

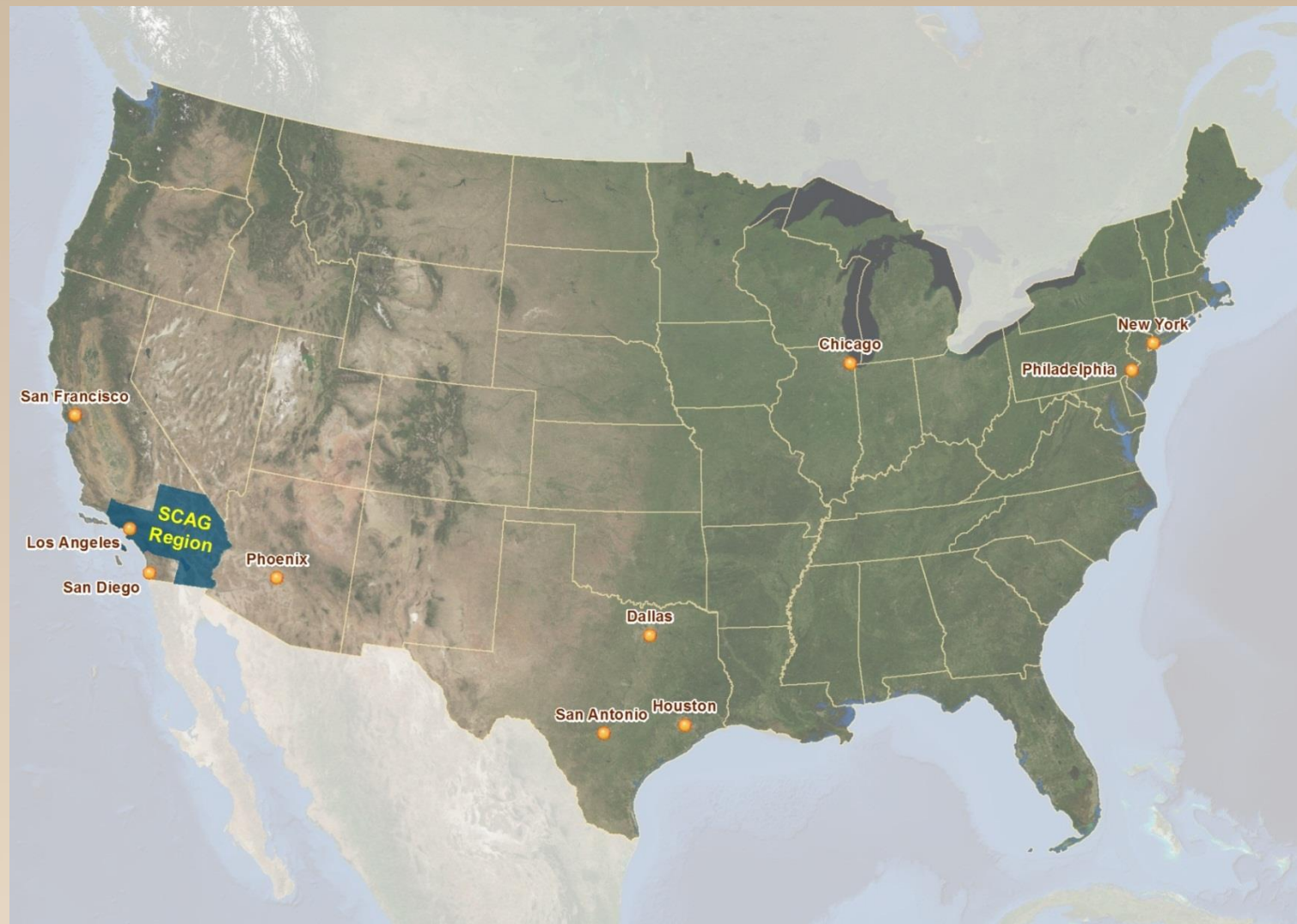
Geospatial Analysis of Job-Housing Mismatch Using ArcGIS and Python

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Research & Analysis
Southern California Association of Governments



Southern California Association of Governments (SCAG)



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Nation's largest Metropolitan Planning Organization (MPO)

6 counties and 191 cities

19 million people within 38,000+ square miles

GRP in 2015: \$1,053 Billion
(16th largest economy in the world)

Overview

- Background
- Objectives
- Methodology & Findings
- Conclusions

BACKGROUND

2016 RTP/SCS and Senate Bill 375

- 2016-2040 Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS)
 - A long-range transportation plan
- SB375 – California’s Climate Protection Act
 - Integration of transportation, land use, housing and environmental planning to meet the regional GHG emission reduction targets

2016 RTP/SCS and Environmental Justice

- Integration of the principles of Title VI into RTPs to address EJ
- EJ analysis to assess the impacts of RTP programs and projects on minority and low-income populations
- Performance Measures to analyze social and environmental equity

Jobs-Housing Imbalance/Mismatch and Social Equity

- A key contributor to traffic congestion
- An impediment to Environmental Justice and social equity
 - EJ populations tend to be more sensitive to job accessibility due to the cost of housing and long distance commuting
 - Workers without a car or people with less income who cannot afford a vehicle have to either live close to their jobs where they can have access to transit or within walkable/bikable distance.

OBJECTIVES

Objectives

- To better understand the spatial and temporal dynamics of job-housing imbalance/mismatch
 - In a geographically detailed way
- To understand whether there are significant differences in commute distance
 - between different income levels
 - between coastal and inland counties
 - between temporal periods

**METHODOLOGY
&
FINDINGS**

LEHD Origin-Destination Employment Statistics (LODES)

- Produced by the Longitudinal Employer-Household Dynamics (LEHD) program
- From administrative records and survey data
 - Local Employment Dynamics (LED) Partnership
- Annually published from 2002 (2002-2014)
- Enumerated with 2010 census block
- Data files: OD, RAC, WAC
 - Age, Earning, Industry Sector
 - 2009-2014: Race, ethnicity, education, sex
 - 2011-2014: Firm age, firm size (WAC)

Census Transportation Planning Products (CTPP)

- Based on American Community Survey (ACS)
- Detailed tabulation of ACS commuting data
 - Residence-based, workplace-based and home-to-work flow tables
 - Worker characteristics, commuting table, means of transportation, demographic, social, economic and housing characteristics, etc.
- Geographies from census tract to the nation
- Latest version based on 2006–2010 ACS

LODES vs. CTPP

- LODES and CTPP datasets are complementary given each dataset's unique characteristics.
 - Differences in collection, coverage, geographic and longitudinal scope, definitions, characteristics, etc.
- LODES enable users to conduct geographically detailed analysis—work locations and the distribution of home-to-work flows than CTPP.
- CTPP's work-to-home flow table provides more trip characteristics than LODES dataset.

Median Commute Distance Using LODES

- Median commuting distance by wage group at census tract level, 2002-2012
 - Euclidean distance between origin and destination blocks (centroids)
 - Commute distance was weighted by block-level commuter number.
 - Weighted block-level commute distance was compiled to estimate the median commute distance at tract level

