OCTA

E-BIKE SAFETY ACTION PLAN

Acknowledgments

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Executive Summary
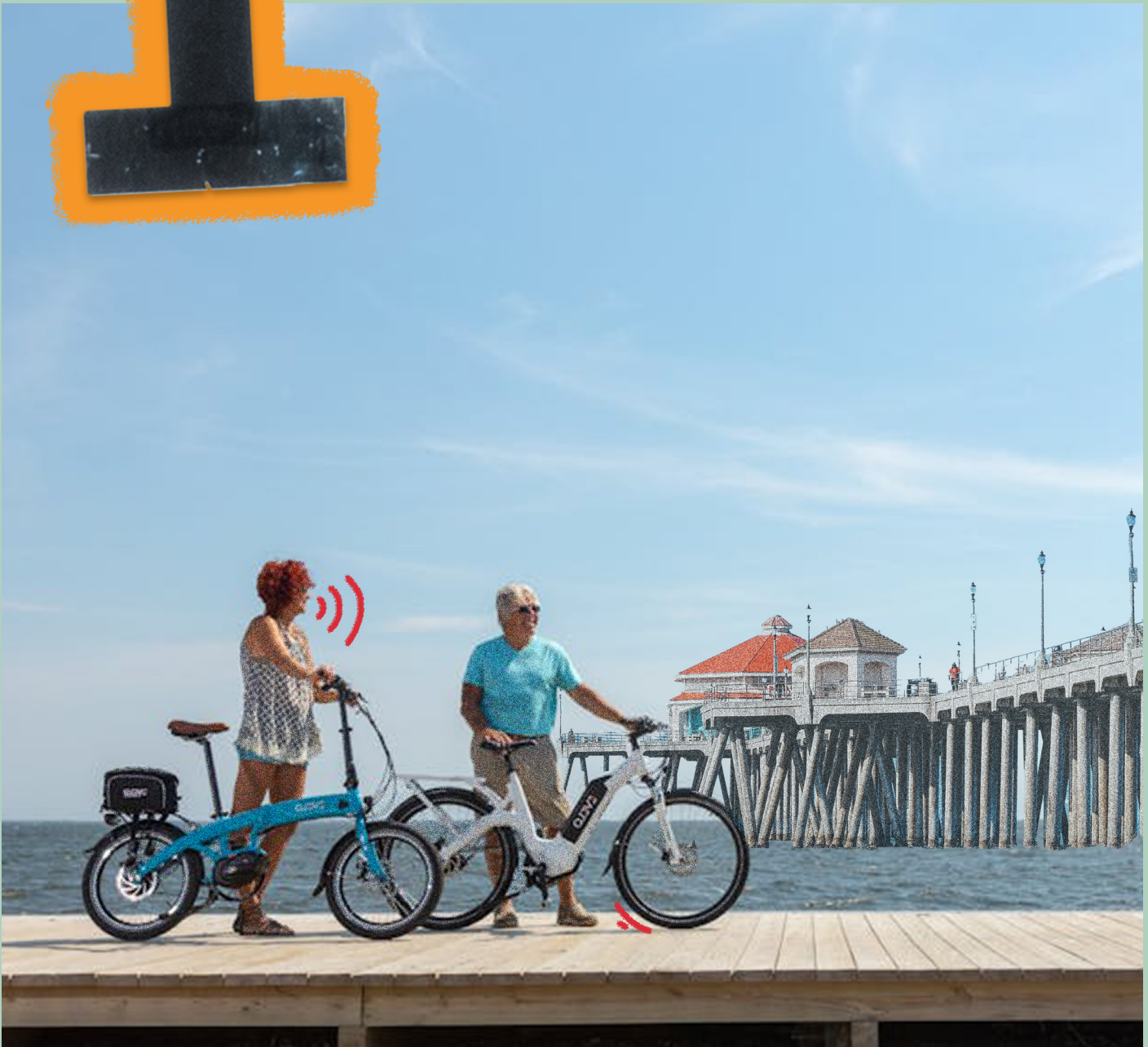
The **Electronic Bicycle (E-Bike) Safety Strategies Action Plan** ("Plan") details the findings and recommendations for Orange County Transportation Authority (OCTA) and its partners to take action and improve e-bike safety in Orange County. The project team assessed existing e-bike safety efforts already underway locally, regionally, and statewide. The project team also engaged with Orange County's local jurisdictions, law enforcement agencies, regional agencies, retailers, and other stakeholders involved in e-bike safety efforts, as well as the broader Orange County community.

The Plan identifies key gaps in e-bike resources and provides a variety of recommendations and strategies for OCTA and its partners. Specific actions to guide implementation of recommendations and strategies are detailed in Chapter 4.

Ultimately, decisions on how to address e-bike safety are at the discretion of each local jurisdiction, and this Plan does not mandate or obligate cities to adopt any specific recommendations; each city and agency may establish its own policies based on local needs and priorities.

LEGISLATION

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E-Bike
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INFRASTRUCTURE

IDENTIFIED GAP

While the scope of the E-Bike Safety Plan does not include infrastructure analysis or recommendations, supportive active transportation infrastructure is a key part of creating a safe environment for e-bike riders.

RECOMMENDATION

Continue to advance bikeway infrastructure that fosters safe e-bike riding.

STRATEGY

1. Support local and regional implementation of connected, separated bicycle infrastructure and related bicycle facilities.

COLLISIONS AND INJURIES

IDENTIFIED GAP

E-bike involvement in collisions and as a mechanism of injury has not been consistently tracked historically. While segmentation is now more standardized, there is not yet enough data to analyze crash and risk factors.

RECOMMENDATION

Build understanding of micromobility crash and risk factors, especially those resulting in KSIs (people killed or seriously injured).

STRATEGY

4. Collaborate with agencies to enhance standardized tracking and monitoring of micromobility-involved crashes at the county level.
5. Assess the qualitative safety and infrastructure experience of traveling in Orange County on e-bikes and other micromobility modes.
6. Evaluate micromobility crash trends, patterns, and risk factors.

LEGISLATION

IDENTIFIED GAP

Some cities have adopted specific e-bike regulations to address enforcement issues, but there is a lack of consistent policies and regulations across the county.

RECOMMENDATION

Support policies and projects to increase safety requirements related to the utilization of electric bicycles.

STRATEGY

2. Continue to monitor local and state legislation related to e-bikes to act as a resource for jurisdictions and advocates. Where possible, update County regulations to support consistent policies.
3. Partner with Orange County school districts to enact e-bike education policies that encourage safe student e-bike riding.

RIDERSHIP

IDENTIFIED GAP

Advancements in e-bike technologies have made it more difficult to differentiate them from pedal bikes, which creates challenges for conducting counts. Local sales data is not readily available to public agencies.

RECOMMENDATION

Understand growth trends and hot spots for micromobility usage.

STRATEGY

7. Improve and expand the existing OCTA Cyclic Count program.
8. Broaden the sources of micromobility ridership and activity data collection.

EDUCATION AND ENCOURAGEMENT

IDENTIFIED GAP

Current education and encouragement efforts are focused on school-aged youth, but e-bike ownership has historically skewed toward older populations. Existing education and encouragement efforts are not consistent across jurisdictions and school districts.

RECOMMENDATION

Target behavior change for key groups affected by e-bike safety issues.

STRATEGY

9. Develop targeted, age-appropriate education on e-bike safety to riders who are most at risk in Orange County: the school community (parents, students, and staff) and older adults.
10. Partner with organizations and ongoing initiatives that serve the target audiences to directly provide educational and encouragement resources and programs.
11. Share the E-Bike Safety Action Plan findings as a resource for other agencies to encourage e-bike adoption and safe e-bike ridership.

RETAILER COLLABORATION

IDENTIFIED GAP

Point-of-sale education on e-bike safety and rules of the road can be an important intervention for new e-bike riders. Retailers surveyed by the project team are not currently providing educational materials to customers who purchase e-bikes.

RECOMMENDATION

Leverage micromobility retailers for outreach and data collection.

STRATEGY

12. Build and sustain relationships with local e-bike retailers, partnering on safety education and encouragement efforts and incentivizing participation.

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2 Background

Background

Orange County has seen the rapid adoption of e-bikes for both utilitarian and recreational use, as riders take to the many roadways, trails, paths, and open spaces across the county. E-bikes hold transformative potential to broaden the base of Orange County residents using active transportation to shift trips away from driving at scale. Older adults, some people with disabilities, and people of all ages, abilities, and fitness levels can benefit from e-bikes, which require significantly less physical effort to operate and provide opportunities to ride for longer periods of time and over greater distances.

As e-bikes have exploded in popularity, policies and regulations are now catching up, as local and regional agencies aim to ensure the safety of e-bike riders and other roadway and trail users. Efforts to improve safety, currently lack central coordination or consistency across different jurisdictions, as well as schools, and neighborhoods.

The E-Bike Safety Action Plan was initiated by OCTA to investigate and propose non-infrastructure strategies to address existing gaps in e-bike safety resources.

What is an E-Bike?

An e-bike is an electric bicycle that is equipped with fully operable pedals and an electric motor of less than 750 watts. The same rules of the road that apply to human-powered bicycles apply to all types of e-bikes. E-bike riders do not need to have or use a driver's license, state or local registration, motor vehicle insurance, or license plates. Under the California Vehicle Code, there are three classes of e-bikes:

- Class 1: Provides assistance only when the rider is pedaling and ceases to provide assistance when the bicycle reaches a speed of 20 miles per hour (mph)
- Class 2: Operates via pedal-assist or throttle and ceases to provide assistance when the bicycle reaches a speed of 20 mph
- Class 3: Provides assistance only when the rider is pedaling and ceases to provide assistance when the bicycle reaches a speed of 28 mph

Riders aged 17 or younger must wear a helmet when riding Class 1 or 2 e-bikes, and all riders of Class 3 e-bikes must wear helmets.

