# EV Analysis | Washington State

**Project Overview**

This Tableau dashboard provides comprehensive analysis of Electric Vehicle (EV) adoption and distribution patterns across Washington State. The visualization combines geographic mapping, temporal trends, manufacturer analysis, and demographic insights to deliver a complete picture of the electric vehicle landscape in one of America's most EV-friendly states.

**Dashboard Architecture & Data Insights**

**Vehicle Type Distribution**

**EV Category Analysis:**

* **Battery Electric Vehicle (BEV)**: Dominant segment representing approximately 75% of all electric vehicles
* **Plug-in Hybrid Electric Vehicle (PHEV)**: Secondary segment comprising roughly 25% of the market
* **Market Preference**: Clear consumer preference for fully electric vehicles over hybrid alternatives

**Manufacturer Performance Analysis**

**Top Electric Vehicle Manufacturers:**

1. **TESLA**: 91,158 vehicles (Overwhelming market leader - ~60% market share)
2. **CHEVROLET**: 15,392 vehicles (Strong second position with Bolt and Volt models)
3. **NISSAN**: 14,711 vehicles (Leaf model success)
4. **FORD**: 11,109 vehicles (Growing EV portfolio)
5. **KIA**: 9,566 vehicles (Competitive positioning)
6. **BMW**: 8,593 vehicles (Premium segment leader)
7. **TOYOTA**: 8,220 vehicles (Prius Prime and other hybrids)
8. **HYUNDAI**: 6,060 vehicles (Emerging player)
9. **RIVIAN**: 5,871 vehicles (New electric truck manufacturer)
10. **VOLKSWAGEN**: 5,771 vehicles (ID series models)

**Additional Notable Manufacturers:**

* JEEP, VOLVO, AUDI, CHRYSLER, MERCEDES-BENZ, SUBARU, HONDA showing moderate market presence
* Luxury brands: AUDI (3,971), CHRYSLER (3,714), MERCEDES-BENZ (1,964)

**Market Insights:**

* Tesla's dominance reflects early market entry and brand loyalty
* Traditional automakers (Ford, Chevrolet, Toyota) showing strong adaptation to EV market
* Emerging EV-only brands (Rivian) gaining traction in specialized segments

**Geographic Distribution Analysis**

**County-Level Performance - Top 10 Counties:**

1. **King County**: 2,323 vehicles (Seattle metropolitan area - highest adoption)
2. **Snohomish County**: 345 vehicles (North Seattle suburbs)
3. **Pierce County**: 303 vehicles (Tacoma region)
4. **Clark County**: 199 vehicles (Vancouver/Portland border area)
5. **Kitsap County**: 132 vehicles
6. **Whatcom County**: 131 vehicles (Bellingham area)
7. **Spokane County**: 123 vehicles (Eastern Washington)
8. **Thurston County**: 93 vehicles (Olympia - state capital)
9. **Benton County**: 40 vehicles
10. **Skagit County**: 37 vehicles

**Geographic Mapping Visualization:**

* **Interactive Map**: Postcode-level distribution showing EV concentration
* **Urban Concentration**: Highest density in Puget Sound region (Seattle metro)
* **Rural Penetration**: Limited but growing adoption in eastern Washington
* **Coastal Distribution**: Strong presence along I-5 corridor and coastal areas

**Temporal Trends Analysis**

**Vehicle Registration by Year (2016-2024):**

* **2016**: 211 registrations (Early adoption phase)
* **2017**: 191 registrations (Market establishment)
* **2018**: 165 registrations (Policy transition period)
* **2019**: 518 registrations (Significant growth beginning)
* **2020**: 228 registrations (COVID-19 impact year)
* **2021**: 347 registrations (Recovery and incentive programs)
* **2022**: 251 registrations (Market normalization)
* **2023**: 502 registrations (Strong growth resumption)
* **2024**: 538 registrations (Continued expansion)

**Year-over-Year Growth Patterns:**

* **2019 Surge**: 214% increase indicating market inflection point
* **2020 Decline**: 56% decrease due to pandemic impact
* **2021-2024 Recovery**: Steady growth with 2023-2024 showing strongest performance
* **Total Growth**: From 211 (2016) to 538 (2024) - 155% overall increase

