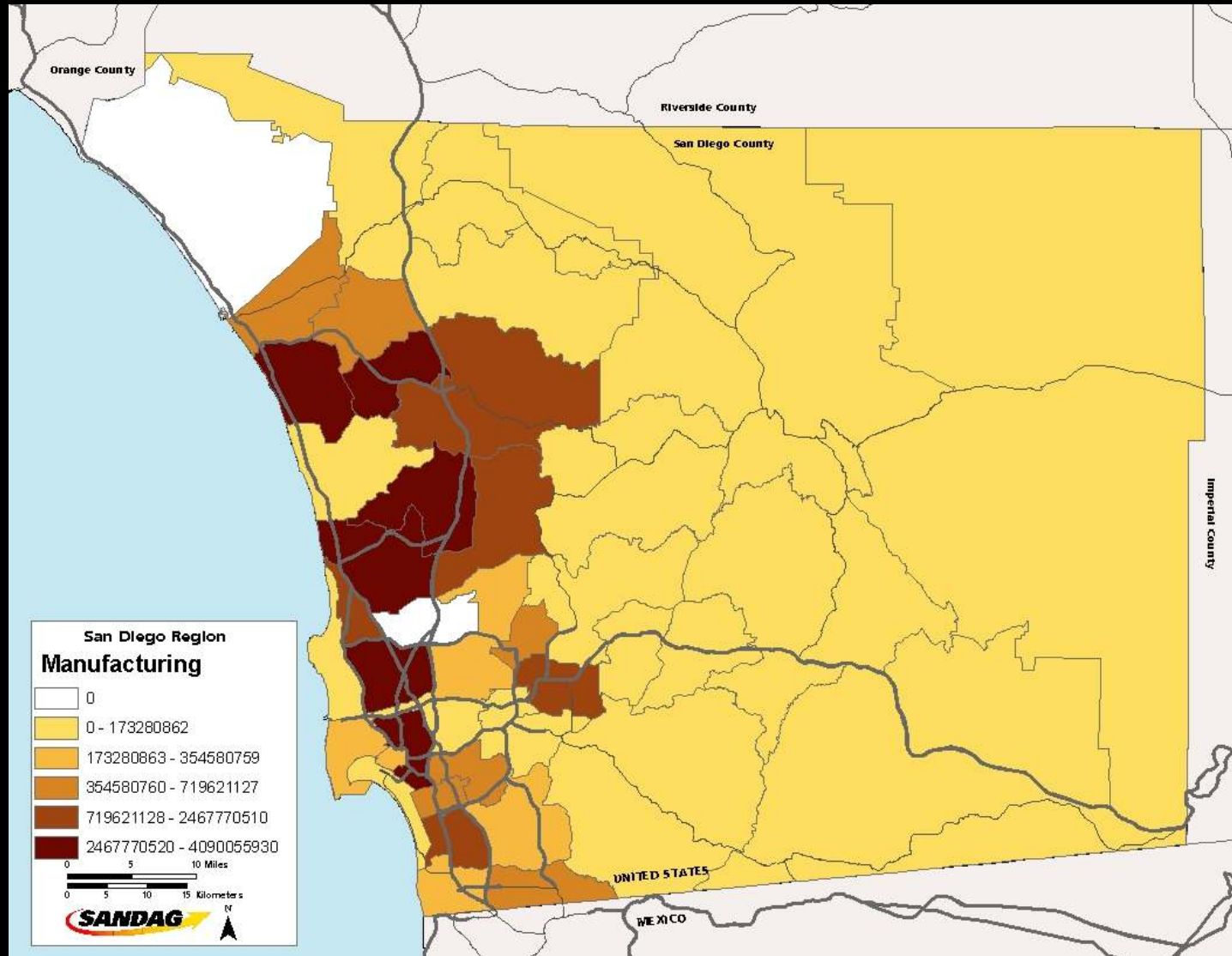
Construction Activity



Education and Health Activity



Manufacturing Activity



Commodities

ID	Name	\$ (millions)
3001	Ag Forestry Fish & Hunting	\$224.8
3030	Mining Utilities NonBldg Construction	\$760.3
3033	Construction of Buildings	\$1,746.9
3046	Manufacturing	\$4,385.4
3391	Transport & Warehousing	\$1,186.6
3401	Commercial Retail Goods and Retail Services	\$2,062.4
3431	Services	\$7,368.4
3464	Education and Health	\$1,496.5
3495	Government & non NAICs	\$1,599.9
3503	State & Local Education	\$511.5

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Imports and Exports

- Rest of the world currently represented by six external zones
 - Only treating make and use of commodities imported to, and exported from, San Diego
- Combination of IMPLAN import and export activities, Freight Analysis Framework, Trade Information Administration reports
 - More data available for exports than imports
- Allocated commodity flows to/from external zones