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Analysis and Outreach

The project team completed several analyses and outreach efforts to build an understanding of the current challenges and opportunities for e-bike safety in Orange County:

- Outreach to key stakeholders via a stakeholder committee and survey, as well as engagement activities for the general public, including an e-bike rodeo and online workshops.
- A data inventory to review existing data sources that could be used for e-bike related planning and analysis.
- An inventory of current non-infrastructure efforts targeting e-bike safety.

Outreach and Engagement

The planning process aimed to leverage and grow partnerships among stakeholders countywide and to provide e-bike safety education and encouragement to Orange County residents.

Stakeholder Committee

OCTA worked closely with a stakeholder committee made up of local city staff, community organizations, law enforcement, and regional agencies that are currently engaging with e-bike safety issues. This committee met multiple times over the course of the project to share their organization or agency's experience with e-bikes in Orange County and to provide input on Plan priorities and recommendations.

Stakeholder Survey and Interviews

Between October 2023 and January 2024, the project team distributed an online survey to Orange County's local jurisdictions, law enforcement agencies, regional agencies, retailers, and other stakeholders involved in e-bike safety efforts.
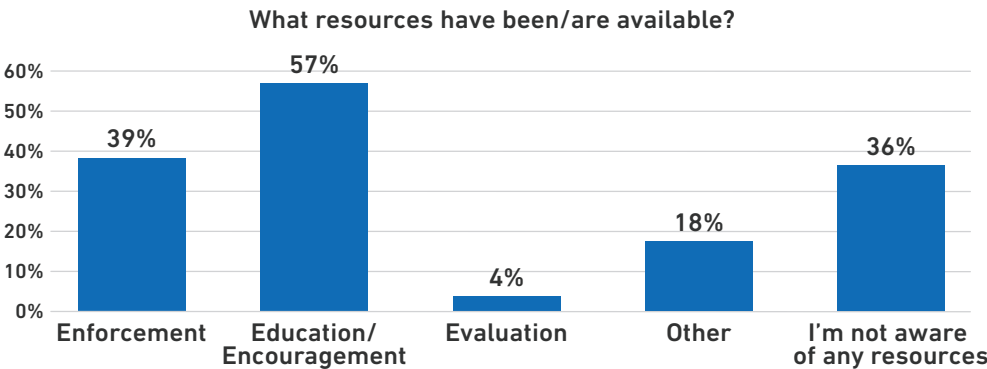
This survey asked respondents to share information about their community's experience with e-bikes, including what resources were currently available and what was needed.

There were 51 responses to the online survey - most (63 percent) came from local public agency staff. Other respondents included regional public agency staff (5 percent), law enforcement (12 percent), retailers (7 percent), and non-profits/community organizations (13 percent). The project team also conducted in-depth interviews with five stakeholders representing the American Automobile Association (AAA), local law enforcement (Costa Mesa Police Department), a local healthcare service (Providence Mission Hospital), a local retailer (Super 73), and the Southern California Association of Governments (SCAG).

The majority of survey respondents stated that e-bike usage has either moderately increased (30 percent) or majorly increased (51 percent) in the past year, highlighting the rapid adoption of e-bikes across Orange County. E-bike safety efforts varied across survey respondents, with a substantial number reporting that they were unaware of any efforts in their community, and others citing cross-departmental partnerships and collaborations to address the rise of e-bike safety concerns - see Figure 1. The most commonly cited type of safety resource available was education and encouragement.

FIGURE 1 Knowledge of E-Bike Safety Resources (survey responses)

What resources have been/are available?

Enforcement: 39%
Education/Encouragement: 57%
Evaluation: 4%
Other: 18%
I'm not aware of any resources: 36%

Virtual Open Houses and E-Bike Rodeo

Two virtual open houses provided opportunities for the Orange County community to learn about basic e-bike safety (including defining e-bikes, learning about their benefits, and rules of the road while riding) as well as provide input on areas where additional resources were needed. The project team also hosted an e-bike rodeo at Niguel Hills Middle School in the City of Laguna Niguel. Participants of all ages learned the rules of the road for bicycling, got safety tips for e-bikes, and practiced their skills on a safety course.

Inventory of Existing Data and Non-Infrastructure Efforts

An inventory of current e-bike safety data resources and non-infrastructure efforts highlighted gaps in data collection and programmatic efforts in Orange County.

Key takeaways include the following:

- **Collisions and injuries**: Historic data specific to e-bikes is limited. However, more recent segmentation of e-bikes in injury and collision reporting will allow for an in-depth understanding of crash and injury factors in the future.

- **Legislation**: E-bike riders in Orange County are subject to the California Vehicle Code (CVC) and Orange County Code of Ordinance (OCCO). Local agencies are responding to the growing usage of e-bikes with a desire to manage safe operation by implementing ordinances; most agencies have Active Transportation Plans (ATPs), but ATPs often do not specifically address e-bikes at a planning, engineering, and/or programmatic level.

- **Ridership**: While local agencies and other stakeholder interviews as part of the Plan anecdotally report increasing e-bike ridership, actual count data is limited and constrained by the difficulties in distinguishing e-bikes from pedal bikes. National e-bikes sales trends show year over year increases in units sold, but sales data on a local or regional level are not readily accessible from individual and consolidated sources.

Supporting Safe Riding

No matter how you travel – set a good example for others:

- Know and follow the rules of the road, path, or trail
- Watch your speed
- Share space with other road/path/trail users

Top: Screenshot of slide deck used in the virtual open house; Bottom: Students take part in an e-bike rodeo safety skills course

- **Education and encouragement**: Current education and encouragement efforts are focused on school-aged youth, but e-bike ownership has historically skewed toward older populations. Existing efforts include e-bike permits/registration for students, presentations from law enforcement, e-bike rodeos, and youth-focused messaging and educational campaigns. However, these efforts are not consistent countywide or within the same school district (from school to school).

- **Enforcement**: Application of safe e-bike riding behavior has been a challenge for local law enforcement due to limited resources and capacity. Current activities for local law enforcement target helmet usage, age restrictions, and/or other e-bike related legislation specific to individual jurisdictions.

- **Retailer collaboration**: Point-of-sale education on e-bike safety and rules of the road can be an important intervention for new e-bike riders. Retailers surveyed by the project team are not currently providing educational materials to customers who purchase e-bikes.

Detailed findings from the inventories conducted by the project team can be found in Appendix B.

4 Recommendations, Strategies, and Actions

This section provides an overview of the safety recommendations, strategies and related actions that OCTA and its partners can undertake to support e-bike safety resources and data related to infrastructure, legislation, collisions and injuries, ridership, education and encouragement, and retailer collaboration (see Table 1).

Based on the findings from stakeholder and public outreach engagement, analysis of existing data gaps, and current programmatic efforts and policies regarding e-bike safety, the Plan provides recommendations for six key areas: infrastructure, legislation, collisions and injuries, ridership, education/encouragement, and retailer collaboration.

Each recommendation includes a written description of the strategies and actions necessary to accomplish the suggested outcome. Following these written descriptions is a table that details participant roles (key roles involved in planning and implementing e-bike safety strategies) and level of difficulty (how challenging a strategy will be to carry out based on funding, coordination, and complexity).

TABLE 1 Overview of Plan Recommendations, Strategies, and Actions

Recommendation	Strategies	Actions
INFRASTRUCTURE: Continue to advance bikeway infrastructure that fosters safe e-bike riding.	**1.** Support local and regional implementation of connected, separated bicycle infrastructure and related bicycle facilities.	**Action 1.1:** Support local jurisdictions in implementing separated facilities within their Active Transportation and Bicycle Master Plans, as well as in the OC on the Move Active Transportation Plan by providing assistance through regional grant programs and technical support services. **Action 1.2:** Compile, monitor, share and utilize design guidance that integrates e-bike considerations based on industry best practices. **Action 1.3:** Encourage development of end-of-trip facilities such as bicycle lockers at locations such as regional transit hubs
LEGISLATION: Support policies and projects to increase safety requirements related to the utilization of electric bicycles.	**2.** Continue to monitor local and state legislation related to e-bikes to act as a resource for jurisdictions and advocates. Where possible, update County regulations to support consistent policies. **3.** Partner with Orange County school districts to enact e-bike education policies that encourage safe student e-bike riding.	**Action 2.1:** Regularly update OCTA matrix to track regulatory landscape in de-jargonized terms. Share out to jurisdictions with context of trends in the e-bike policy space. **Action 2.2:** Collaborate with local jurisdictions and regional agencies to clarify local regulations for consistency across municipal/regional boundaries and infrastructure types. **Action 3.1:** Collaborate with educational stakeholders to develop e-bike permitting and education standards for Orange County schools.

