# Navigating San Bernardino County: Deciphering Vehicle Traffic Patterns for Commuters

Presented by:
Sai Kalyan Ayyagari

Background

- Largest county in the U.S. by area, covering 20,105 sq. mi. and 23 cities.

- Population over 2.1 million, making it the fifth most populous in California.

- Diverse economy: manufacturing, logistics, healthcare, tourism.

- County seat: San Bernardino, a hub for commerce and government.

- Major transportation routes: Interstates 10 and 15, State Route 210.

- Key role in transportation and logistics due to its location.

- Understanding VMT crucial for transportation planning and sustainability.
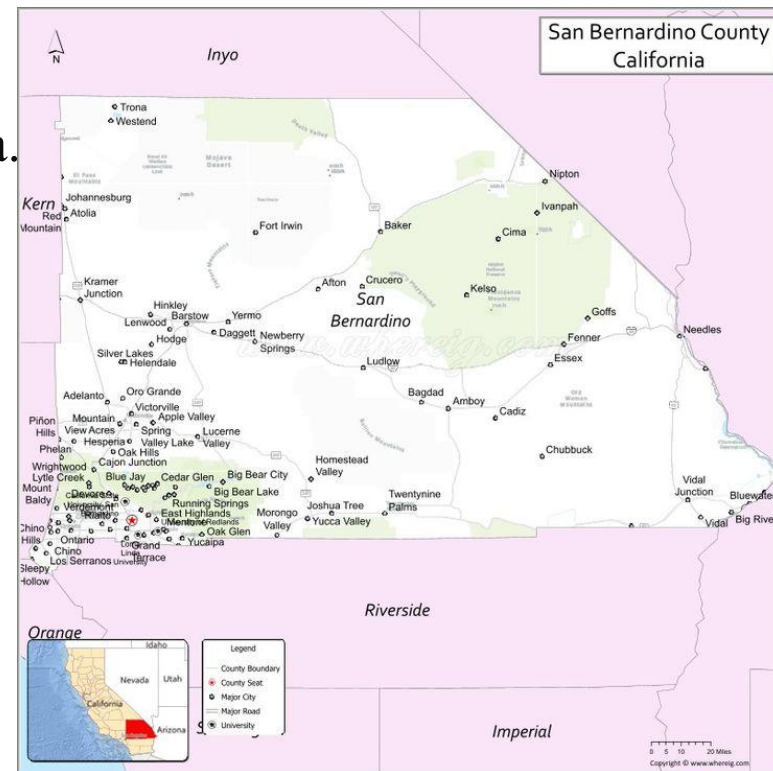
Motivation

- Growing urbanization and population drive demand for better transportation solutions.

- Concerns over congestion, pollution, and environmental impact underscore the need for VMT research.

- Potential for more efficient and sustainable transportation policies.

- Economic benefits: improved infrastructure attracts businesses and boosts productivity.

- Addressing VMT supports environmental goals and cleaner air.

- Enhancing public safety through targeted interventions.

- Meeting evolving transportation needs for residents and businesses.

- Promoting sustainable modes of transportation for community well-being.

Research Objective

- Analyze VMT trends and patterns in San Bernardino County.

- Identify factors influencing VMT, such as population density and infrastructure.

- Assess impacts on congestion, air quality, and transportation efficiency.

- Explore correlations with socioeconomic factors.

- Evaluate effectiveness of current policies.

- Propose recommendations for sustainable transportation planning.

- Contribute to VMT research knowledge.

- Inform decision-makers on improving transportation and quality of life.

Literature Study

- **VMT Research Significance:** Examines the critical role of VMT in sustainable transportation planning, focusing on congestion, air quality, and the interplay between infrastructure and socioeconomic factors.

- **Urbanization Challenges:** Discusses the impact of increasing urbanization and population on transportation systems, highlighting the need for efficient solutions in densely populated areas like San Bernardino County.

- **Economic and Environmental Benefits:** Reviews how improved transportation infrastructure contributes to economic growth and environmental sustainability, underscoring the importance of addressing VMT for cleaner air and economic productivity.

- **Sustainable Transportation Policies:** Explores the necessity for policies that support sustainable transportation, ensuring community well-being and safety while meeting evolving transportation needs.