Median Commute Distance by Wage Group

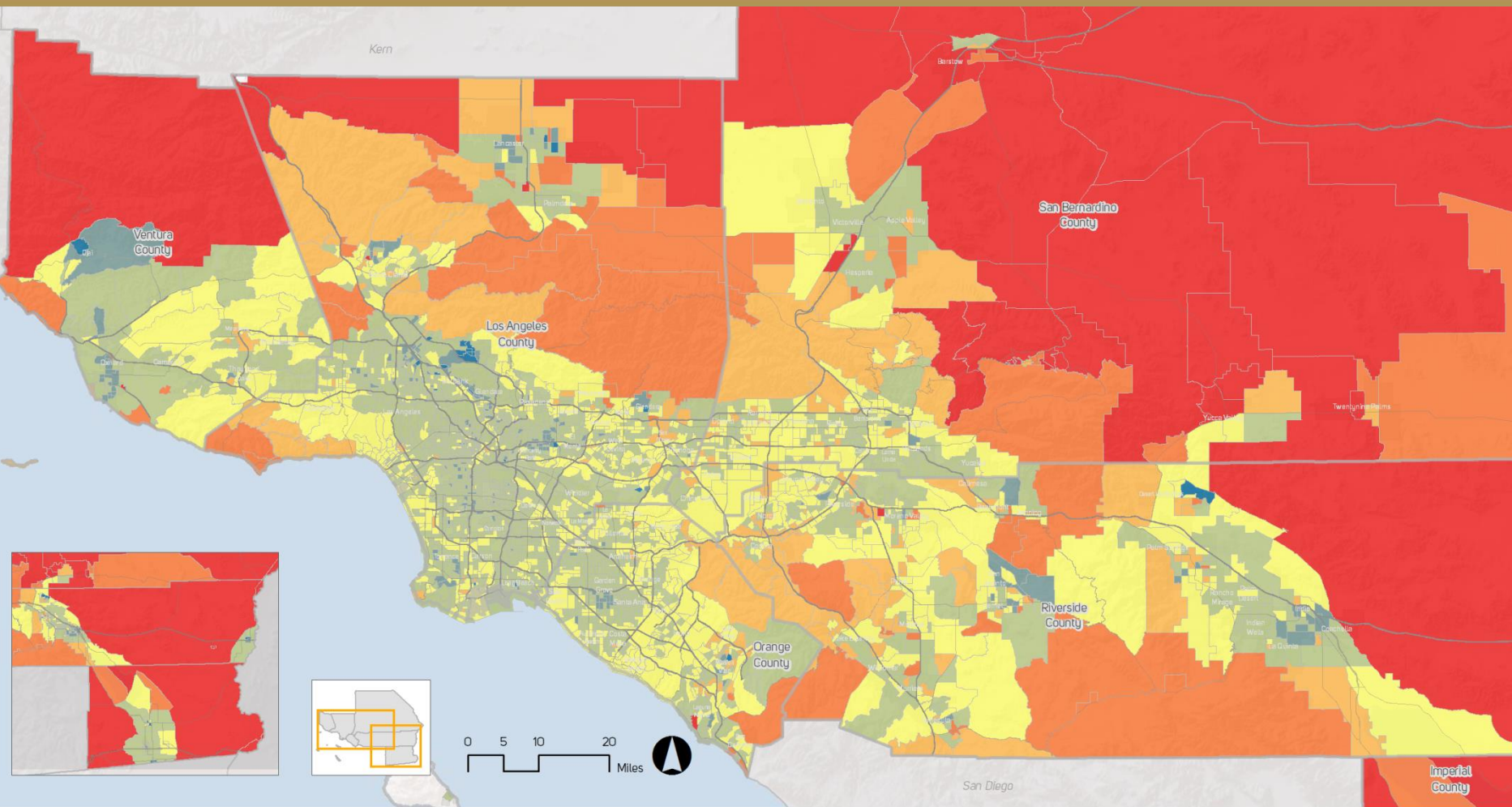
- Weighted Median Commute Distance (mi.),
by Wage Group, 2002-2012

Origin	Destination	2002			2008			2012		
		All	Low Wage	High Wage	All	Low Wage	High Wage	All	Low Wage	High Wage
SCAG	SCAG	9.4	8.6	11.0	9.8	8.9	11.0	10.1	9.0	11.3
Imperial	SCAG	7.5	8.1	5.6	7.6	5.5	8.2	8.5	6.3	9.6
Los Angeles	SCAG	8.8	8.2	10.2	9.0	8.1	10.0	9.1	8.1	10.1
Orange	SCAG	9.0	8.0	10.6	9.3	8.6	10.3	9.8	8.9	10.8
Riverside	SCAG	13.4	11.8	17.6	15.8	14.2	18.5	16.6	14.8	19.3
San Bernardino	SCAG	13.3	12.1	16.0	15.7	14.8	17.4	16.2	14.7	18.2
Ventura	SCAG	9.4	8.6	11.5	10.5	11.2	11.4	11.2	11.7	12.0

(Note: 'Low Wage' = Jobs with earnings \$1250/month or less; 'High Wage' = Jobs with earnings greater than \$3333/month)

Source: U.S. Census Bureau. 2015. LODS Data.

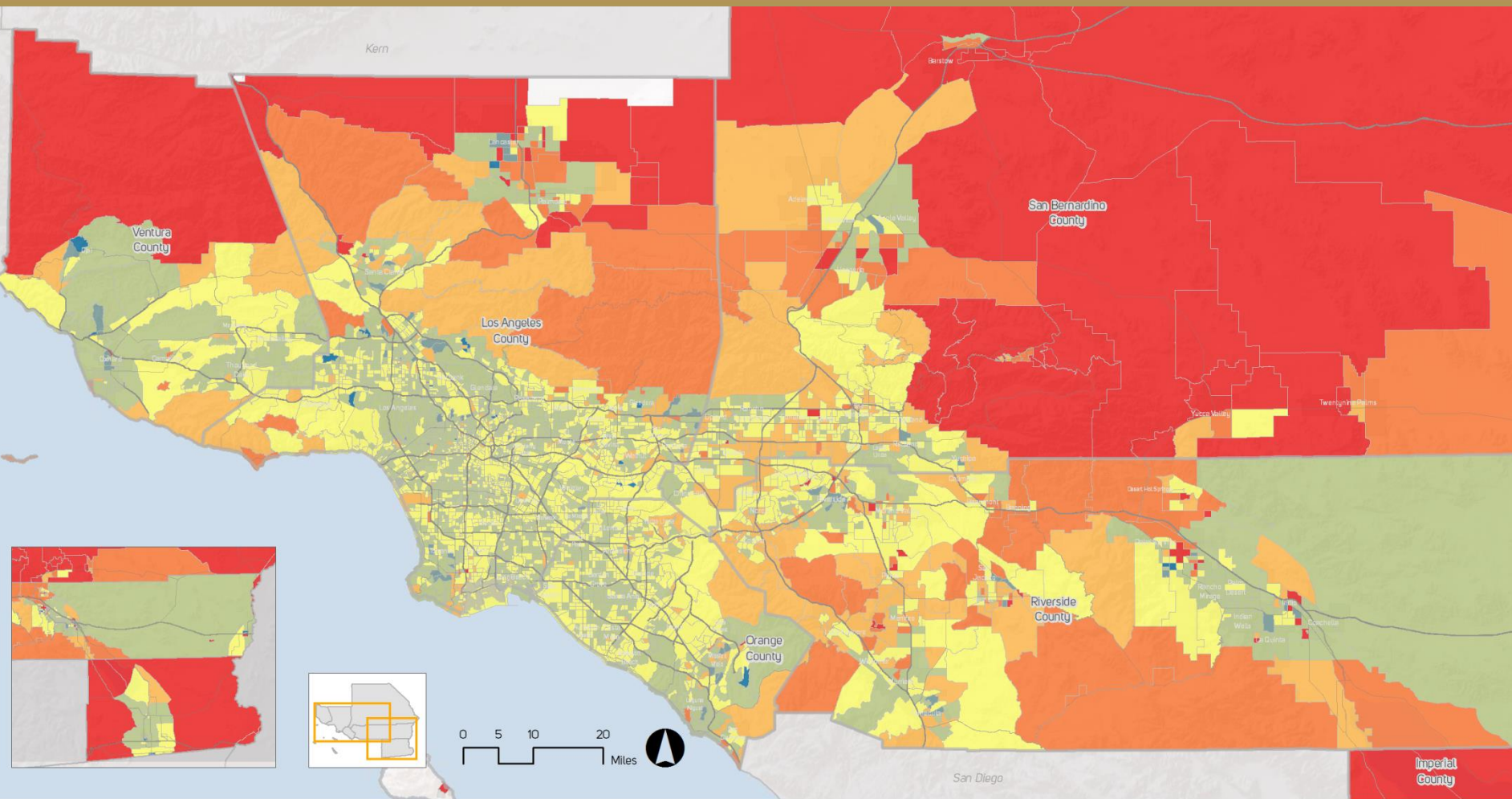
Median Commute Distance, 2012 (All Jobs)