Recommendation	Strategies	Actions
COLLISIONS AND INJURIES: Build understanding of micromobility crash and risk factors, especially those resulting in KSIs (people killed or seriously injured).	**4.** Collaborate with agencies to enhance standardized tracking and monitoring of micromobility-involved crashes at the county level.	**Action 4.1:** Standardize a crash data reporting system with the crash information needed to understand the trends in micromobility crashes, their mechanisms, and the contributing collision factors. **Action 4.2:** Collaborate with the California Department of Public Health (CDPH) and Orange County Health Care Agency (OCHCA) to monitor and track injuries of micromobility users.
	5. Assess the qualitative safety and infrastructure experience of traveling in Orange County on e-bike and other micromobility modes.	**Action 5.1:** Develop a map-based reporting system for micromobility users and other community members to report near-miss collisions experienced or witnessed. **Action 5.2:** Engage e-bike user groups to understand their travel experience and assess the prevalence of e-bike crash under-reporting.
	6. Evaluate micromobility crash trends, patterns, and risk factors.	**Action 6.1:** Develop safety performance metrics to measure the roadway safety conditions for e-bikes and other micromobility modes. **Action 6.2:** Conduct systemic crash analysis to assess micromobility safety patterns and risk factors.
RIDERSHIP: Understand growth trends and hot spots for micromobility usage.	**7.** Improve and expand the existing OCTA cyclic count program.	**Action 7.1:** Identify a set of priority locations to collect year-over-year cyclic counts consistently. **Action 7.2:** Expand the attributes and content collected from the count program.
	8. Broaden the sources of micromobility ridership and activity data collection.	**Action 8.1:** Enhance coordination with other OCTA efforts to share and synthesize micromobility volume data **Action 8.2:** Explore and evaluate micromobility activity and ridership data from data vendors.

Recommendation	Strategies	Actions
EDUCATION AND ENCOURAGEMENT: **Target behavior change for key groups affected by e-bike safety issues.**	**9.** Develop targeted, age-appropriate education on e-bike safety to riders who are most at risk in Orange County: the school community (parents, students, and staff) and older adults.	**Action 9.1:** Develop targeted messaging and materials for parents/caregivers and youth in the school community. **Action 9.2:** Develop older-adult specific educational materials that encourage e-bike usage while acknowledging physical challenges that can affect e-bike safety for aging populations.
	10. Partner with organizations and ongoing initiatives that serve target audiences to directly provide educational and encouragement resources and programs.	**Action 10.1:** Build partnerships with agencies and organizations who can reach target audiences directly to provide education and encouragement. **Action 10.2**: Leverage existing Safe Routes to School (SRTS) programs and initiatives as opportunities for supplemental e-bike safety education and encouragement.
	11. Share E-Bike Safety Action Plan findings as a resource for other agencies to encourage e-bike adoption and safe e-bike ridership.	**Action 11.1:** Develop a policy one-sheet for elected officials that identifies next steps in e-bike safety policy development. **Action 11.2:** Utilize existing regional coordination processes to improve decisionmaker awareness of e-bike gaps and strategies recommended in this Plan.
RETAILER COLLABORATION: **Leverage micromobility retailers for outreach and data collection.**	**12.** Build and sustain relationships with local e-bike retailers, partnering on safety education and encouragement efforts.	**Action 12.1:** Equip retailers with customer-facing materials that provide information on safe riding and maintenance of e-bikes. **Action 12.2:** Provide incentives for retailer participation in data collection.

INFRASTRUCTURE:
Continue to advance bikeway infrastructure that fosters safe e-bike riding.

A supportive built environment is a critical element for safe e-bike usage, but it is not the primary focus of this plan, which concentrates on non-infrastructure strategies and actions. The following strategy provides high-level guidance for OCTA to foster safe e-bike riding through infrastructure improvements.

STRATEGY 1:
Support local and regional implementation of connected, separated bicycle infrastructure and related bicycle facilities.

Action 1.1: Support local jurisdictions in implementing separated facilities within their Active Transportation and Bicycle Master Plans, as well as in the OC on the Move Active Transportation Plan by providing assistance through regional grant programs and technical support services.

Through its roles as planner and funder of active transportation infrastructure throughout the County, OCTA is well-positioned to offer support for the implementation of separated bikeway facilities in the following ways:

- **Grant administration and support:** There are a number of regional and statewide grants that may be applicable for implementation of separated bikeway facilities in Orange County. These include the Caltrans Active Transportation Program, for which OCTA has historically provided technical support to local jurisdictions in the application process. OCTA's recent Complete Streets Call for Projects created a funding avenue for jurisdictions seeking to implement complete streets improvements that included separated bikeways and bike safety enhancements. In assessment of grant program priorities, OCTA can elevate projects that emphasize separated bikeways and support e-bike ridership (connected,

inter-jurisdictional corridors to host longer e-bike trips and/or projects that create a high degree of separation and protection for riders, ensuring low-stress routes for e-bike riders of all ages).

- **Interjurisdictional coordination:** Given the expanded trip lengths made possible by e-bikes, the agency is well-positioned to coordinate across jurisdictional boundaries in the county and ensure that facilities offer a continuous level of separation from traffic and form a well-connected network. OCTA's administration of the arterial highways system across the county is an opportunity to plan intuitive, direct, and connected routes on major streets where wider separated bikeways may be more feasible.

As local jurisdictions maintain direct authority over their streets, Orange County cities are responsible for implementing separated bicycle facilities identified in their local Active Transportation and Bicycle Master Plans. They are also responsible for coordinating with OCTA on interjurisdictional corridors and routes to ensure facilities adequately serve e-bike riders.

Action 1.2: Compile, monitor, share and utilize design guidance that integrates e-bike considerations based on industry best practices.

North American cities are still developing design recommendations for e-bikes and other micromobility devices. OCTA should align with nationally and regionally recognized designs and serve as a resource for local jurisdictions who are seeking design solutions and best practices. OCTA can update resources as new guidance emerges, considering factors like lane widths, separation barriers, sight lines, and physical separation or increased spacing between modes. As new guidance is updated, local jurisdictions are responsible for referencing and employing new best practices as they design and implement facilities and e-bike supportive infrastructure.

Studies of bicycling trends and e-bike usage in China indicate that expanding the width of bike lanes would allow for a more efficient accommodation of a range of biking speeds, allowing e-bikes to share the facility with traditional bicycles and other devices.[1] [2] [3] This aligns with newer guidance in the United States from NACTO's 2023 "Designing for Small Things with Wheels," which recommends cities consider the range of micromobility types, including e-bikes and cargo e-bikes, when designing bike facilities and their widths. NACTO provides the following guidance for designing for a variety of micromobility devices:

- **Extra Width**: Bikeways should be wide enough for all users to ride comfortably and for faster riders to pass. Typical bikes need 4-5 feet, while cargo bikes or large e-bikes may need up to 7 feet.

- **Safe Intersections**: Intersections should have enough space for micromobility devices to wait, turn, and shift lanes. Protected intersections can separate bikeway users from drivers, promoting safety.

- **Smooth Surfaces:** Bikeways should be well-maintained with smooth surfaces and gentle slopes (1:20) to prevent falls for devices with small wheels (<10 inches).

- **Intuitive Wayfinding:** Facilities should be easily identifiable with comprehensive wayfinding and intuitive transitions. Signs and markings can help users understand how to use the bikeways and welcome a range of micromobility devices.

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1 Sun, Sudan and Yingji Xia. "The need for wider non-motor lanes: A study on the bicycle electrification process in China." Journal of Transport & Health, Volume 25 (J2022), https://doi.org/10.1016/j.jth.2022.101374.

2 Lu Bai, Pan Liu, Ching-Yao Chan, Zhibin Li. "Estimating level of service of mid-block bicycle lanes considering mixed traffic flow." Transportation Research Part A: Policy and Practice, Volume 101, 2017, https://doi.org/10.1016/j.tra.2017.04.031.

3 Yan Li, Wen-hui Zhou, Si-rui Nan, Fan Wang, and Kuan-min Chen. "Redesign of the cross-section of bicycle lanes considering electric bicycles." Proceedings of the Institution of Civil Engineers – Transport, 2017. https://www.icevirtuallibrary.com/doi/10.1680/jtran.16.00175

Spotlight: Los Angeles Metro Bike Hubs

In Los Angeles County, the Los Angeles County Metropolitan Authority (Metro) partnered with BikeHub to install and operate five Metro Bike Hubs at major transit stations throughout its rail and busway system.

Riders sign up as members to a hub to gain access to the secure parking facilities any time of day, and staff are available during the day for bike repairs. A one-year membership is $60, with discounts provided to seniors, people with disabilities, Medicare recipients, and K-12 students. Metro also recently updated its bike locker program: the new system allows riders to use on-demand lockers at select stations to store their bicycles through an app-based program.

Image source: LA Metro

Action 1.3: Encourage development of end-of-trip facilities such as bicycle lockers at locations such as regional transit hubs.

A key part of expanding e-bike ridership involves supporting the use of e-bikes in concert with other modes, particularly transit. Secure facilities are especially significant for e-bike riders given the expense of e-bikes, which makes the devices more valuable targets for thieves.

Secure end-of-trip facilities allow riders to leave their e-bikes at transit stations/stops during longer trips, making the use of e-bikes as a first/last mile option more convenient while alleviating concerns around theft. These facilities may include larger bike hubs managed by staff that provide additional services like repairs, or reserved lockers intended for short-term rentals during the day. Bike hubs and storage may be included in transit projects planned and delivered by OCTA, and local jurisdictions also have opportunities to deliver secure bike storage and parking in locally owned facilities and locations.

TABLE 2 Infrastructure Strategies: Roles and Level of Difficulty

Strategy	Who's involved?			Level of Difficulty (Easy, Medium or Hard)
	OCTA	Local agencies	CBOs, advocacy organizations, other stakeholder groups	
1. Support local and regional implementation of connected, separated bicycle infrastructure and related bicycle facilities.	Support	Lead	Support	Medium

LEGISLATION:
Support policies and projects to increase safety requirements related to the utilization of electric bicycles.