- **Transportation and Quality of Life:** Analyzes how strategic transportation planning can enhance quality of life by improving accessibility, reducing commute times, and promoting healthier urban environments.

Methodology

- **Data Source**: Utilized **Streetlight Data** providing a sample trip count of 90,522,000 trips in San Bernardino County for the year 2021.

- **Vehicle Types**: Analyzed all vehicle types (light, medium, heavy-duty) for comprehensive understanding.

- **Objective**: Aimed to understand travel patterns, traffic flow, and commuting behaviors to support transportation planning.

- **Spatial Analysis**: Used GIS techniques for visualization.
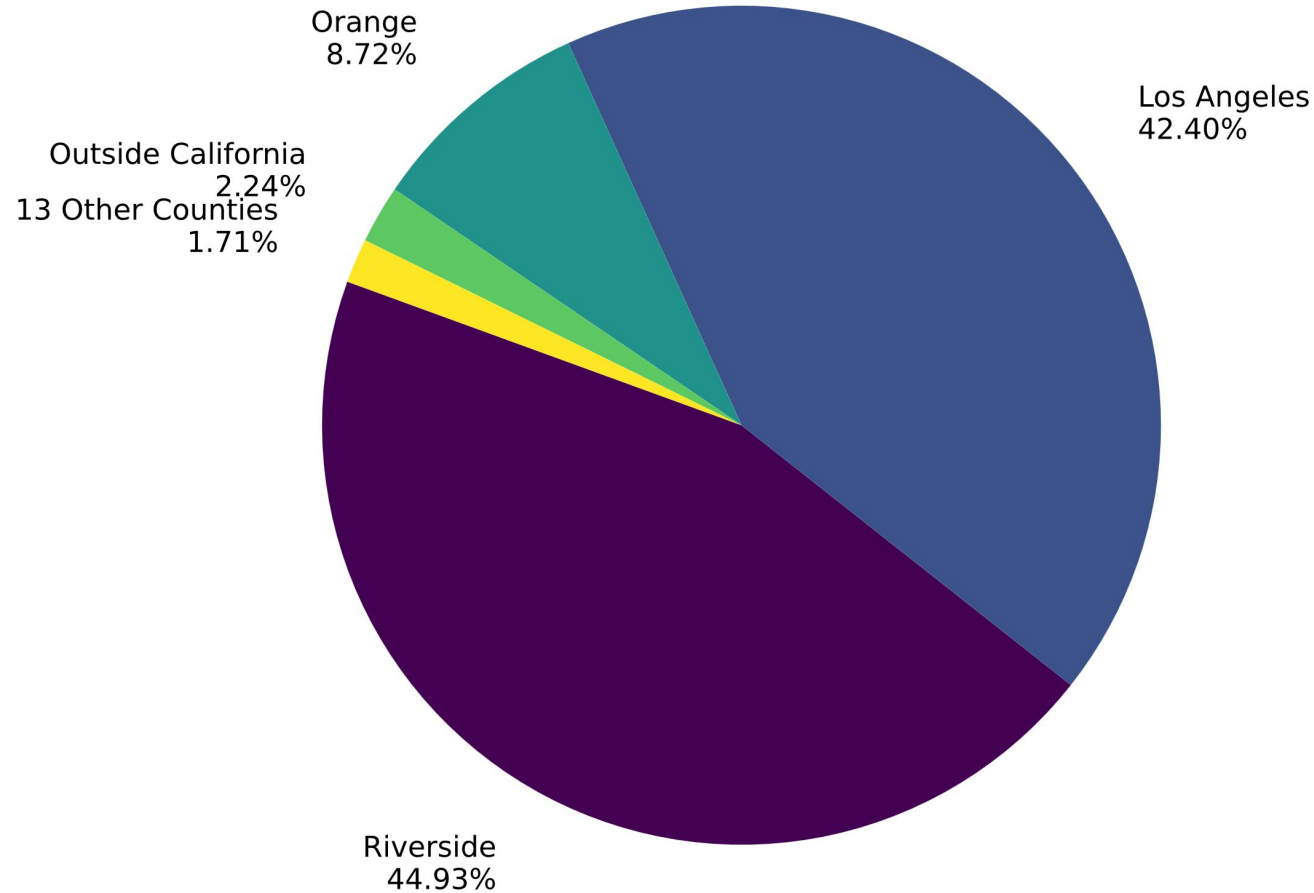
Results & Analysis

- **San Bernardino** as the leading city with a total of **1,636,867** trips.