Median Commute Distance of All Jobs in 2012

- 3 Miles and Under
- 3 to 5
- 5 to 10
- 10 to 15
- 15 to 20
- 20 to 30
- Longer than 30 Miles

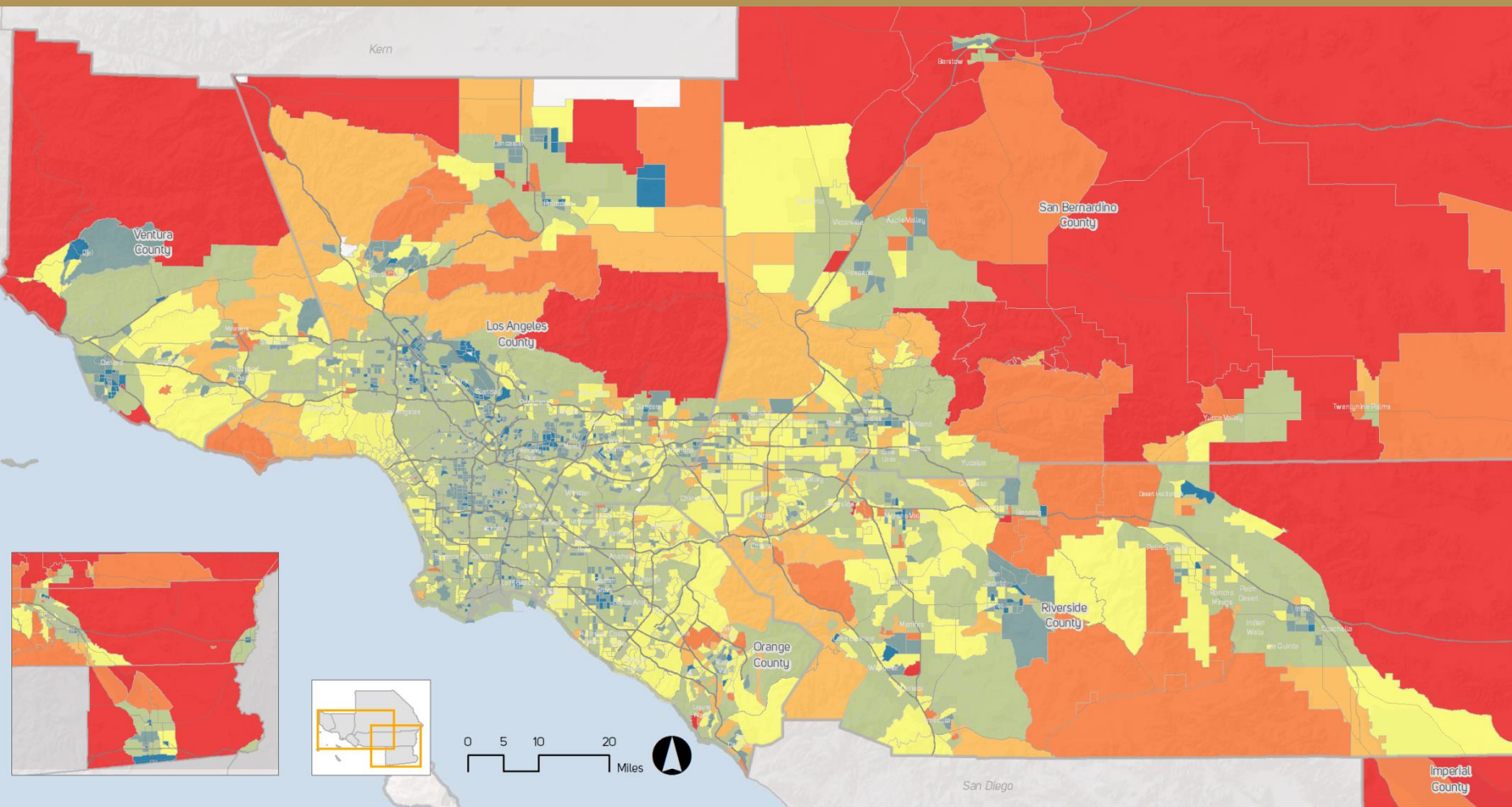
Median Commute Distance, 2012 (High Wage Jobs)



Median Commute Distance of High Wage Jobs in 2012

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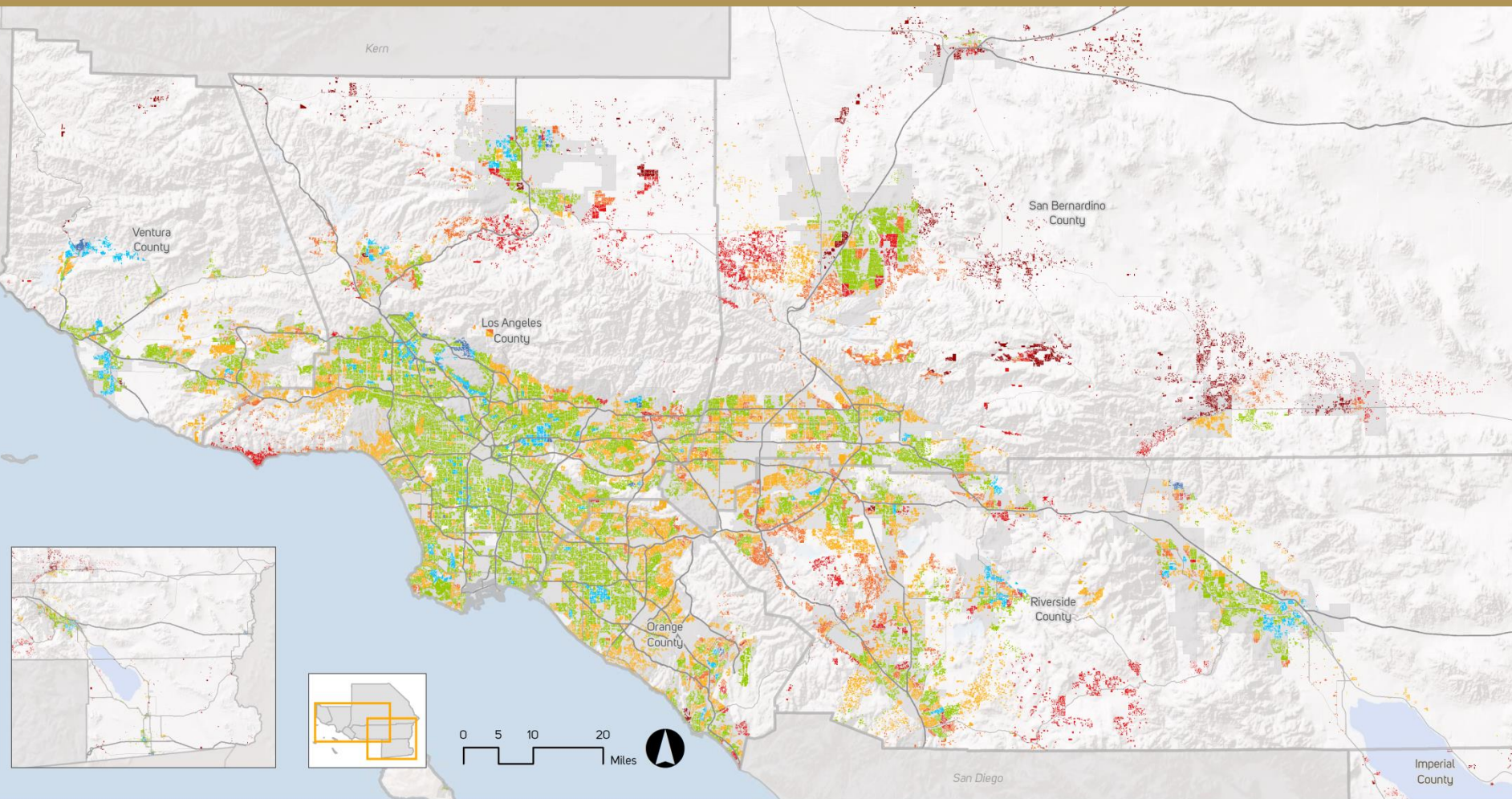
Median Commute Distance, 2012 (Low Wage Jobs)