The following strategies aim to help OCTA and local jurisdictions work towards a regulatory environment that is supportive of safe and responsible e-bike ridership.

STRATEGY 2:
Continue to monitor local and state legislation related to e-bikes to act as a resource for jurisdictions and advocates. Where possible, update County regulations to support consistent policies.

Action 2.1: Regularly update OCTA matrix to track the regulatory landscape in plain language. Share out to jurisdictions with context of trends in the e-bike policy space.

Today, e-bike riders are subject to regulations from the California Vehicle Code (CVC) and the Orange County Code of Ordinance (OCCO), which currently allow riders to operate e-bikes on bike paths, bike lanes, and a number of other facility types. In addition, multiple jurisdictions within Orange County have passed e-bike ordinances to regulate aspects of e-bike ridership, such as where they may be ridden and at what speeds. These local policies, combined with variances between the three classes of e-bike, may at times create confusion for Orange County e-bike riders as they ride across city borders and on differing facility types.

FIGURE 2 California state regulations for pedal bikes, e-bikes, and mopeds

| VEHICLE TYPE	PEDAL OPERATED	MAXIMUM MOTOR-ASSISTED SPEED (MPH)	MINIMUM AGE (YEARS)	DRIVER'S LICENSE	LICENSE PLATE	HELMET	CLASS I BIKE PATH	CLASS II BIKE LANE	CLASS III BIKE ROUTE	CLASS IV PROTECTED LANE
BICYCLE	YES	N/A	N/A	NO	NO	17 AND UNDER	YES	YES	YES	YES
TYPE 1 E-BIKE	YES	20	N/A	NO	NO	17 AND UNDER	YES	YES	YES	YES
TYPE 2 E-BIKE	NO	20	N/A	NO	NO	17 AND UNDER	YES	YES	YES	YES
TYPE 3 E-BIKE	YES	28	16	NO	NO	YES	NO	YES	YES	NO
MOPED	NO	N/A	16	YES	YES	YES	NO	YES	YES	NO

Image source: PeopleforBikes

OCTA should continue to update its existing online matrix of local and regional jurisdictions' current e-bike policies and ordinances. This regularly updated resource will serve as a reference for policymakers, advocates, and planners when they update their local policies. For example, the matrix can support decisionmakers in cities with adjacent, continuous bike facilities, such as the Huntington Beach and Newport Beach's Beach Bike Paths, to ensure that regulations and speed limits are clear to e-bike riders.

The matrix should be clear and accessible, using plain language for the public. OCTA can adapt it into a mobile-friendly menu, where users can select their jurisdiction and learn relevant e-bike regulations in plain language. OCTA can continue to share the policy matrix and related resources through existing regular communications related to active transportation projects and policies, including active transportation-related committees and the E-Bike Working Group. Jurisdictions should be encouraged to notify OCTA of new local e-bike regulations.

Mapping E-Bike Legislation

The project team visualized the local jurisdictions in the county that have established different levels of e-bike ordinances (as of early 2024).

A "generic e-bike ordinance" indicates that e-bike rules are similar to bicycle policies or rules of the road; a "specific e-bike ordinance" refers to when cities explicitly call out the restrictions or rules on using e-bikes. For example, the City of San Clemente prohibits e-bike operations on beach trails.
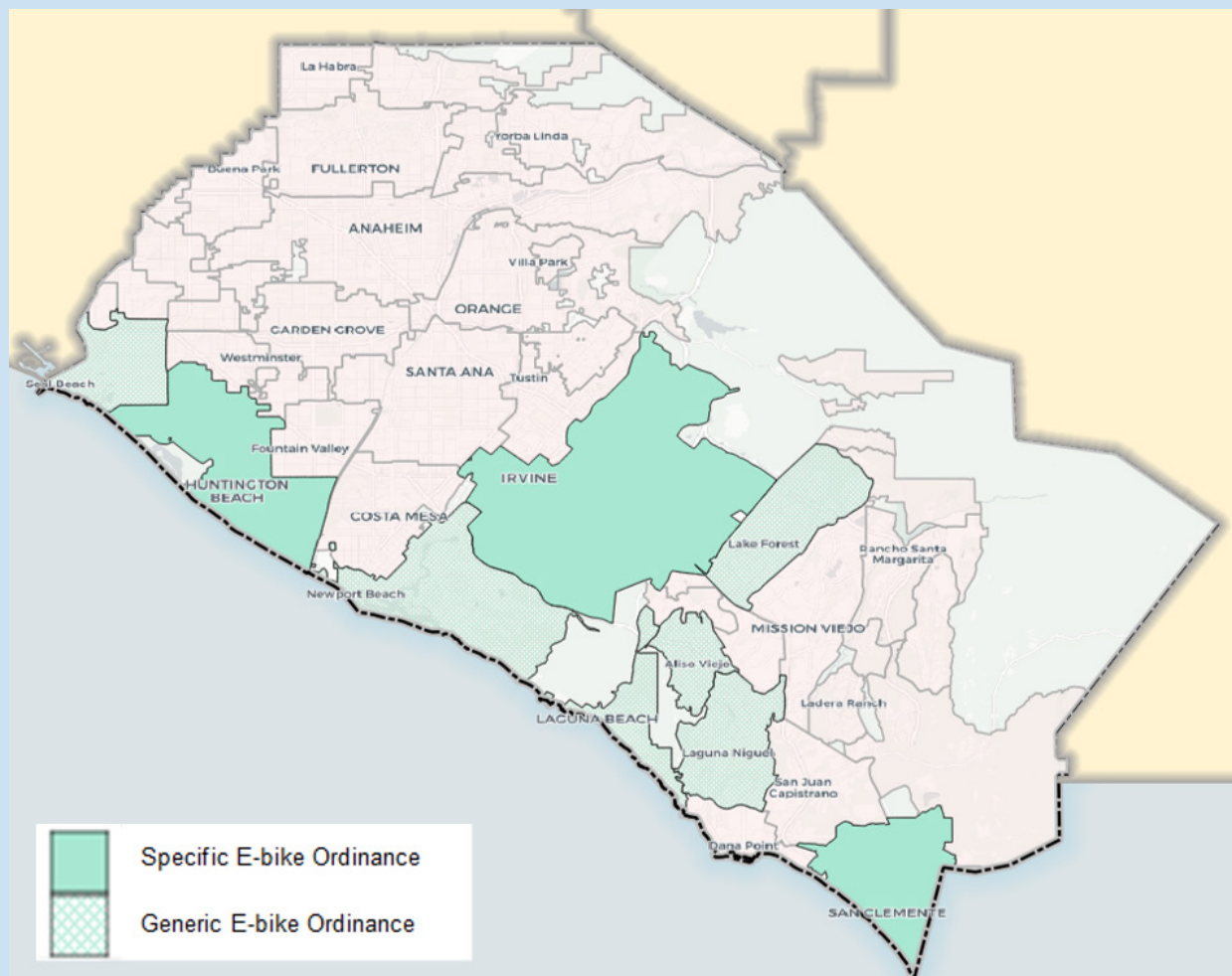
Specific E-bike Ordinance
Generic E-bike Ordinance

Action 2.2: Collaborate with local jurisdictions and regional agencies to clarify local regulations for consistency across municipal/regional boundaries and infrastructure types.

Regulatory differences among Orange County jurisdictions and across parks and facility types can confuse experienced and new e-bike riders alike. Building on the policy tracking detailed in Action 2.1, OCTA can use its role as a regional agency to foster consistency in e-bike regulations and permissions and communicate these rules to e-bike riders.

While OCTA does not have direct jurisdiction over all e-bike regulations, it can share best practices and leverage its knowledge of regional policies. OCTA could support local jurisdictions by sharing guidance on topics including:

- E-bike prohibitions on certain roadways, trails, or paths
- E-bike permit requirements in schools
- Educational strategies for safe e-bike use

STRATEGY 3:
Partner with Orange County school districts to enact e-bike education policies that encourage safe student e-bike riding.

Action 3.1: Collaborate with educational stakeholders to develop e-bike permitting and education standards for Orange County schools.

Schools are key touchpoints for introducing safe e-bike practices to student riders and are a direct way to ensure students have access to e-bike classes and educational resources. Today, some schools throughout the county operate bike permitting programs for their students, which tie permission to park a student's bike at the school to a bike safety training, presentation, and/or assessment. This approach ensures that students are introduced to safe riding practices before they start to ride an e-bike regularly to school. Additional "refresher" courses may also be taught throughout the school year as instructional time allows.

Spotlight: E-Bike Training and Permitting at Ensign Intermediate School

Ensign Intermediate School in the Newport-Mesa Unified School District operates a bike permitting program that introduces students to annual safety trainings and presentations. After a training conducted in partnership with Newport Beach Police Department and the schools Physical Education faculty, students must pass an assessment in order to receive a helmet sticker that permits them to park their bike in the school's bike parking cage. Students may retake the assessment, which is tracked through the schools learning management system, so administrators can monitor who has received a permit sticker.

As of the writing of this plan, school districts that currently offer some form of student e-bike permit program include, but are not limited to:

- Newport-Mesa Unified School District
- Capistrano Unified School District
- Huntington Beach Union High School District
- Los Alamitos Unified School District
- Irvine Unified School District

OCTA can coordinate with school districts and local jurisdictions to encourage the adoption of such e-bike permit programs through safety messaging and active transportation planning efforts. OCTA can also potentially provide resources or funding for e-bike education (safety skills training, safety materials, or formal presentations) linked to a permit program.