- **Rancho Cucamonga's** close second with **1,489,581** trips.

- Significant activity in **Ontario and Fontana** recording **1,413,998** trips and **1,413,081** trips.

Total Vehicle Trip Counts in San Bernardino County - 2021
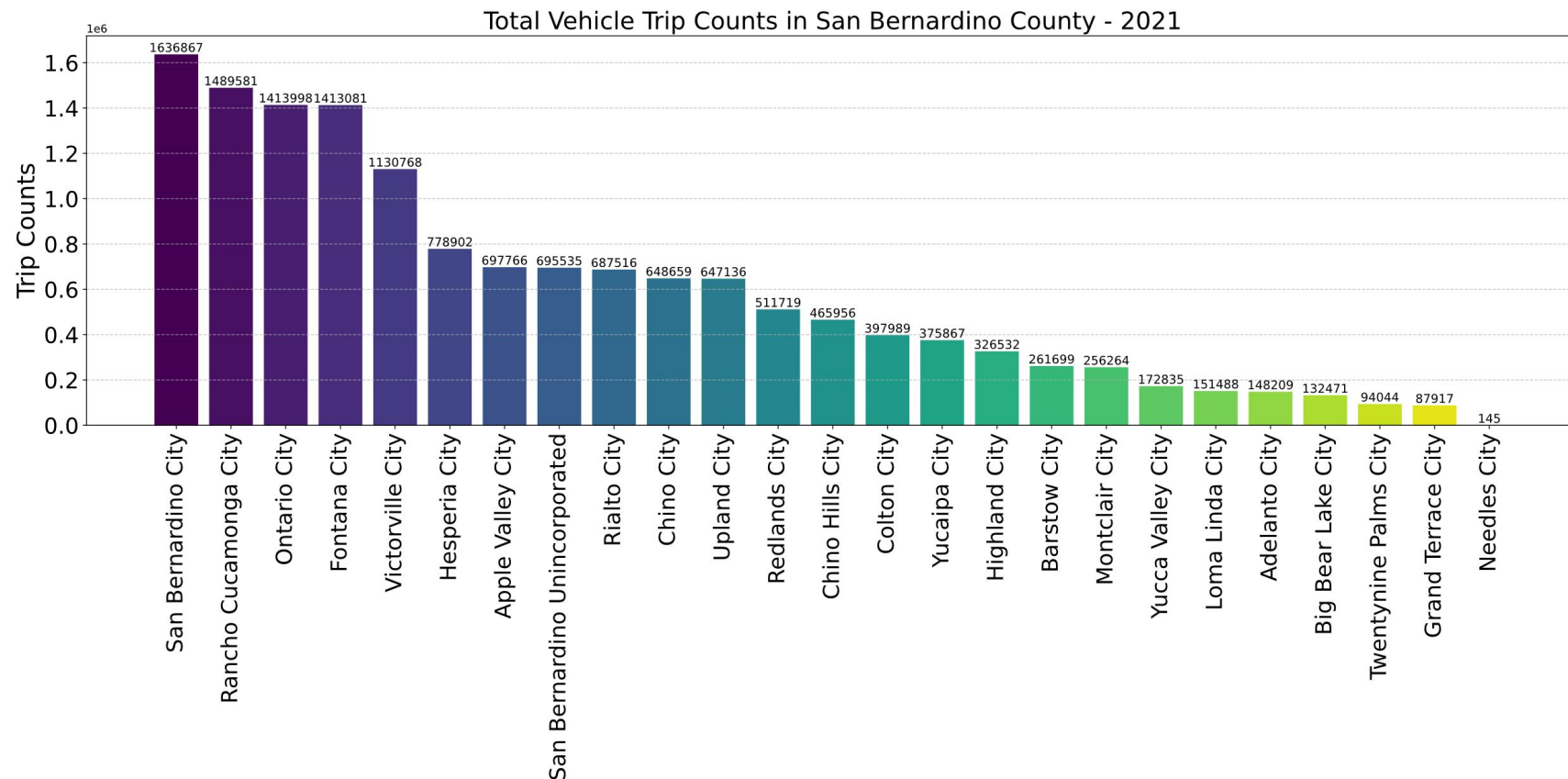
Results & Analysis

- **Riverside County**: Largest traffic composition, **48.25%**.