Median Commute Distance of Low Wage Jobs in 2012

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- Longer than 30 Miles

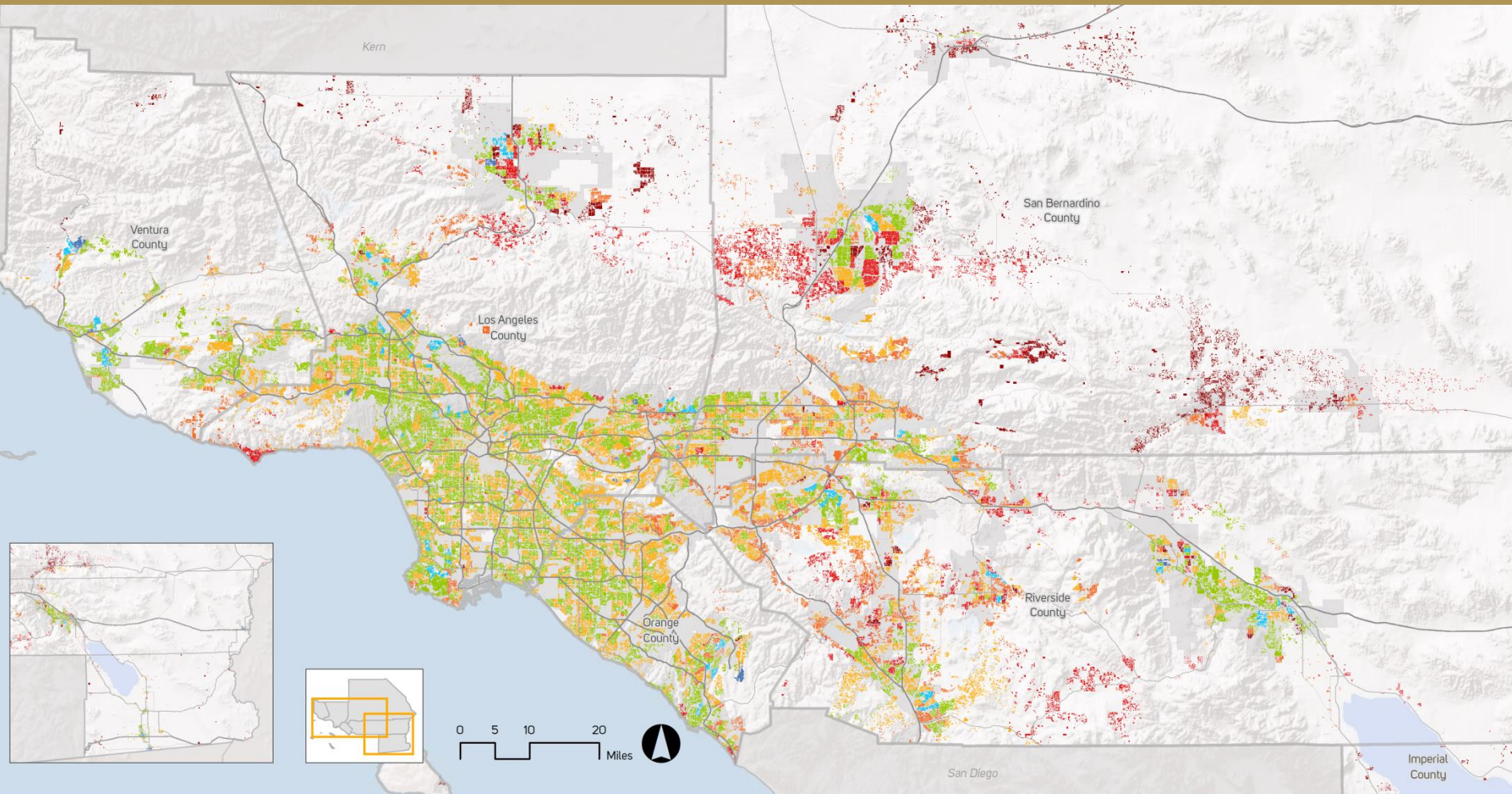
Median Commute Distance, 2012 (All Jobs, Residential Parcels)



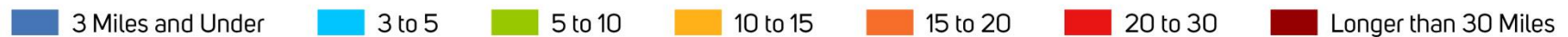
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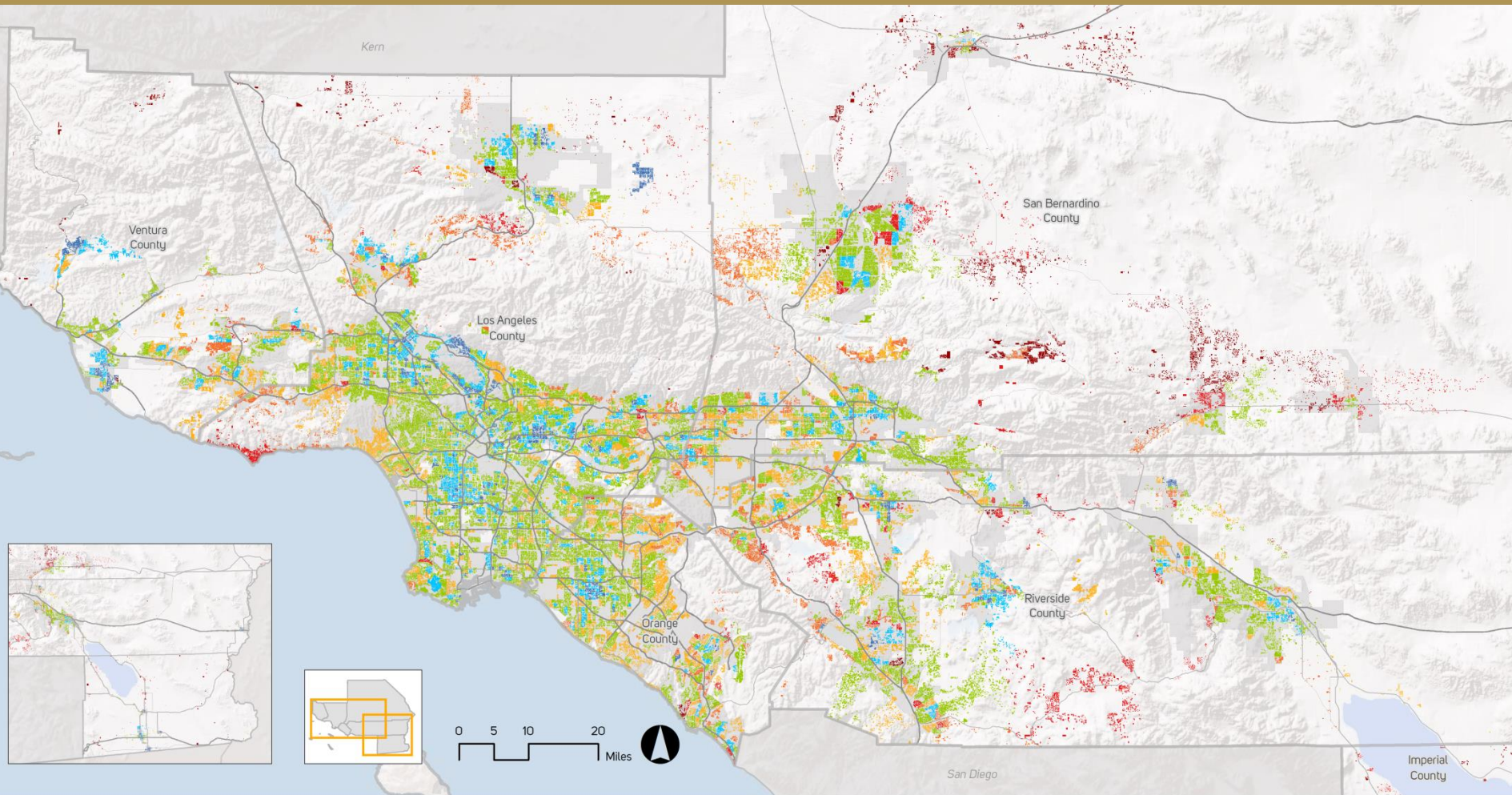
Median Commute Distance, 2012 (High Wage Jobs , Residential Parcels)