Ongoing Safe Routes to Schools efforts offer a method to introduce permits and trainings as programmatic recommendations that complement school bicycle and pedestrian safety improvements. OCTA can collect and share examples of successful programs with interested school districts, demonstrating how such programs work in practice and what partnerships (safety training professionals, trained faculty) are necessary to realize them. Implementation of permit programs will be managed by school districts and individual schools, with guidance from the Orange County Department of Education.

A bike permit sticker on a student's e-bike in Laguna Niguel

TABLE 3 Legislation Strategies: Roles and Level of Difficulty

Strategy	Who's involved?			Level of Difficulty (Easy, Medium or Hard)
	OCTA	Local agencies	CBOs, advocacy organizations, other stakeholder groups	
2. Continue to monitor local and state legislation related to e-bikes to act as resource for jurisdictions and advocates. Where possible, update County regulations to support consistent policies.	Lead	Support	Support	Easy to Medium
3. Partner with Orange County school districts to enact e-bike education policies that encourage safe student e-bike riding.	Support	Support	Lead	Medium

COLLISION AND INJURIES:
Build understanding of micromobility crash and risk factors, especially those resulting in KSIs (people killed or seriously injured).

The following strategies and actions are structured to help OCTA better understand crashes involving e-bikes and other micromobility devices.

STRATEGY 4:
Collaborate with agencies to enhance standardized tracking and monitoring of micromobility involved crashes at the county level.

Action 4.1: Standardize a crash data reporting system with the crash information needed to understand the trends in micromobility crashes, their mechanisms, and the contributing collision factors.

Historically, state and local law enforcement have not differentiated between types of micromobility devices in collision reports. With the rise of e-bikes, e-scooters, and other micromobility devices, California Highway Patrol (CHP) and local jurisdictions have recently begun segmentation in crash reporting.

What is micromobility?

The term micromobility refers to a range of small, lightweight devices that operate at top speeds of 30mph or less, with most traveling at or below 20 mph. The Federal Highway Administration broadly defines micromobility as "any small, low-speed, human- or electric-powered transportation device, including bicycles, scooters, electric-assist bicycles (e-bikes), electric scooters (e-scooters), and other small, lightweight, wheeled conveyances." Micromobility devices weigh less than 500 lbs (with typical weights <100 lbs) with widths smaller than 4', allowing them to fit in a standard bike lane.

TYPES OF POWERED MICROMOBILITY VEHICLES[1]

	Powered Bicycle	Powered Standing Scooter	Powered Seated Scooter	Powered Self-Balancing Board	Powered Non-Self-Balancing Board	Powered Skates
Center column	Y	Y	Y	Possible	N	N
Seat	Y	N	Y	N	N	N
Operable pedals	Y	N	N	N	N	N
Floorboard / foot pegs	Possible	Y	Y	Y	Y	Y
Self-balancing[2]	N	N	N	Y	N	Possible

Image source: Taxonomy & Classification of Powered Micromobility Vehicles

As of 2024, the CHP 555 Collision form includes different micromobility devices like "Electric Bicycle (Class 1, 2, 3)","Electrically Motorized Board" and "Go-ped ZIP style Electric Scooter, Motorboard." Cities like Costa Mesa, Huntington Beach, Laguna Beach, and Irvine have also started segmenting e-bike-related crashes.

Adding e-bikes to the CHP form allows for more detailed reporting of micromobility crashes in the future. OCTA can support local agencies in adopting this reporting and encourage the use of updated e-bike coding. To gather detailed micromobility-specific crash information, OCTA could outline which attributes the local law enforcement should collect, such as the number of wheels, type of propulsion (electric or pedal), and number of riders.

OCTA could also develop best practices for:

- A micromobility collision template and implementation process for local agency collision reporting.
- A micromobility injury reporting template for local partners.

Additionally, OCTA could provide training for field officers to differentiate e-bike classes and micromobility types, ensuring they check for state-mandated e-bike class stickers. This will help ensure accurate and high-quality data collection at crash scenes.

Action 4.2: Collaborate with the California Department of Public Health (CDPH) and Orange County Health Care Agency (OCHCA) to monitor and track injuries of micromobility users.

Recent studies by the California Department of Public Health and the Mineta Transportation Institute show that 40-50 percent of e-bike crash injuries in California result from falls or non-collision accidents (not involving a fixed/non-fixed object or motor vehicle).[4]

These incidents are often underreported to police and only recorded when cyclists seek emergency medical services (EMS) or emergency room (ER) treatment. To better understand the full picture of e-bikes safety, OCTA should facilitate the tracking of e-bike injuries using hospital data.

In recent years, the standardized injury coding systems in public health have identified injury mechanisms related to e-bike as a specific, standalone category:

- **International Classification of Diseases (ICD-10-CM):** ICD-10-CM is used to code all diagnoses, symptoms, and procedures related to inpatient and outpatient medical care in the United States. As of 2023, the ICD-10- CM has added a code specific to e-bikes.
- **National Electronic Injury Surveillance System (NEISS):** This national database, managed by the U.S. Consumer Product Safety Commission, tracks ER-treated injuries and includes a code for e-bike injuries under "Mopeds or power-assisted cycles" (product type 3215).

As NEISS only tracks ER-treated injuries, ICD-10-CM data offers a more comprehensive view of e-bike-related hospital visits. The California Department of Public Health is already analyzing e-bike injury data using ICD-10-CM and can provide county-specific information. OCTA and/or OCHCA can request annual e-bike injury data from CDPH, categorized by age, ethnicity, gender, and other subgroups. CDPH is also working to link ICD-10-CM data with SWITRS for a clearer picture of e-bike collisions. Alternatively, agencies can request ICD-10-CM data directly from the California Department of Health Care Access, but they would need the capacity to process and review the raw data for e-bike-specific injuries.

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4 Active Transportation Resource Center. "Rolling Out E-bikes with a Safe Systems Approach Webinar."

https://www.youtube.com/watch?v=V58T78ajnZQ

Spotlight: BikeMaps.org Crowd-Sourced Map

One example of a crowd-sourced map for bike safety is BikeMaps.org, launched in 2014. The website is a global mapping system for users to document locations of cycling incidents. Incident types include collisions, near-misses, cyclist hazards, bike thefts, and new infrastructure. Currently, BikeMaps.org does not segment out e-bikes.
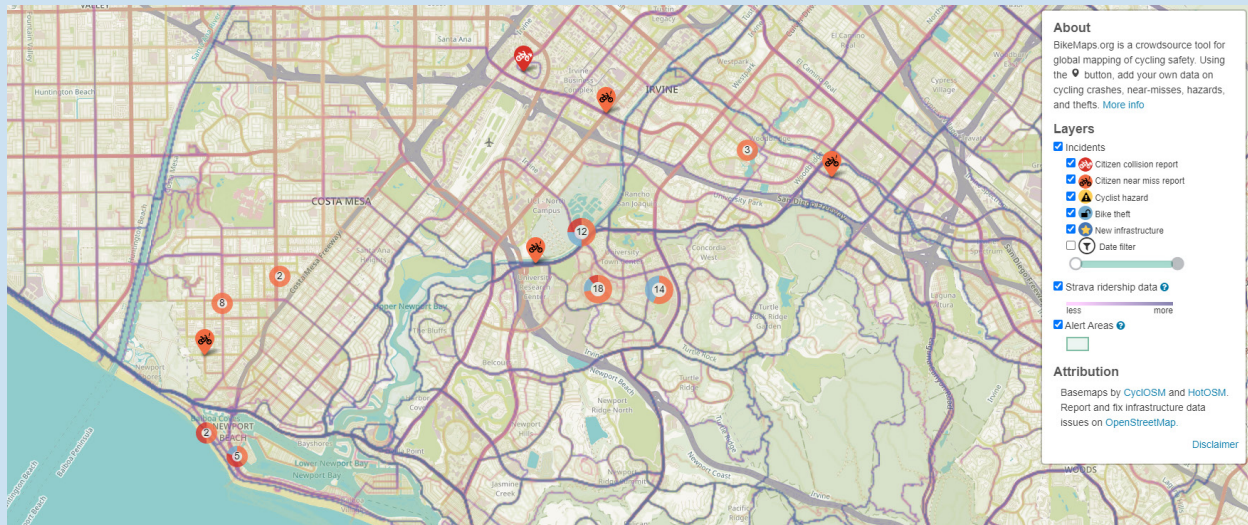

Image source: Screenshot from BikeMaps.org

STRATEGY 5:
Assess the qualitative safety experience of traveling in Orange County on e-bike and other micromobility modes.

Action 5.1: Develop a map-based reporting system for micromobility users and other community members to report near-miss collisions experienced or witnessed.

In addition to actual crashes documented by police and trauma centers, near-miss collisions involving e-bikes can also be an important metric to understand safety issues. Developing a countywide web-based reporting system can capture this data by allowing residents to submit near-miss collisions that involve micromobility modes that they witnessed or experienced.

This qualitative approach allows residents to voice their concerns and participate in the countywide effort of making streets safer for e-bike users.

Action 5.2: Engage e-bike user groups to understand their travel experience and assess the prevalence of e-bike crash under-reporting.

People's lived experiences are valuable inputs to measure the performance of e-bike safety strategies that OCTA adopts and provide context for future policy development and decision-making. Conducting regular round tables, focus groups, or interviews with various e-bike user groups, will help OCTA understand rider motivations, concerns, and experiences of riding e-bikes in Orange County. OCTA has already developed survey instruments to better understand e-bike trends for public agency staff as well as the wider community.