- **Los Angeles County**: Second largest, **45.68%**.

- **Orange County**: Contributes **9.41%** to traffic volume.

- **Beyond California**: Adds about **2.41%** to the mix.

- **Other California Counties**: Together account for **1.84%**.

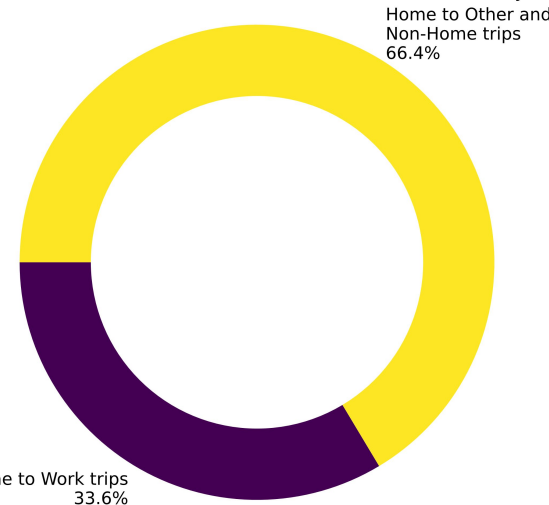Traffic Composition in San Bernardino County from/to Other Counties - 2021

Orange
8.72%

Los Angeles
42.40%

Outside California
2.24%
13 Other Counties
1.71%

Riverside
44.93%

Results & Analysis

- **Home to Work Trips**: **33.6%** of total commute.

- **Home to Other & Non-Home Trips**: **66.4%** of total commute.
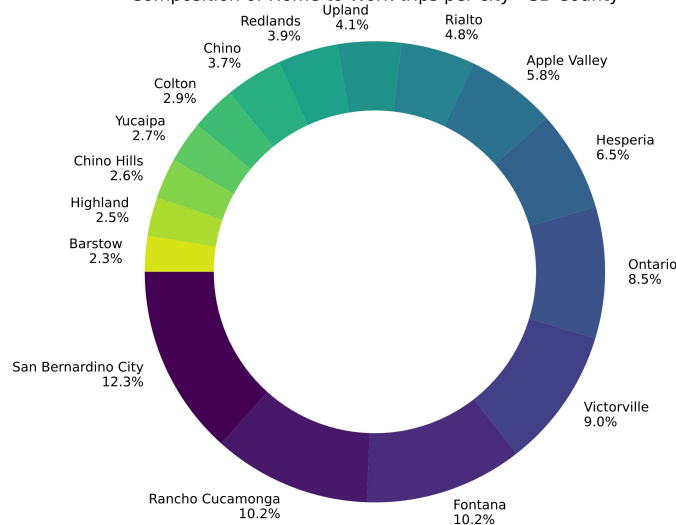
Commuter Percentages by City:

- **Highest for Work Trips**: San Bernardino City at **12.3%**.

- **Lowest for Work Trips**: Barstow at **2.3%**.

- **Highest for Other Trips**: San Bernardino City at **12.4%**.
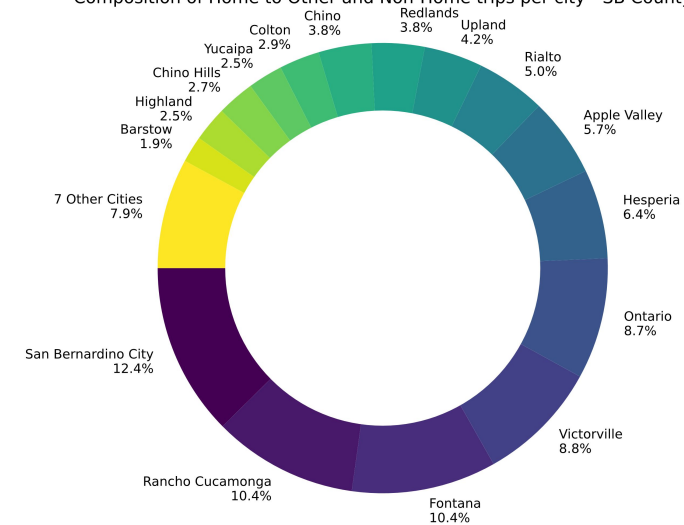
- **Lowest for Other Trips**: Barstow at **1.9%**.