Transport Cost Coefficients

- Cost of transporting one unit of commodity one mile and for one minute
- Used for transforming skims from transport model into spatial interaction costs for AA
- Differentiated by
 - Goods
 - Services delivered by providers
 - Services picked up by households
 - Labor
- Developed using CA BTS Commodity Flow Survey, IMPLAN for CA, BLS Wage Rates, Caltrans Statewide Travel Survey

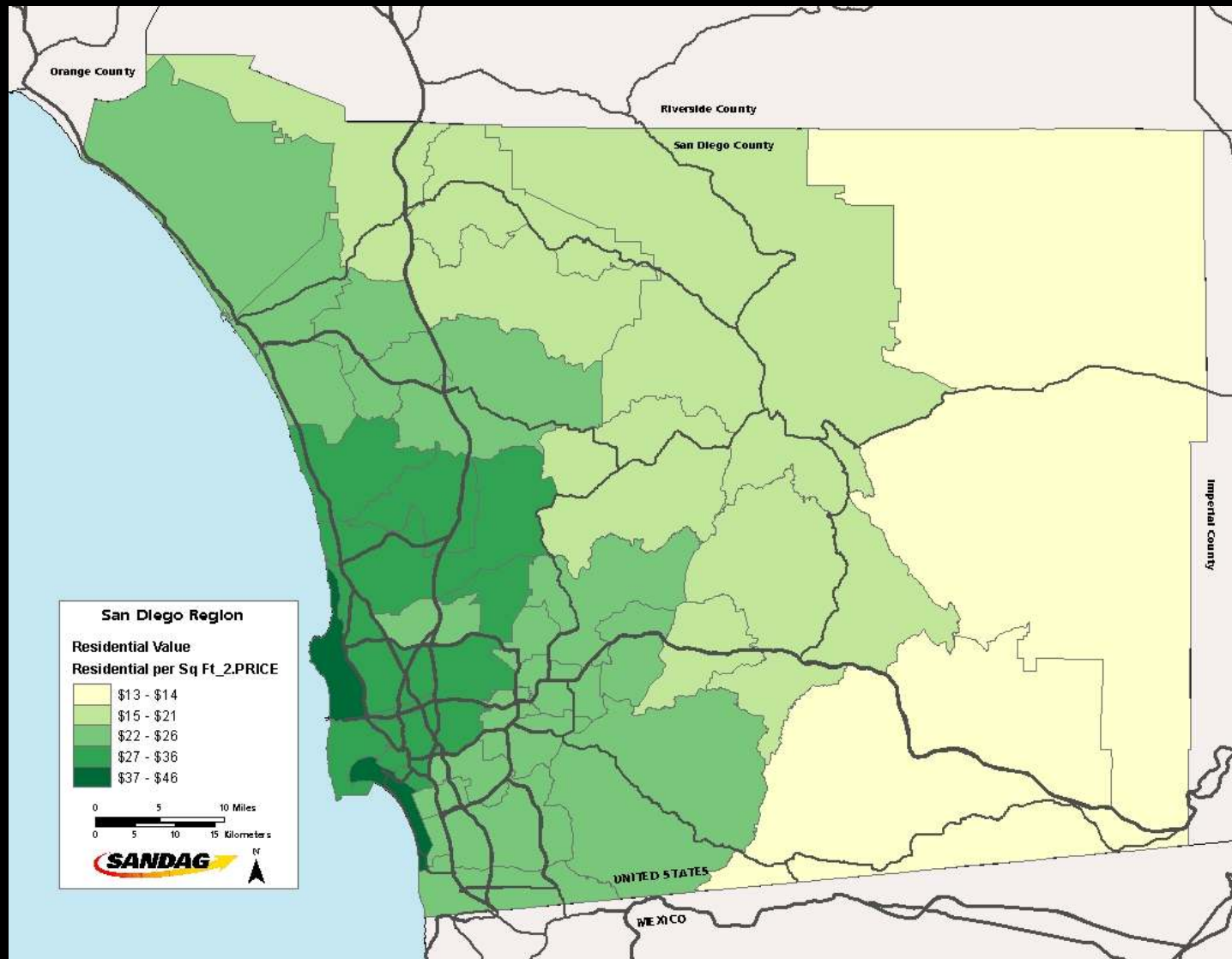
Estimating Rents

- Goal is to modify zonal rents by space type to reflect local effects
- Form of Hedonic estimation: regression equation that incorporates neighborhood characteristics into determining the price (or rent) for real estate
- Estimated zonal rents provide a starting point for AA