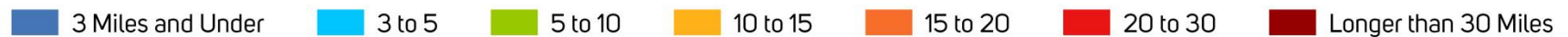
Median Commute Distance of High Wage Jobs in 2012



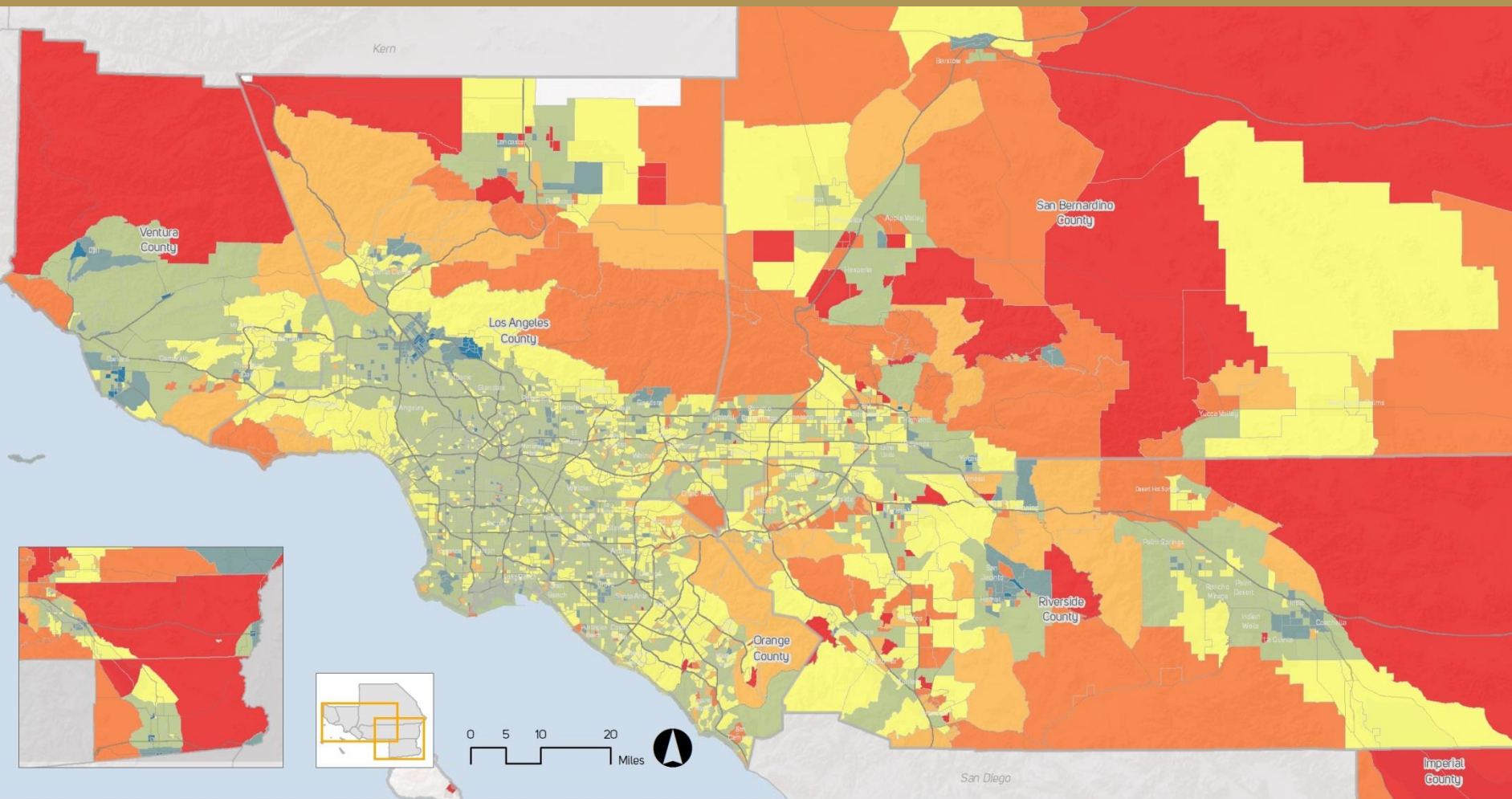
Median Commute Distance, 2012 (Low Wage Jobs , Residential Parcels)



Median Commute Distance of Low Wage Jobs in 2012



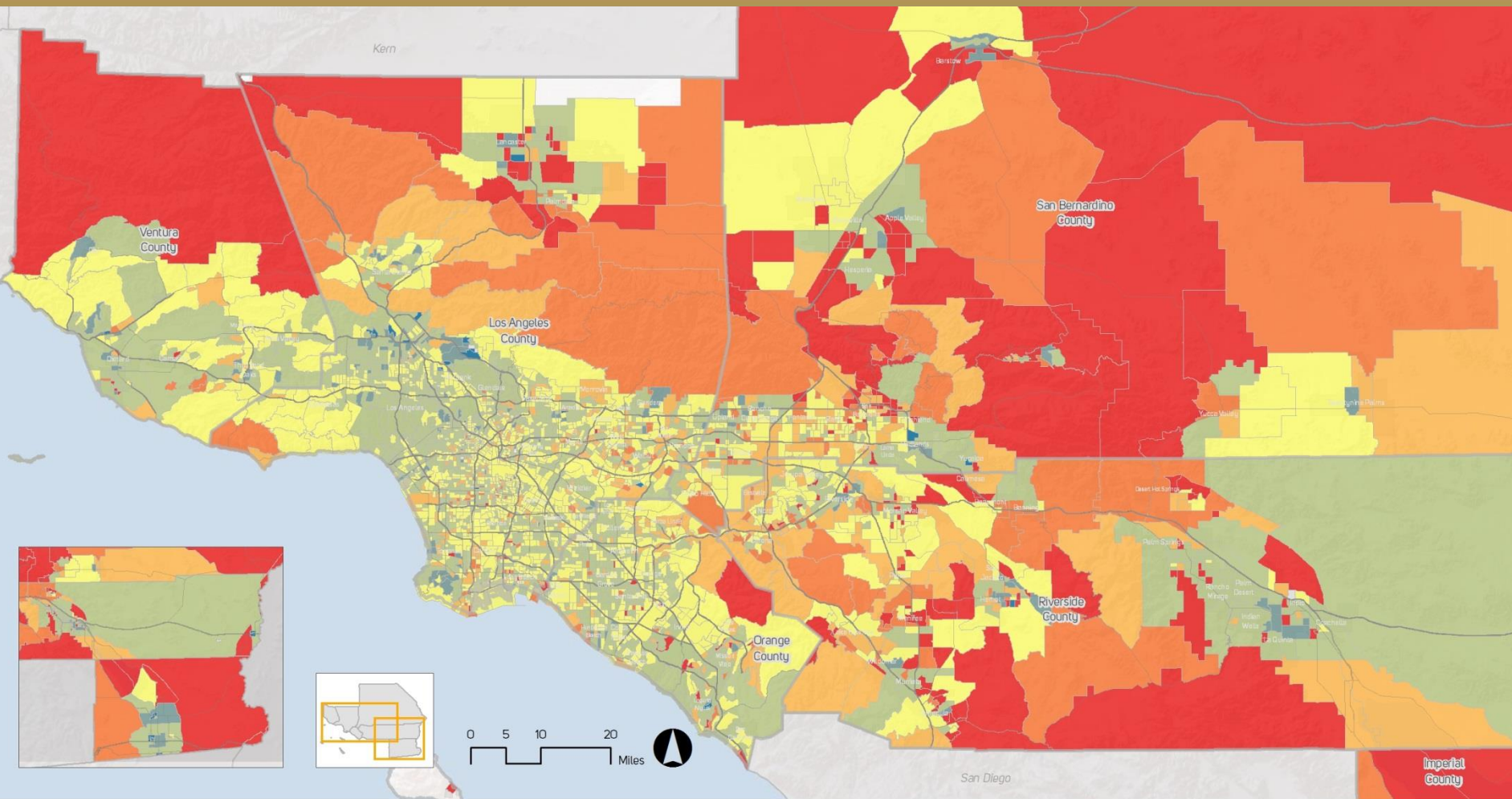
Median Commute Distance, 2002 (All Jobs)