Total Trip Distribution Work vs Non-Work in San Bernardino County - 2021

Home to Other and Non-Home trips 66.4%

Home to Work trips 33.6%

Composition of Home to Work trips per city - SB County

Upland 4.1%
Redlands 3.9%
Chino 3.7%
Colton 2.9%
Yucaipa 2.7%
Chino Hills 2.6%
Highland 2.5%
Barstow 2.3%
San Bernardino City 12.3%
Rancho Cucamonga 10.2%
Fontana 10.2%
Victorville 9.0%
Ontario 8.5%
Hesperia 6.5%
Apple Valley 5.8%
Rialto 4.8%

Composition of Home to Other and Non-Home trips per city - SB County

Chino 3.8%
Colton 2.9%
Redlands 3.8%
Upland 4.2%
Yucaipa 2.5%
Chino Hills 2.7%
Highland 2.5%
Barstow 1.9%
7 Other Cities 7.9%
San Bernardino City 12.4%
Rancho Cucamonga 10.4%
Fontana 10.4%
Victorville 8.8%
Ontario 8.7%
Hesperia 6.4%
Apple Valley 5.7%
Rialto 5.0%

Results & Analysis

Commute (Home to Work) Trips:

- **Highest:** Los Angeles and Riverside Counties

- **Moderate:** Orange

- **Lowest:** Kern and San Diego followed by all other counties highlighted in yellow

Non-Commute (Home to Other and Non-Home) Trips:

- **Highest:** Los Angeles and Riverside Counties

- **Moderate:** Orange and Kern

- **Lowest:** San Diego and all other counties highlighted in yellow
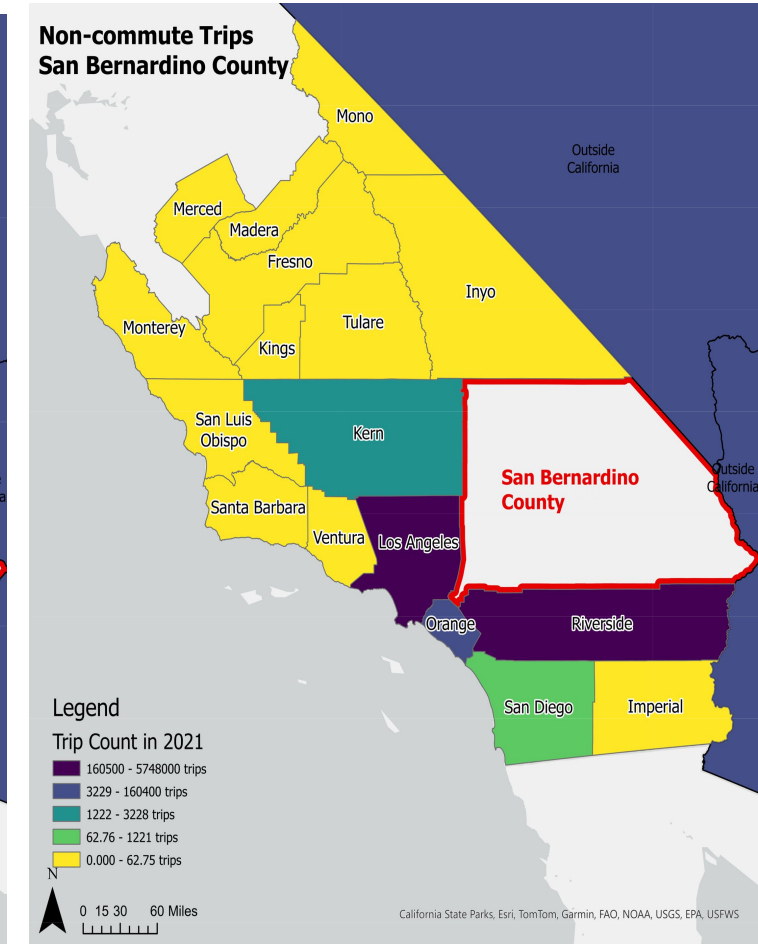
Results & Analysis

Within San Bernardino County:

- **Typical Trip Lengths**: Between **20-60 miles**, with some trips exceeding **100 miles**.