Sample questions asked in future surveys, focus groups, or other qualitative data collection could include some of the following:

- What type of e-bike do you own, and what were the factors you considered when purchasing an e-bike?

- Did you ride a pedal bike before you started riding an e-bike?

- What types of e-bike trips do you take most often?

- What prevents you from taking more trips on an e-bike?

- For the last three trips you took on an e-bike, what was the trip purpose and distance traveled?

- When riding an e-bike, how often do you feel in conflict with other modes (pedestrians, cyclists, transit, cars)?

- Have you experienced a crash on your e-bike? Who/what was involved?

STRATEGY 6:
Evaluate micromobility crash trends, patterns, and risk factors.

Action 6.1: Develop safety performance metrics to measure the roadway safety conditions for e-bikes and other micromobility modes.

Defining safety performance metrics related to micromobility crashes is key for establishing the baseline safety conditions for micromobility devices and for measuring the progress of the adopted safety strategies over time. The modal-specific safety performance measures can be developed in alignment with the OCTA's ongoing Local Roadway Safety Plan efforts. At a minimum, OCTA shall consider documenting and tracking the following metrics:

- Number of crashes involving micromobility devices by year, injury levels, and jurisdiction

- Number of fatal and severe injury crashes involving micromobility users under 18 and above 65

Action 6.2: Conduct systemic crash analysis to assess micromobility safety patterns and risk factors.

Once standardized data collection and monitoring for e-bike crashes and injuries has been established, OCTA can conduct safety analyses on the data to produce quantitative safety metrics. Safety analyses should follow the FHWA Safe System Approach and aim to reduce the fatalities and severe injuries of micromobility users on the road.

Safety analyses focused on micromobility can help answer the following questions:

- What roadway, contextual, and behavioral factors are contributing to fatal and severe crashes that involve micromobility users?

- How do collision trends compare across different types of micromobility devices (different e-bike classes, pedal bikes, e-scooters, etc)?

- Where are fatal and severe crashes that involve micromobility users happening?

- What crash risk factors related to roadway, land use, and socioeconomic contexts are present for micromobility users?

- Based on the crash reports from police, public health, and general public, are micromobility crashes consistently reported and tracked throughout the county?

Principles of a Safe System Approach

A Safe System Approach focuses on reducing death and serious injuries through design that accommodates human mistakes and injury tolerances. This approach uses the following principles:

- **Death/serious injury is unacceptable:** While no crashes are desirable, the Safe System approach prioritizes mitigating or reducing crashes that result in death or serious injuries.

- **Humans make mistakes:** People will inevitably make mistakes that can lead to crashes, but the transportation system can be designed and operated to accommodate human mistakes and injury tolerances and avoid death and serious injuries.

- **Humans are vulnerable**: People have limits for tolerating crash forces before death or serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates human vulnerabilities.

- **Responsibility is shared:** All stakeholders (transportation system users and managers, vehicle manufacturers, etc.) must ensure that crashes don't lead to fatal or serious injuries.

- **Safety is proactive:** Proactive tools should be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards.

- **Redundancy is crucial:** Reducing risks requires that all parts of the transportation system are strengthened, so that if one part fails, the other parts still protect people.

TABLE 4 Collisions and Injuries Strategies: Roles and Level of Difficulty

Strategy	Who's involved?			Level of Difficulty (Easy, Medium or Hard)
	OCTA	Local agencies	CBOs, advocacy organizations, other stakeholder groups	
4. Collaborate with agencies to enhance standardized tracking and monitoring of micromobility-involved crashes at the county level.	Lead	Lead/ Support	Support	Hard
5. Assess the qualitative safety experience of traveling in Orange County on e-bike and other micromobility modes	Lead	Support	Support	Medium
6. Evaluate micromobility crash trends, patterns, and risk factors	Lead	Lead/ Support	Support	Medium

RIDERSHIP:
Understand growth trends and hot spots for micromobility usage.

Micromobility ridership data is an important metric for active transportation planning and provides contextual understanding for roadway safety. At a minimum, the year-over-year ridership data can paint a broad picture of the overall growth and prevalence of micromobility usage in the county. Ridership data in spatial formats, where volumes are associated with a specific corridor, street segment, or intersection, can measure the micromobility usage or demand for an infrastructure project. In roadway safety planning, micromobility ridership data can represent exposure in safety analysis, and allows for the comparison between micromobility crash frequency and the number of micromobility trips. The following strategies aim to help OCTA deepen the understanding of micromobility activities and usage.

STRATEGY 7:
Improve and expand the existing OCTA bike count program.

Action 7.1: Identify a set of locations to collect year-over-year cyclic counts consistently.

OCTA currently conducts annual bike counts on 450 locations throughout the county for 2024 counts. New locations are identified every year based on review of roadway safety trends and demographic representation. Identifying a fixed set of locations to consistently collect micromobility counts over the years can help OCTA understand the overall growth in bike and micromobility activities. These locations should be a mix of on-street facilities and the trail system and represent the diverse demographic and geographic characteristics of the county.

Action 7.2: Expand the attributes and content collected from the count program.

The existing OCTA bike count program collects bike volume data annually on one weekday and one weekend using screen-line counts, and e-bikes are visually distinguished from conventional bikes and tallied separately. The recent battery technology improvements have made it more difficult to visually differentiate e-bikes. Therefore, developing a more robust set of micromobility attributes to collect through the count program can provide more granular, accurate understanding of the types of devices and their travel patterns within Orange County.

Additional attributes to consider for collection include:

- Speed of the micromobility device (average, 85th percentile)
- Number of wheels (2, 3, 4+)
- Presence of pedals (yes, no)
- Number of riders (single rider, two riders, 2+ riders)
- Type of devices based on micromobility classification

Number of riders can help triage vehicle type when not otherwise easily determined, and potentially track the prevalence of illegal riding behaviors. Speed of the micromobility device can help identify the type of micromobility devices while providing evaluation of compliance to speed regulations. Finally, presence of pedals and number of wheels are additional attributes that can be used to infer the type of micromobility devices.

STRATEGY 8:
Broaden the sources of micromobility ridership and activity data collection.

Action 8.1: Enhance coordination with other OCTA efforts to share and synthesize micromobility volume data.

To build a more comprehensive micromobility ridership data repository, OCTA can review existing countywide or project-specific counts programs. In addition to the annual cyclic counts, this may include other cyclic counts, screen line counts, traffic signal counts, and video counts from local jurisdictions.

The Safe Routes to School program provides a key opportunity for OCTA to gather e-bike ridership data from youth, a major user group of e-bikes. Some schools may already conduct travel tallies for events like Walk/Bike to School Day, but OCTA can collaborate with school districts or individual schools to develop tallies that include e-bikes and other micromobility devices.

OCTA can also modify Caltrans travel tally sheets or create an online form for teachers to record data. BikeWalkRoll.org offers a simple website survey for schools and classrooms to log travel tallies, though it currently lacks an option for e-bikes.

Action 8.2: Explore and evaluate micromobility activity and ridership data from data vendors.

There are a growing number of private companies that offer various software and hardware data solutions as well as analytical services to track and monitor micromobility activities based on simulated travel demand model, or location-based service (LBS) data. OCTA can explore cost-effective options that allow the agency to harness the growing amount of micromobility data available from these data vendors and service providers.

If shared micromobility services begin operation in Orange County, the Mobility Data Specification (an API developed to allow secure data flow between cities and private mobility providers) can be used to track popular routes and ridership for e-bikes and other micromobility devices.

FIGURE 3 Caltrans Sample Safe Routes to School Printed Tally Street

FIGURE 4 Online travel tally survey (BikeWalkRoll.org)

TABLE 5 Ridership Strategies: Roles and Level of Difficulty

Strategy	Who's involved?			Level of Difficulty
	OCTA	Local agencies	CBOs, advocacy organizations, other stakeholder groups	(Easy, Medium or Hard)
7. Improve and expand the existing OCTA bike count program.	Lead	Support	Support	Medium
8. Broaden the sources of micromobility ridership and activity data collection.	Lead/ Support	Lead/ Support	Support	Medium
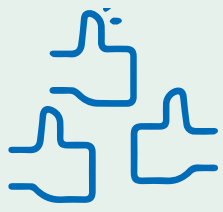
EDUCATION & ENCOURAGEMENT:
Target behavior change for key groups affected by e-bike safety issues.

The following strategies aim to help OCTA achieve behavior change for three key groups affected by and impacting e-bike safety: the school community, drivers, and older adults.

STRATEGY 9:
Develop targeted, age-appropriate e-bike safety education for riders who are most at risk in Orange County: the school community (parents, students, and staff) and older adults.

Action 9.1: Develop targeted messaging and materials for parents/caregivers and youth in the school community.

Parent-focused materials should provide information on e-bike classes and guidance to what is age appropriate for their children. Youth-focused materials should provide information on basic rules of the road and use de-jargonized language that can be delivered by teachers, parents, or peers.

OCTA has already developed a host of youth-targeted materials and should continue to focus on multimedia content focused on youth e-bike riders.

Safe Routes Partnership developed a communications toolkit (also included in Appendix A) that provides the following guidance for reaching youth with education on bike and pedestrian safety:

- Formal safety education: Bike safety skills classes can help youth understand how to safely navigate streets and traffic on an e-bike. These programs can occur before, during, or after school.

- Integration with curricula: Provide teachers with worksheets and activities that combine encouraging messaging about biking with the standard lessons on science, the environment, and math. Integrating walking and biking safety with physical education curricula can be an easy fit.