**Interactive Features & Car Make Filter**

**Advanced Filtering Capabilities:**

* **Comprehensive Car Make Filter**: 30+ manufacturers available for selection
* **Multi-Select Functionality**: Ability to compare multiple manufacturers
* **Dynamic Updates**: All visualizations update based on filter selections

**Available Manufacturer Filters:** ACURA, ALFA ROMEO, AUDI, AZURE DYNAMICS, BENTLEY, BMW, CADILLAC, CHEVROLET, CHRYSLER, DODGE, FIAT, FISKER, FORD, GENESIS, GMC, HONDA, HYUNDAI, JAGUAR, JEEP, KIA, LAND ROVER, LEXUS, LINCOLN, LUCID, MAZDA, MERCEDES-BENZ, MINI, MITSUBISHI, NISSAN, POLESTAR, PORSCHE, RAM, RIVIAN, ROLLS-ROYCE, SMART, SUBARU, TESLA, THINK

**Technical Implementation Features**

**Tableau Advanced Capabilities**

* **Geographic Mapping**: Integrated postcode-level mapping with bubble visualization
* **Interactive Filtering**: Dynamic manufacturer and geographic filtering
* **Multi-Chart Dashboard**: Coordinated visualizations with cross-filtering
* **Time Series Analysis**: Year-over-year trend visualization
* **Proportional Symbol Mapping**: Geographic distribution with size-coded symbols

**Dashboard Design Elements**

* **Clean Layout**: Professional single-page dashboard design
* **Consistent Color Scheme**: Teal/mint green theme reflecting environmental focus
* **Data Density**: Comprehensive information without visual overload
* **Interactive Elements**: Click-to-filter functionality across all visualizations
* **Responsive Design**: Optimized for various screen sizes

**Business Intelligence & Policy Insights**

**Market Dynamics**

* **Tesla Dominance**: 60%+ market share indicates strong brand preference and charging infrastructure advantage
* **Traditional Automaker Adaptation**: Ford, Chevrolet, Toyota successfully transitioning to EV market
* **Premium vs. Mass Market**: Clear segmentation between luxury (BMW, Mercedes) and volume brands

**Geographic Patterns**

* **Urban Concentration**: King County (Seattle) represents nearly 50% of state's EV adoption
* **Infrastructure Correlation**: Higher adoption in areas with established charging networks
* **Income Demographics**: Stronger adoption in higher-income counties (King, Snohomish)

**Temporal Insights**

* **Policy Impact**: Growth patterns likely reflect state and federal EV incentive programs
* **Market Maturation**: Stabilizing growth rates suggest market moving beyond early adopters
* **Future Projections**: Current trajectory suggests continued strong growth

**Environmental Impact**

* **Washington State Leadership**: High per-capita EV adoption reflects state's environmental policies
* **Clean Energy Alignment**: EV growth complements Washington's hydroelectric power infrastructure
* **Carbon Reduction**: Significant contribution to state's carbon neutrality goals

**Technical Specifications**

* **Platform**: Tableau Desktop/Public
* **Data Sources**: Washington State Department of Licensing EV registration data
* **Geographic Integration**: Postcode-level mapping with Mapbox integration
* **Time Series**: 9-year historical analysis (2016-2024)
* **Manufacturer Coverage**: 30+ automotive brands
* **Geographic Scope**: All 39 Washington counties with postcode-level detail
* **Interactive Elements**: Multi-dimensional filtering and drill-down capabilities

**Project Value & Skills Demonstrated**

This Tableau dashboard showcases advanced data visualization and analysis capabilities including:

* **Geographic Intelligence**: Spatial analysis and location-based insights
* **Market Analysis**: Competitive landscape and manufacturer performance evaluation
* **Temporal Analytics**: Time series analysis with trend identification
* **Policy Analysis**: Understanding regulatory impact on market adoption
* **Environmental Analytics**: Clean technology adoption patterns
* **Interactive Design**: User-friendly interface with advanced filtering capabilities

The solution demonstrates proficiency in creating policy-relevant dashboards that support:

* **Government Planning**: Infrastructure development and policy optimization
* **Business Strategy**: Market entry and competitive positioning analysis
* **Environmental Policy**: Clean transportation initiative effectiveness
* **Urban Planning**: EV charging infrastructure development priorities

This dashboard represents a comprehensive analysis tool suitable for state agencies, automotive manufacturers, environmental organizations, and urban planners making data-driven decisions about electric vehicle adoption and infrastructure development.