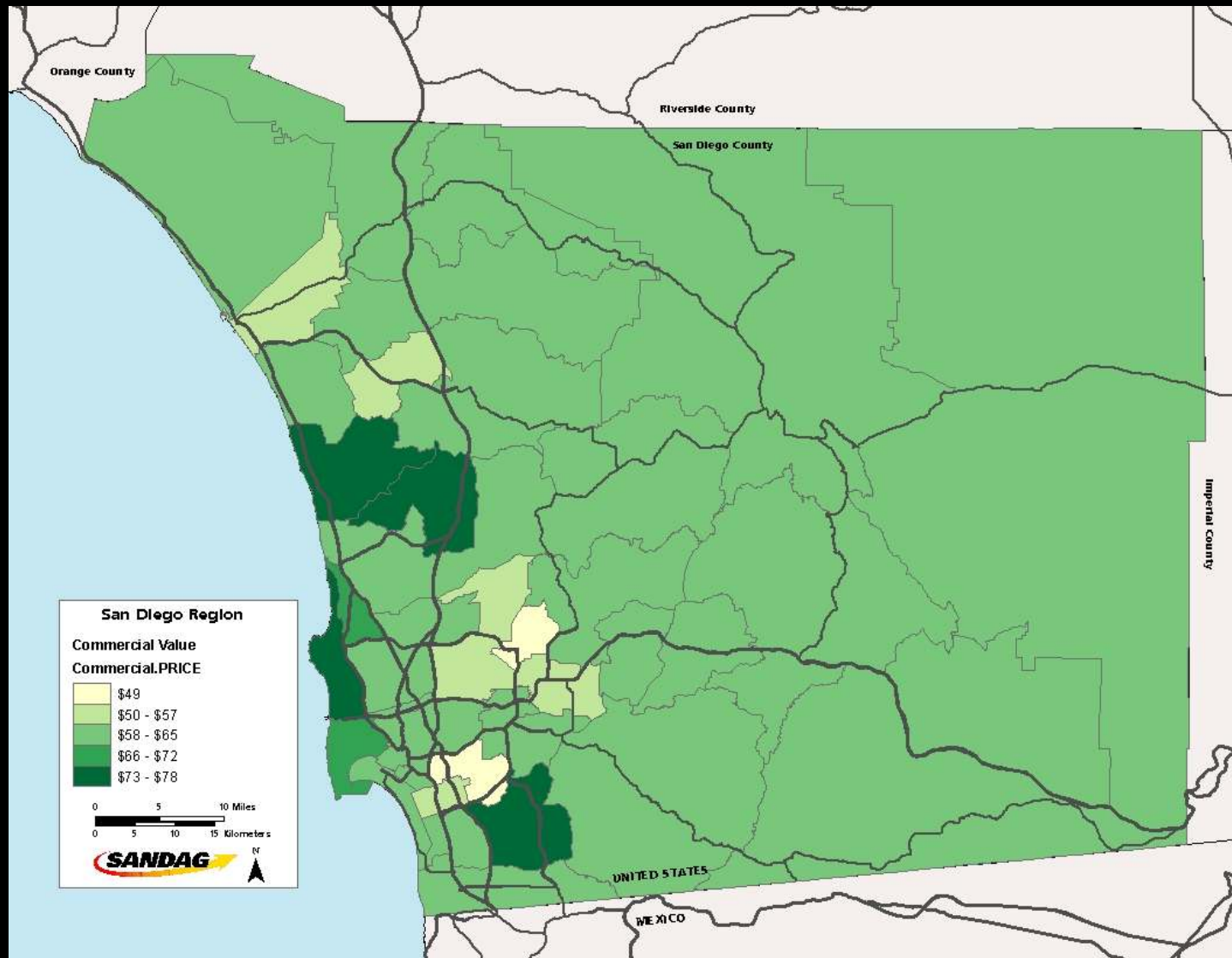
Variables in Hedonic Models

- Residential Model
 - Zonal constants
 - Local density
 - Proximity to beach
 - Proximity to freeway
 - Proximity school
 - Proximity to transit station
 - Proximity to freeway ramp
- Employment Model
 - Zonal constants
 - Office class type (type B or type C)
 - Age of structure
 - Parking
 - Proximity to beach
 - Proximity to freeway

Estimated Residential Price per Square Foot by Zone



Estimated Office Price per Square Foot by Zone



Construction Costs

- Building, renovation, maintenance, demolition
 - RS Means CostWorks, Whitestone Building Maintenance and Repair Reference
- Permit and other building fees
 - Used SD Building Industry Assn annual fee survey