- Flyers, text messages and social media: Safety announcements should be distributed at schools using flyers, banners, and signs, as well as digitally using text messaging and social media platforms.

To develop additional educational materials for the school community, OCTA can draw on the following resources in Table 6, which are also listed in the How To-Toolkit in Appendix A.

FIGURE 5 Screenshot of OCTA Video "E-Bike Safety: Support Group – Chasing Speed"

Source: OCTA; Link to video
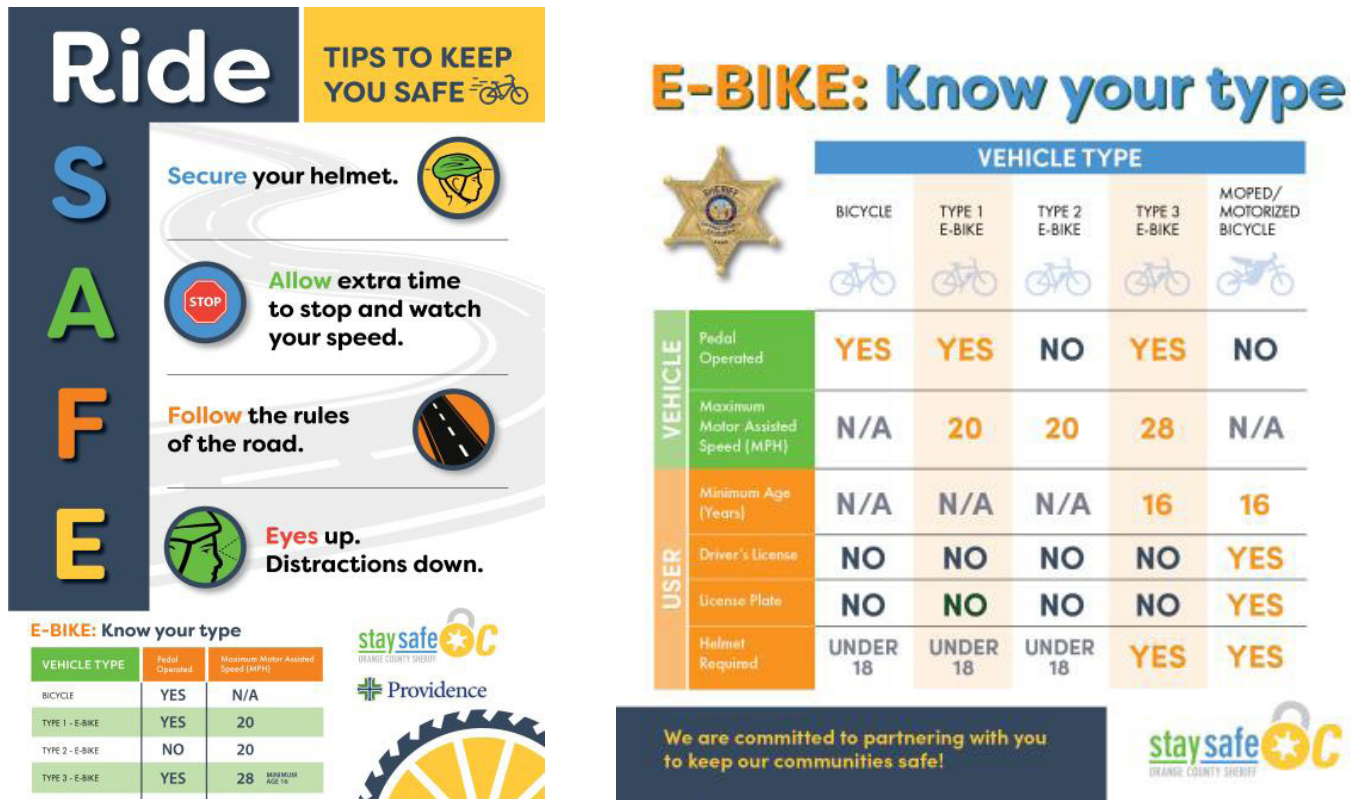
Image Sources: OC County Sheriff's Department and Providence Hospital

TABLE 6 Existing e-bike resources for parents

Resources: (Author/Source) and Description	Key takeaways for parents
Are Electric Bikes (E-Bikes) Safe for Children? (American Academy of Pediatrics): This overview of e-bikes defines the three classes of e-bikes and includes general rules of the road.	E-bikes can go faster and are heavier than pedal bikes; riders should not remove or unlock the speed limited on an e-bike. The Consumer Product Safety Commission recommends that children ages 9-12 should not operate and product that travels faster than 10 mph.
E-Bikes: What Parents Should Know (Marin Safe Routes to School Program): This two-page guide helps parents determine whether or not their child has the skills for an e-bike and provides an overview of e-bike classes.	Parents should determine whether or not their child is experienced enough to manage the increased speeds and maneuverability of a heavy e-bike. Key skills for youth riders include taking turns with vehicles, riding with the flow of traffic, using hand signals for turning, and knowing how to stop abruptly.
Are Electric Bikes (E-bikes) Safe for Kids? How to Prevent Injuries (Children's Hospital of Orange County): This guide details common injuries caused by e-bikes and offers safety advice to parents.	The biggest risk associated with e-bikes for youth is speed. Parents should ensure that their children do the following: ▪ Wear a helmet with the chin strap fastened ▪ Don't ride on an e-bike with another rider ▪ Have knowledge of road safety ▪ Stay visible while riding
Recall Search (Consumer Product Safety Commission): This database includes U.S. products that have been recalled.	Before buying an e-bike, parents should confirm there are no current recalls for the specific e-bike they plan to purchase.

Spotlight: California Highway Patrol's Ride Ready & ABC-E Quick Check

CHP's e-bike messaging uses the READY acronym to teach e-bike riders the rules of the road:

Ride Predictably: Ride in a straight line to minimize weaving in traffic; signal before making a turn; check behind you before making a turn or changing lanes.

Embrace the Rules of the Road: Obey all traffic signals and signs; ride in the rightmost lane or bicycle lane in the same direction as traffic.

Always Think Ahead: Make sure your bike is good to go with an ABC-E Quick Check; carry tools and supplies for your ride; brake sooner on an e-bike, as you will need to slow down sooner because e-bikes have more power, speed, and weight than conventional bicycles.

Do Be Seen and Be Safe: Ride where people can see you; wear bright clothing; Use a front white light, rear red light, and reflectors if riding during times of darkness.

Image source: California Highway Patrol

You Control Your Safety: Always wear a helmet; ride at a safe speed that is appropriate for where you are riding; think for yourself on group rides - while riding in a group is fun, it is crucial that you rely on your own judgement rather than someone else's.

Action 9.2: Develop older-adult specific educational materials that encourage e-bike usage while acknowledging physical challenges that can affect e-bike safety for aging populations.

Older adults have increasingly adopted e-bikes in recent years since e-bikes offer a way to maintain mobility and physical fitness as older adults experience age-related changes and challenges.

Even before the more recent rise in e-bike ridership during the COVID-19 pandemic, the rate of older Californians treated in emergency departments for pedestrian and bicycle-related injuries has been growing, with larger increases seen for bicycle-related injuries.[5]

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5 McMillan, Tracy, Ana Lopez, and Jill Cooper. "Safe Routes for Older Adults." (2018).

These statistics align with research that shows older adults have heightened interest in the safety aspects of bicycling compared to other age groups.[6]

With this context in mind, educational materials should empower older adults with safety training to encourage them to ride confidently. In general, older adults who ride bikes have similar needs as other riders to feel safe and comfortable – safe bicycle facilities, good lighting, and vehicular traffic that is low volume/low speed.[7]

Research shows that the two most significant perceived benefits of e-bikes among older adults are 1) being able to bike longer distances than with a pedal bike and 2) e-bikes compensating for health issues that make it too difficult to ride a pedal bike.[8] Encouragement messaging should highlight these benefits, as well as the physical

activity benefits of reducing the risk of coronary heart disease, stroke, high blood pressure, high cholesterol, and diabetes. Messaging should also cover basic road rules and additional precautions for age-related functional limitations.

Education and encouragement materials should also be cognizant of differing physical abilities amongst older adults. A 2022 study of people aged 65+ developed four typologies of older adult physical activities: Frail (physical activity is a "memory" and "there is disbelief that physical activity is possible"), Ambivalent (low levels of physical activity, potential safety concerns), Aspiring (aware of and regularly engages in some form of physical activity), and Active (incorporates walking, bicycling, and other types of physical activity regularly).[9] For the most impact, educational materials related to e-bike safety should target older adults who fall into the Aspiring or Active categories.

6 Kardan, Mohammadhossein, et al. "Cycling in older adults: A scoping review." Frontiers in sports and active living 5. (2023).

7 The League of American Bicyclists. "Benchmarking Insights on Older Adults." (2021).

8 Van Cauwenberg, Jelle, et al. "E-bikes among older adults: benefits, disadvantages, usage and crash characteristics." Transportation 46 (2019): 2151-2172.

9 Amireault, Steve, John M. Baier, and Jonathan R. Spencer. "Physical activity preferences among older adults: A systematic review." Journal of aging and physical activity 27.1 (2019): 128-139.