- **Shortest Average Travel Time**: Noted in Loma Linda City.

Outside San Bernardino County:

- **Average Trip Distance**: **185.57 miles**, mostly ranging between **50-250 miles**.

- **Shortest Average Travel Time**: Riverside County.

- **Longest Average Travel Time**: Merced County.
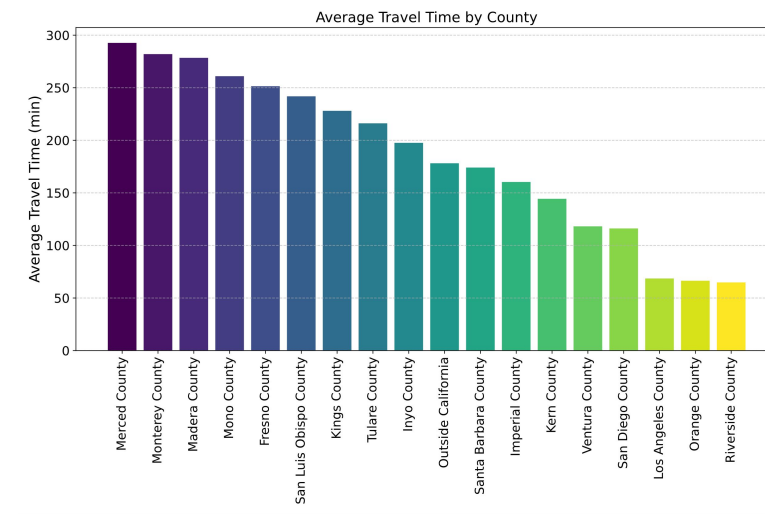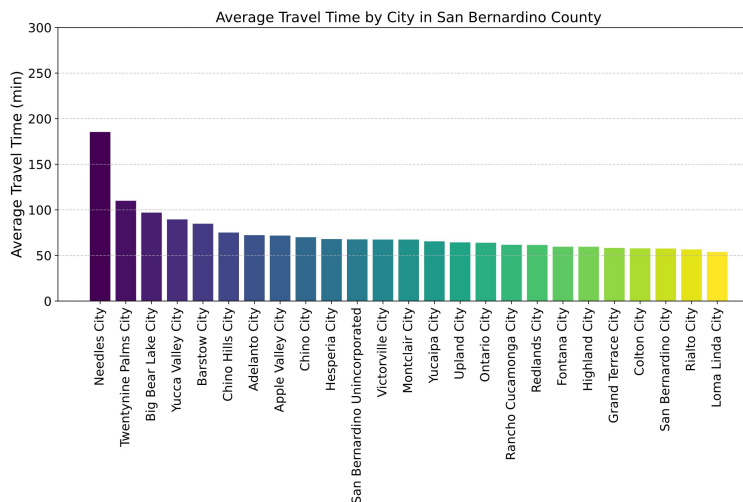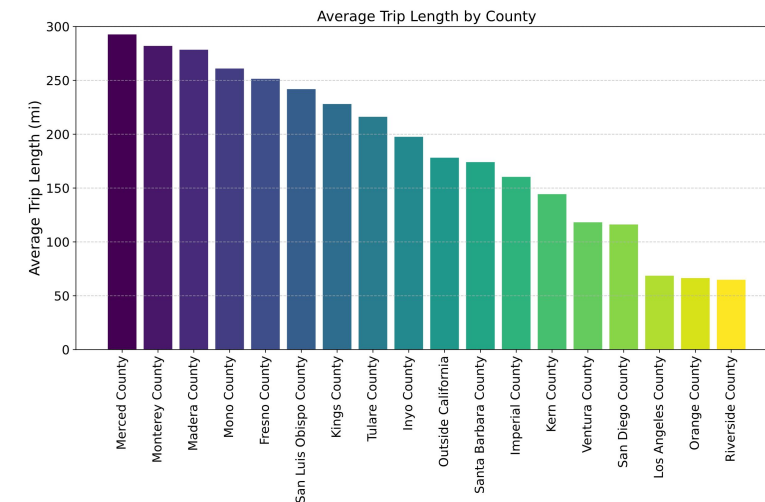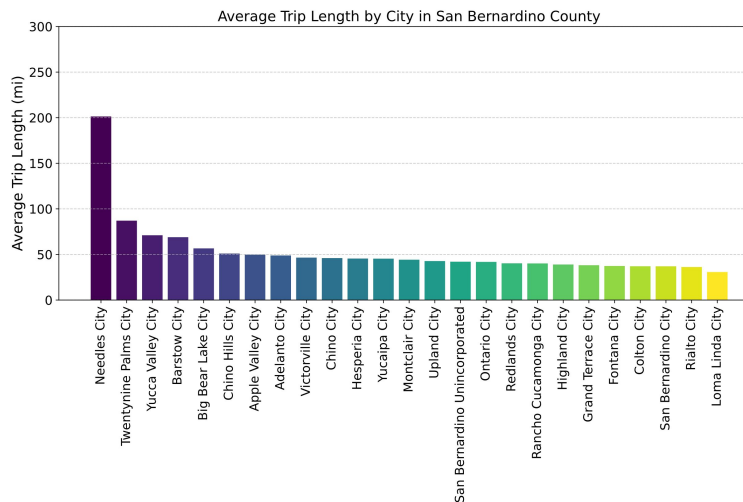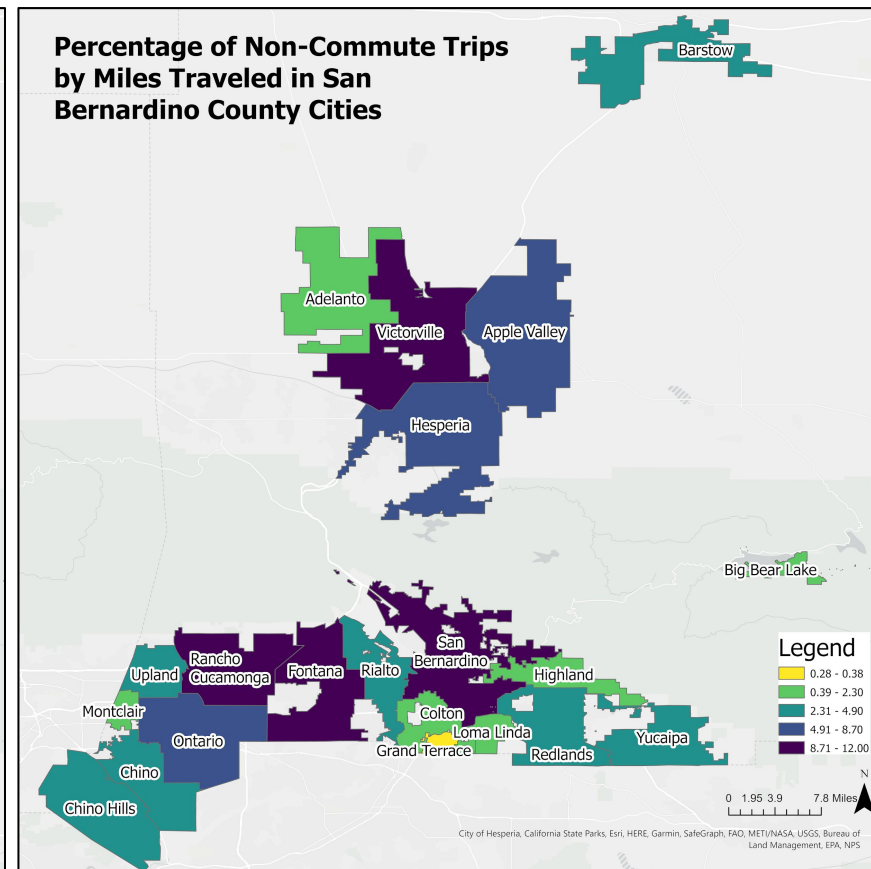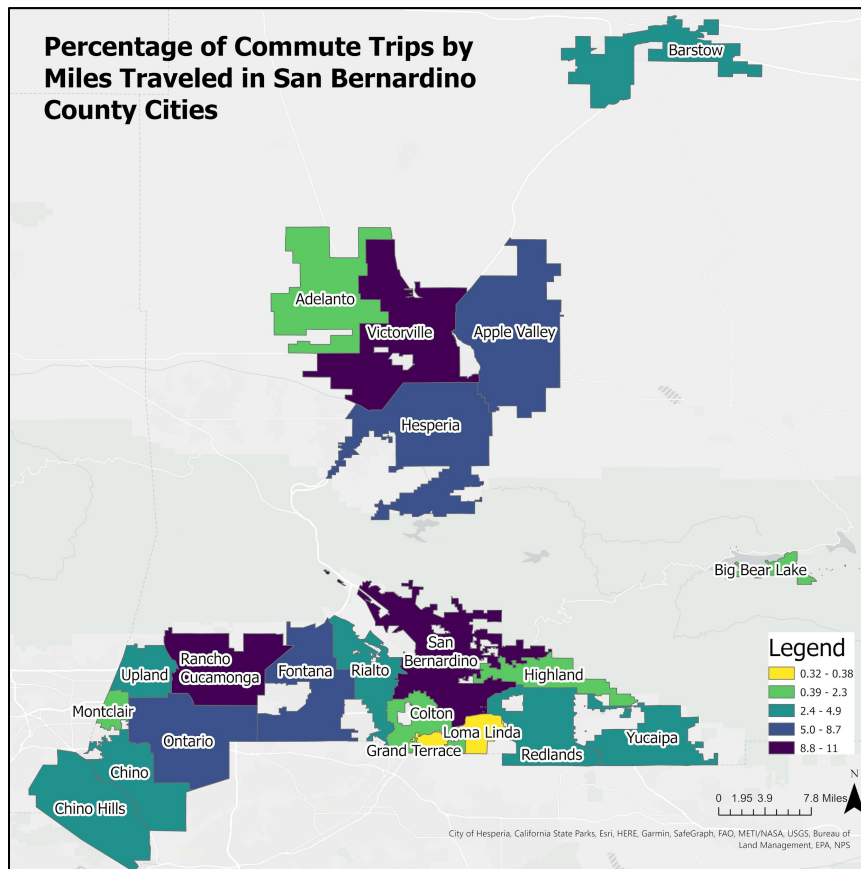
Results & Analysis