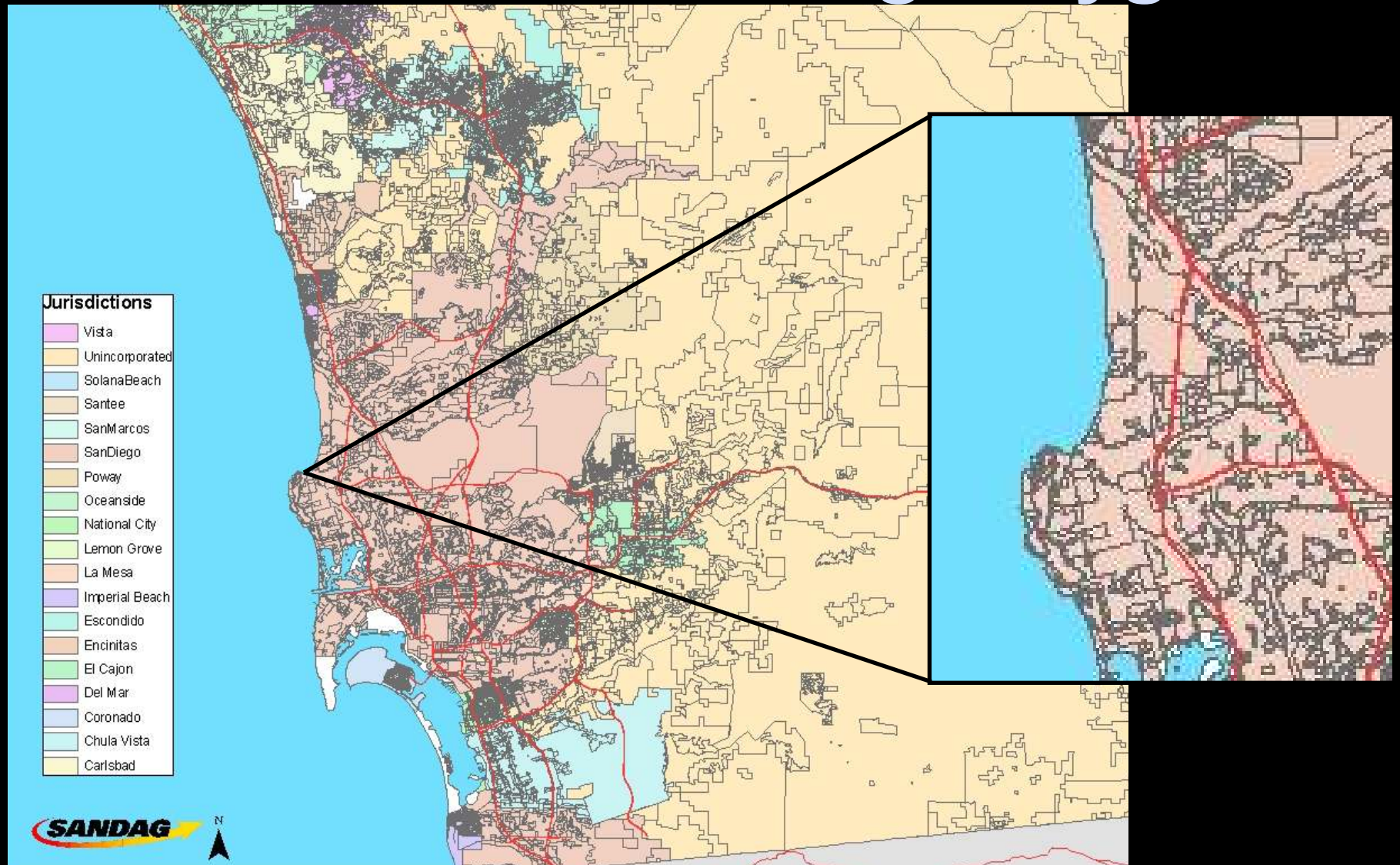
Zoning

- Zoning defines allowable development types and ranges of intensity
- SD uses zoning to set range of development/redevelopment possibilities
- Zoning collected from each jurisdiction
 - Includes both zoning permissions and GIS zoning polygons

Challenges of Zoning

- Standardizing data from multiple agencies
- Consolidating to reduce the number of similar zones
- Interpreting the difference between permitted and conditional
- Collecting and inferring ranges of permitted intensity (floor area ratios)

Thousands of Zoning Polygons



Zoning vs. General Plans

- San Diego is a general plan focused region
- Converting from square feet of residential space to housing units is important for local planning

2nd iteration

- Priorities for Second Iteration of San Diego PECAS Model:
 - Import/Export data
 - White/Blue Collar labor
 - Smaller geographic disaggregation
 - More activity and commodity categories
- Linkage between long-range Demographic Economic Forecast Model (DEFM)
- Should be able to answer some initial policy questions

Any Questions?