Median Commute Distance of All Jobs in 2002

- 3 Miles and Under
- 3 to 5
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- Longer than 30 Miles

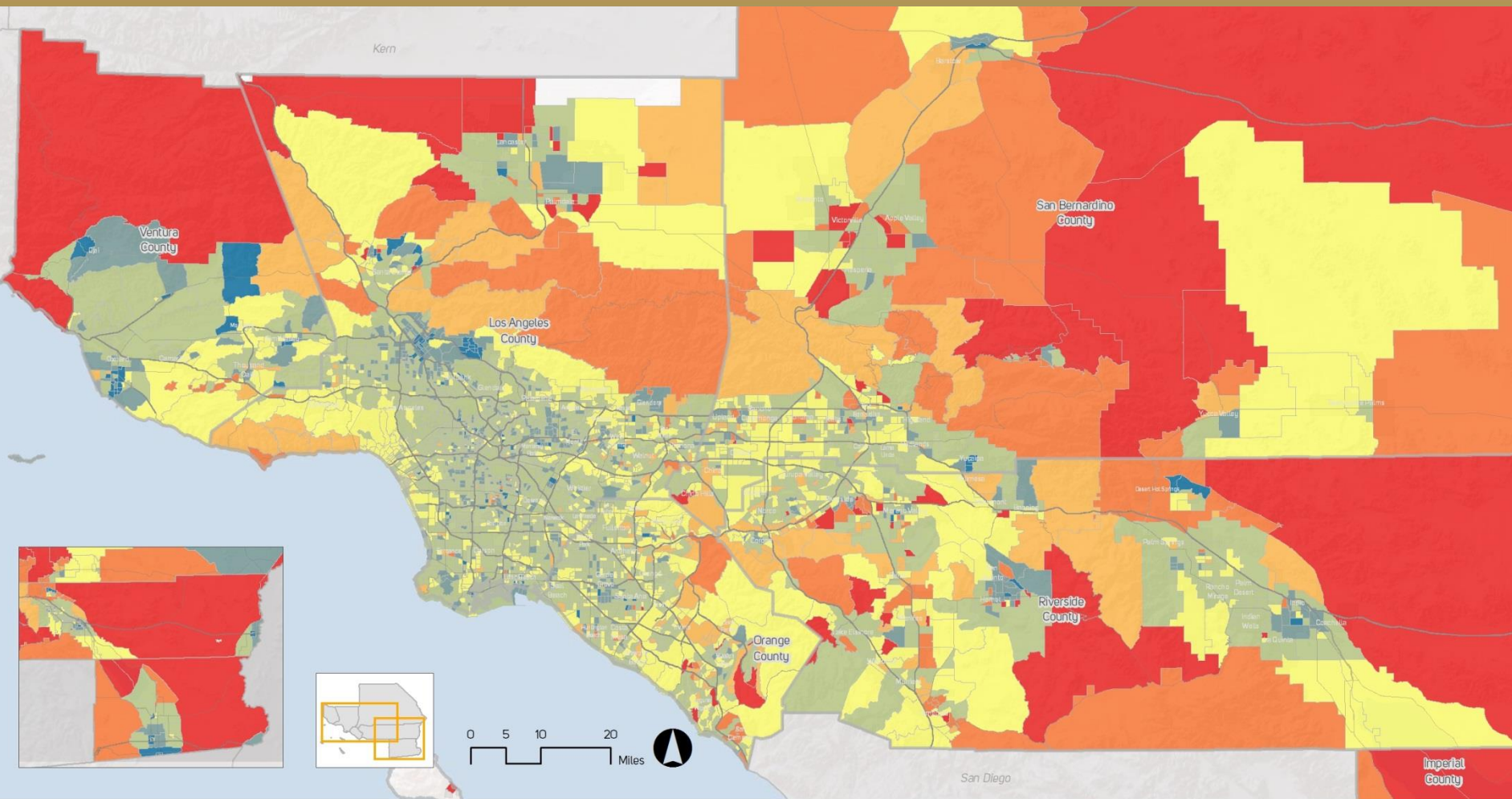
Median Commute Distance, 2002 (High Wage Jobs)



Median Commute Distance of High Wage Jobs in 2002

- 3 Miles and Under
- 3 to 5
- 5 to 10
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- Longer than 30 Miles

Median Commute Distance, 2002 (Low Wage Jobs)



Median Commute Distance of Low Wage Jobs in 2002

- 3 Miles and Under
- 3 to 5
- 5 to 10
- 10 to 15
- 15 to 20
- 20 to 30
- Longer than 30 Miles

Job-to-Worker Ratio (Typical Commute Distance)

- Estimating total jobs and workers using county-level median commute distance

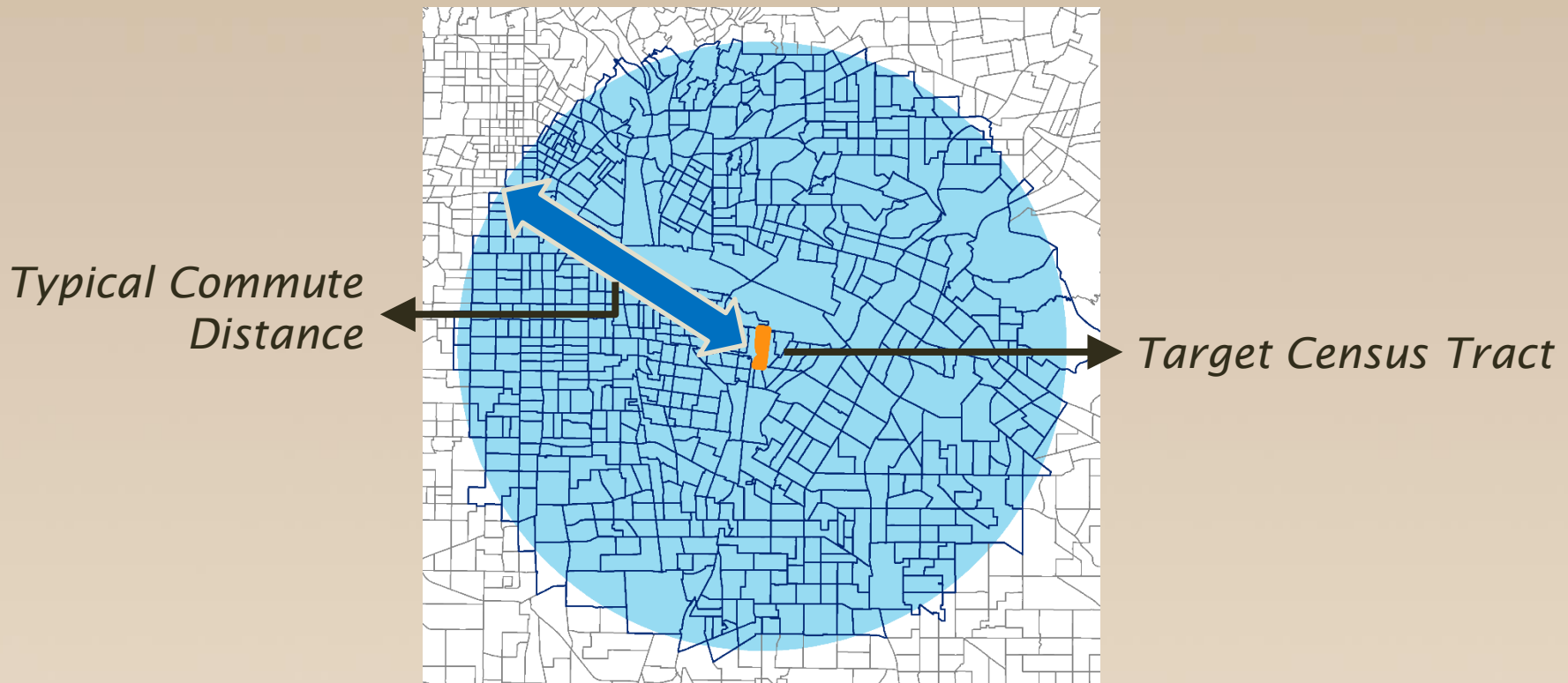
Origin	Destination	2012		
		All Jobs	Low Wage	High Wage
SCAG	SCAG	10.1	9.0	11.3
Imperial	SCAG	8.5	6.3	9.6
Los Angeles	SCAG	9.1	8.1	10.1
Orange	SCAG	9.8	8.9	10.8
Riverside	SCAG	16.6	14.8	19.3
San Bernardino	SCAG	16.2	14.7	18.2
Ventura	SCAG	11.2	11.7	12.0