Commute Trips:

- **Highest**
  - Victorville: **10.92%**
  - San Bernardino City: **10.68%**
  - Rancho Cucamonga: **10.66%**

Lowest Commute Trips:

- Adelanto, Big Bear Lake, Grand Terrace, each with **less than 1%**.

Non-Commute Trips:

- **Highest**:
  - Victorville: **11.16%**
  - San Bernardino City: **11.06%**
  - Rancho Cucamonga: **10.81%**

- **Lowest Trips**:
  - **Around 1.1%**, indicating cities with minimal non-commute activities.

Percentage of Commute Trips by Miles Traveled in San Bernardino County Cities

Legend
0.32 - 0.38
0.39 - 2.3
2.4 - 4.9
5.0 - 8.7
8.8 - 11

Percentage of Non-Commute Trips by Miles Traveled in San Bernardino County Cities

Legend
0.28 - 0.38
0.39 - 2.30
2.31 - 4.90
4.91 - 8.70
8.71 - 12.00

Conclusion

- **92%** of trips are within San Bernardino County.

- Significant opportunity to promote green transportation solutions.

- Only **8%** of trips are to or from outside the county.

- Non-work-related trips double the number of work-related trips.

- Most external trips connect with Riverside and Los Angeles Counties.

- Internal trips are generally shorter than external ones.

- Need for strategic planning in cities like Victorville, San Bernardino, Fontana, Rancho Cucamonga, and Ontario.

- Investments in multi-modal infrastructure aimed at enhancing connectivity with Riverside and Los Angeles Counties can reduce travel distances.

Future Work

- **Assess Transit/Multi-modal Accessibility**: Evaluate public transportation availability and the integration of various travel modes to enhance mobility.

- **Analyze Pollution Metrics**: Examine pollution levels in comparison with regulatory standards to identify areas for improvement.

- **Inform Policies for Equitable Mobility**: Leverage findings to develop policies that promote equal access to transportation for all community members.

- **Promote Healthier Urban Environments**: Use insights to advocate for urban planning and transportation strategies that minimize environmental impact and support public health.