(Note: 'Low Wage' = Jobs with earnings \$1250/month or less; 'High Wage' = Jobs with earnings greater than \$3333/month)

Source: U.S. Census Bureau. 2015. LODES Data.

Job-to-Worker Ratio (Jobs and Workers Estimates)

- Estimated total jobs and workers for each tract within typical commute distance



Job-to-Worker Ratio (Jobs and Workers Estimates)

- Estimated total jobs and workers for each tract within typical commute distance
- Python scripting to create buffers and to calculate statistics for 3,956 census tracts

```
# Execute Buffer to get a buffer of target tract
arcpy.Buffer_analysis("lyr", outBuffer, bufferDistance, dissolve_option = "NONE")

# Execute Clip using the buffer output to get a clipped feature class
arcpy.Clip_analysis(inCentroids, outBuffer, outClip)

# Execute Statistics to get the total workers and jobs within the clipped buffer.
arcpy.Statistics_analysis(outClip, outStatsTable, statsFields)
```

Job-to-Worker Ratio

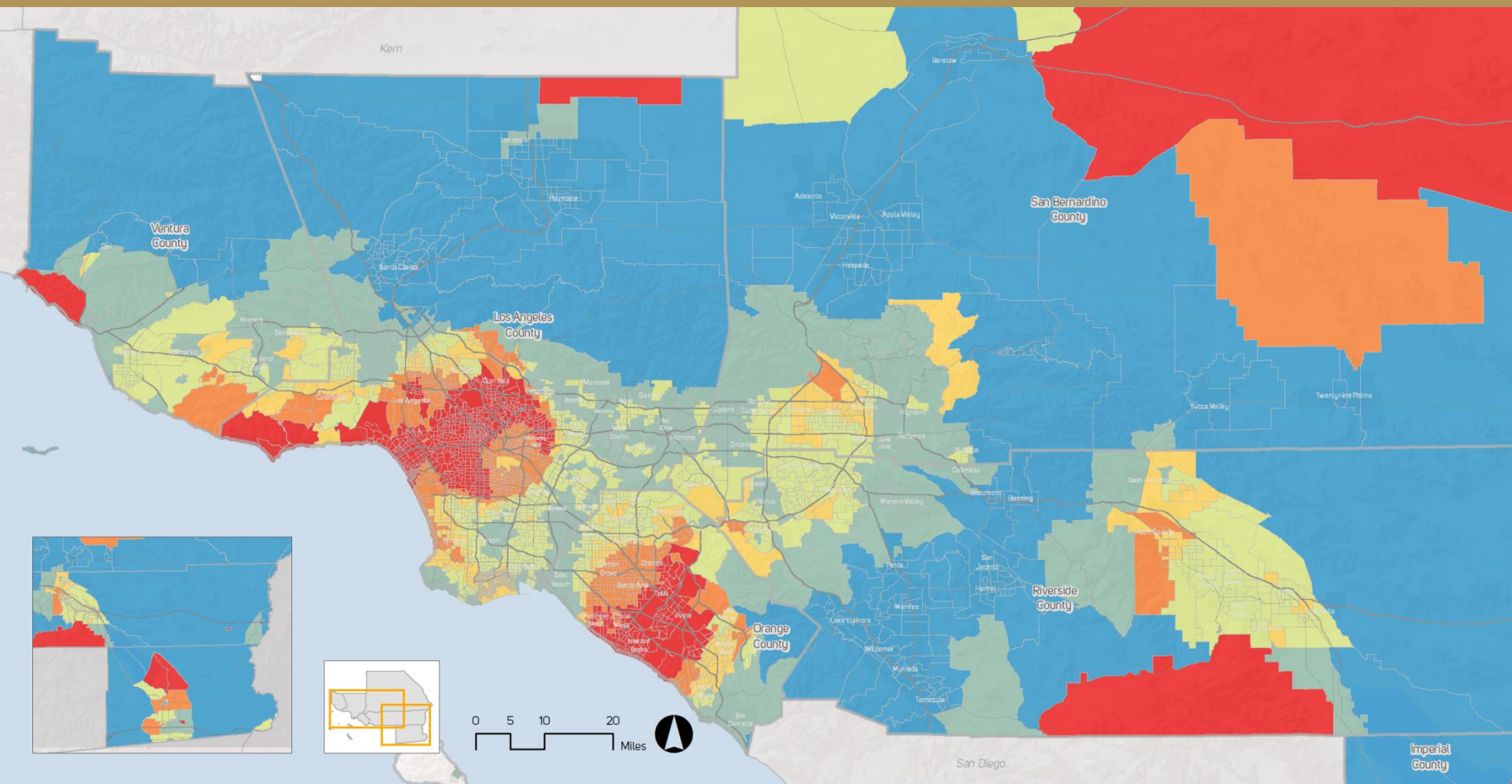
- Job-to-Worker Ratio by Wage Group, 2012
 - Higher ratio means more jobs.
 - Lower ratio means more workers.

County	All Jobs	Low Wage	High Wage
Imperial	0.94	0.93	1.01
Los Angeles	1.17	1.09	1.23
Orange	1.13	1.16	1.11
Riverside	0.86	0.88	0.88
San Bernardino	0.91	0.93	0.92
Ventura	0.91	0.97	0.86

(Note: 'Low Wage' = Jobs with earnings \$1250/month or less; 'High Wage' = Jobs with earnings greater than \$3333/month)

Source: U.S. Census Bureau. 2015. LODES Data.

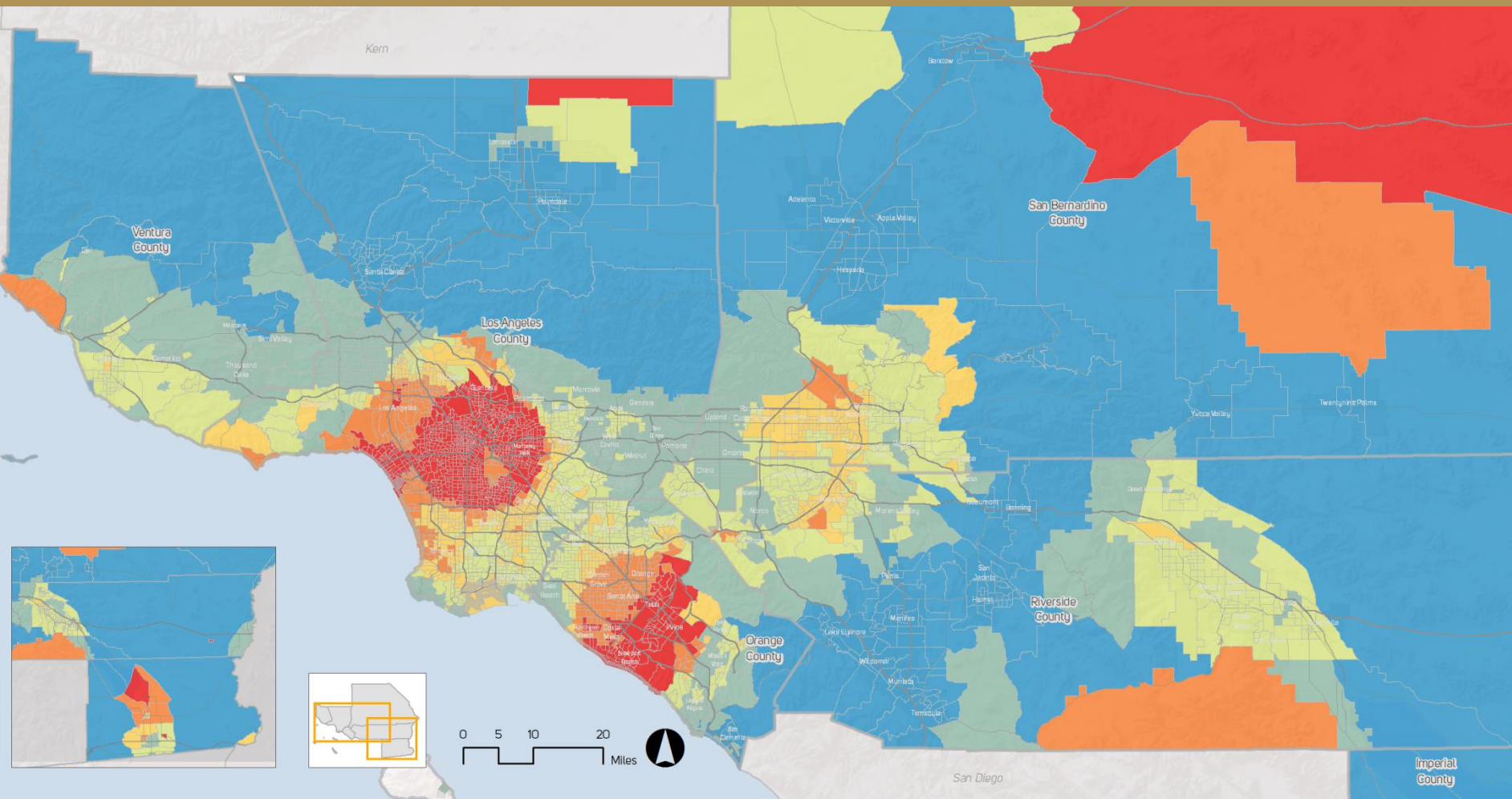
Job-to-Worker Ratio, 2012 (All Jobs to All Workers)



Ratio of All Jobs to All Workers in 2012

Less than 0.7 (More Workers) 0.7 to 0.9 0.9 to 1 1 to 1.1 1.1 to 1.3 More than 1.3 (More Jobs)

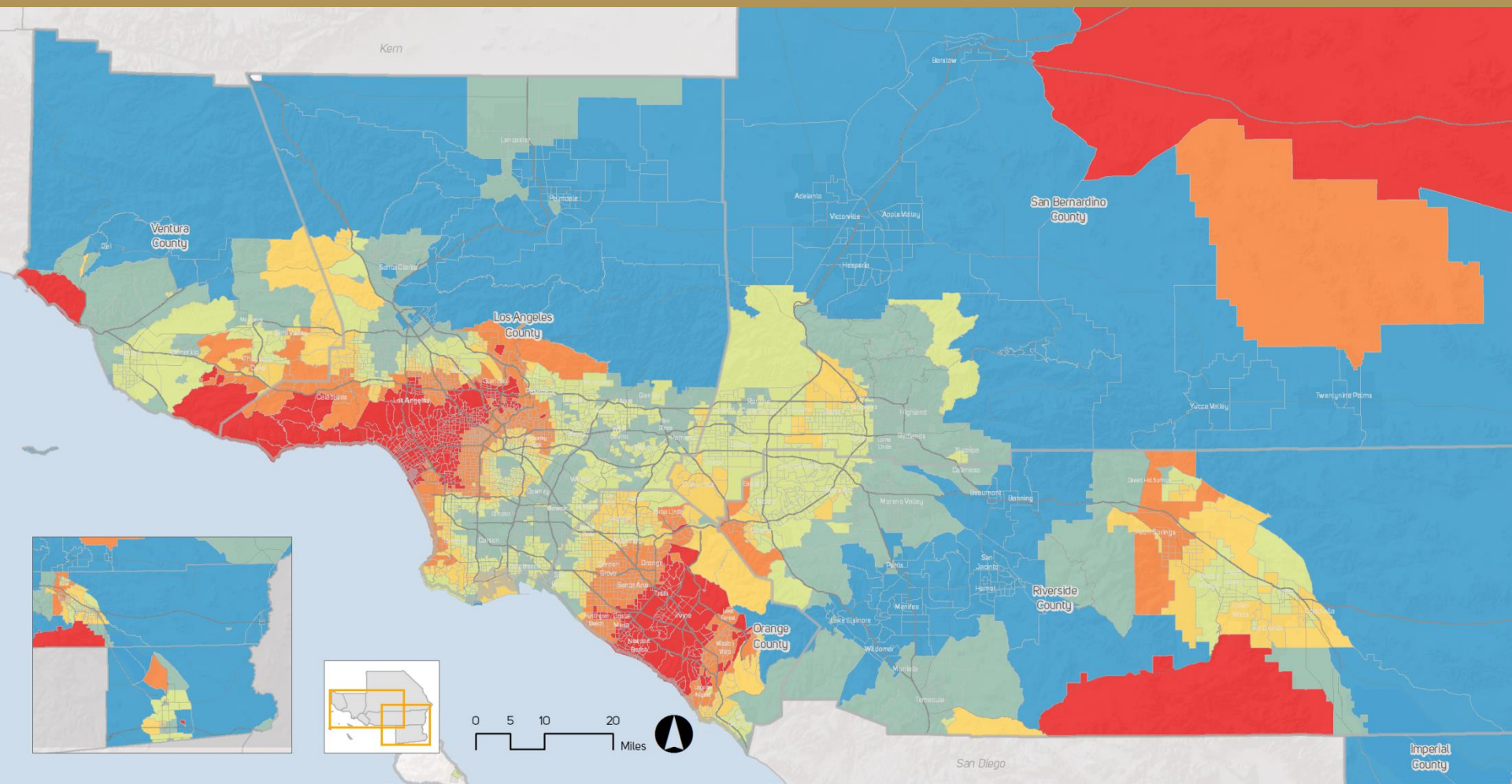
Job-to-Worker Ratio, 2012 (High Wage Jobs/High Wage Workers)



Ratio of High Wage Jobs to High Wage Workers in 2012

Less than 0.7 (More Workers) 0.7 to 0.9 0.9 to 1 1 to 1.1 1.1 to 1.3 More than 1.3 (More Jobs)

Job-to-Worker Ratio, 2012 (Low Wage Job/Low Wage Worker)



Ratio of Low Wage Jobs to Low Wage Workers in 2012

Less than 0.7 (More Workers) 0.7 to 0.9 0.9 to 1 1 to 1.1 1.1 to 1.3 More than 1.3 (More Jobs)

CONCLUSIONS

Conclusions

- The commute distance is growing in the SCAG region between 2002 and 2012.
- Higher wage workers tend to commute longer distance than lower wage workers.
- The commute distance of workers in inland counties grew more rapidly than in coastal counties, especially in low wage workers.
- Inland counties show a lower job-to-worker ratio than coastal counties.

Conclusions (cont.)

- Counties with lower job-to-worker ratio generate more long distance commuters.
 - Indicating the need for more job growth in inland counties, while coastal counties need more housing growth
- The growing commute distance can influence a range of economic, social, transportation and environmental outcomes
 - Particularly to low-income workers

Job-Housing Balance Improvement (2016 RTP/SCS)

- The SCAG region is projected to experience faster employment growth in inland counties through 2040.
- Improvements in job-housing balance may result in the reduction of transportation congestion and related air quality issues.
- The spatial mismatch of low-income workers and jobs also may be less in the future than was observed from the recent data.

Thank you!

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