FIGURE 7 **Statewide treated and released older adult patients with pedestrian and bicycle-related injuries**

Treated & Released Patients (ages 65+) for Pedestrian and Bicycle-Related Injuries

This chart shows the number of Californians age 65 and older treated and released from emergency departments for pedestrian or bicycle-related non-fatal injuries in the years 2006-2014.
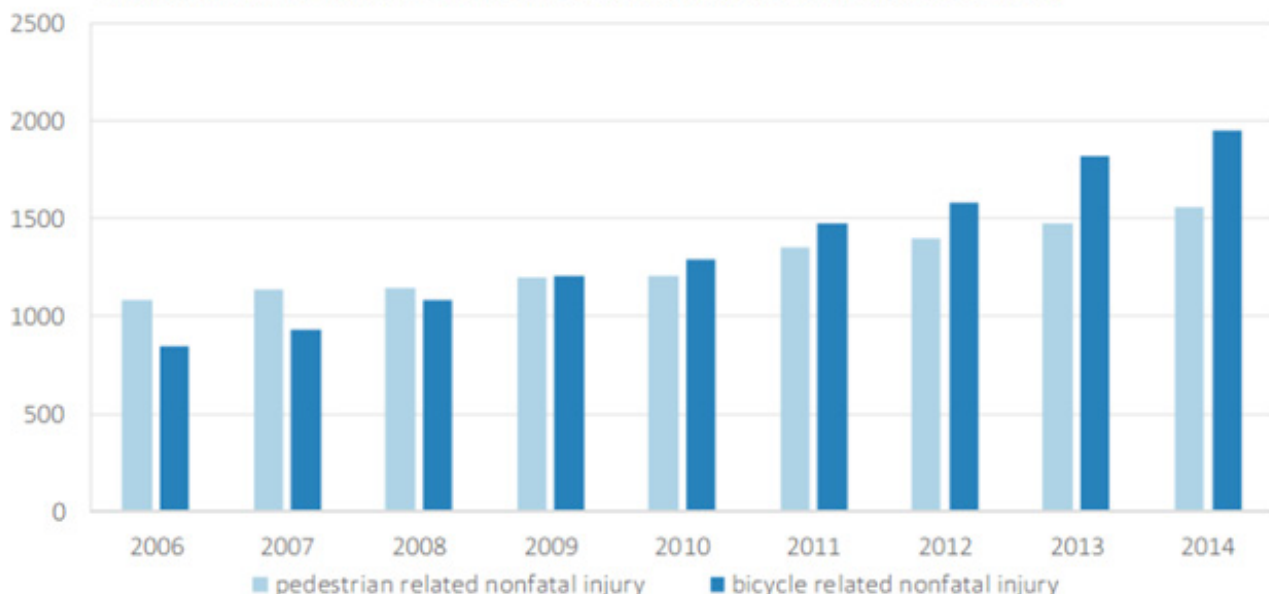
Image source: UC Berkeley SafeTrec

STRATEGY 10:
Partner with organizations and ongoing initiatives that serve target audiences to directly provide educational and encouragement resources and programs.

Action 10.1: Build partnerships with agencies and organizations who can reach target audiences directly to provide education and encouragement.

Currently, law enforcement agencies are the primary provider of e-bike education in Orange County. While law enforcement officers are often on the front lines of enforcing e-bike regulations, officers interviewed with as part of the project said that their staffing and resources are limited compared to the demand and need for e-bike safety programs and education.

OCTA can work to build capacity in other organizations to ensure that e-bike education and encouragement is available across the county. Organizations and agencies that could share resources directly include:

- **American Automotive Association (AAA):** AAA is actively engaged in the e-bike space and has developed education classes and curriculum as well as communications via their newsletters, e-blasts, and the AAA Magazine. AAA can also help promote inclusion of e-bikes in the California State DMV Driver Handbook and Drivers Education materials, aiming to improve motorist perception and awareness of faster e-bike speeds and that e-bikes may be more common on higher-volume and higher-speed roadways.

- **School Districts and Local Schools:** While school districts usually have limited communications directly with parents and students, they have connections to local schools and principals, who have direct lines of communication to the local school community. Many principals send weekly messages to school families, and some schools have social media accounts where e-bike messaging can be disseminated.

- **E-bike retailers:** Retailers are constantly engaging with new and existing e-bike riders. Detailed actions for partnership and collaboration with retailers are included in the next Strategy section.

- **Elected officials and policy makers:** E-bikes are an evolving policy area for jurisdictions in Orange County, which changes as new best practices are developed and new data is evaluated. Detailed actions for partnership and collaboration with elected officials and policymakers is included later in this section.

- **AARP:** AARP's Livable Communities Program is focused on creating safe streets and transportation options for residents of all ages, and AARP has already published a few online resources on e-bikes targeting older adults. Transportation-focused conferences, workshops, and the Livable Communities Newsletter provide opportunities to share e-bike safety information directly with the older adult community.

Action 10.2: Leverage existing SRTS programs and initiatives as opportunities for supplemental e-bike safety education and encouragement.

Implementation of the countywide Safe Routes to School Action Plan offers opportunities for OCTA to integrate e-bike safety education and encouragement with ongoing efforts in school communities. Programs and events like Walk and Bike to School Day, bike audits, bike rodeos, bike trains, and more can and should incorporate e-bike safety education.

For example, as detailed in Strategy 3, Action 1 and Strategy 8, Action 1, OCTA can support e-bike safety training and education associated with school e-bike permitting processes and encourage inclusion.

Spotlight: Shared Mobility Inc's E-Bike Libraries

As private shared micromobility operators phase out older vehicles or exit the industry, their still-usable bikes are often disposed of. Instead of disposing of their fleet, Uber donated thousands of pedal-assist e-bikes to non-profit Shared Mobility Inc (SMI). SMI worked with community groups to develop free e-bike libraries for community members. Community groups can tailor the e-bike libraries to meet their program goals, which could include education on maintenance, supporting healthy lifestyles, or teaching basic bike skills. SMI has launched e-bike library pilot programs in Buffalo, NY; Niagara Falls, NY; and Los Angeles, CA.

Image Source: Shared Mobility Inc

STRATEGY 11:
Share E-Bike Safety Plan findings as a resource for other agencies to encourage e-bike adoption and safe e-bike ridership.

Action 11.1: Develop a policy one-sheet for elected officials that identifies next steps in e-bike safety policy development.

OCTA can provide clear direction and encouragement to local policymakers through a one-sheet that distills clear next steps for e-bike policy development.

This one-sheet can also identify clear ways that elected officials such as councilmembers and mayors can act to encourage e-bike ridership while promoting safe riding behaviors (e.g. sharing bike safety resources or examining data gaps).

The one-sheet should identify and promote positive local examples of Orange County jurisdictions leading on e-bike policies across multiple policy areas, such as data collection, school bike permitting programs, and educational resources.

Action 11.2: Utilize existing regional coordination processes to improve decisionmaker awareness of current e-bike resources and needs.

In addition to presenting key policy recommendations to elected officials, OCTA can leverage its existing processes and touchpoints with jurisdictions and stakeholders to share the recommendations, strategies, and actions identified within the E-Bike Safety Plan. This includes the quarterly E-Bike meetings as well as regular agency body meetings such as the Technical Advisory Committee, the Citizens Advisory Committee, and the Bicycle and Pedestrian Active Transportation Subcommittee.

The agency can also highlight Plan strategies and actions as appropriate through overlaps with planning and funding work, emphasizing how e-bike safety strategies and policy gaps relate to ongoing efforts like data management. As safety strategies span multiple policy areas, OCTA can look to share appropriate e-bike strategies as appropriate in each project or program.

TABLE 7 Education and Encouragement Strategies: Roles and Level of Difficulty

Strategy	Who's involved?			Level of Difficulty (Easy, Medium or Hard)
	OCTA	Local agencies	CBOs, advocacy organizations, other stakeholder groups	
9. Develop targeted, age-appropriate education on e-bike safety to riders who are most at risk in Orange County: the school community (parents, students, and staff) and older adults.	Lead	Support	Support	Medium
10. Partner with organizations and ongoing initiatives that serve target audiences to directly provide educational and encouragement resources and programs	Support	Lead	Lead	Medium
11. Share E-Bike Safety Plan findings regionally, as resource for other agencies to encourage policies that support e-bike adoption and safe e-bike ridership	Lead	Support	Support	Easy

RETAILER COLLABORATION
Leverage micromobility retailers for outreach and data collection.

STRATEGY 12:
Build and sustain relationships with local e-bike retailers, partnering on safety education and encouragement efforts and incentivizing participation.

Action 12.1: Equip retailers with customer-facing materials that provide information on safe riding and maintenance of e-bikes.

Retailers are often the first point of contact for new e-bike riders, and they can serve a critical role in providing safety education. OCTA can provide retailers with print and digital customer-facing educational materials developed as part of the Education and Engagement strategies and related actions. Retailers can share printed materials with new customers at point-of-purchase or displayed in-store and can also hyperlink to digital materials on their websites.

Video Series: Charged up for E-Bikes

PeopleforBikes developed a ten-part video series aimed at retailers with information on the e-bike market along with tips for making sales. While this series is aimed primarily at helping retailers improve e-bike sales, the series also provides guidance on how to educate customers and ensure safe e-bike operations, including the following:

Understanding e-bike customers: The typical e-bike customer is a male in their 50s-60s, but retailers should be open to all customers no matter their gender, age, or skill-level. E-bike customers may have different priorities than the typical pedal-bike enthusiast – they may not have been in a bike shop before and will need more attention. Older adult customers, who are often buying an e-bike because of injury or advancing age, may need additional support.

Education on equipment: Retailers should understand and be able to explain the three classes of e-bikes. Based on customer responses to questions like "where do you plan to ride," "what appeals to you about e-bikes", and "how much do you know about the technology of e-bikes," retailers can then present a few e-bike options that fit the needs of the customer.

Action 12.2: Provide incentives for retailer participation in data collection.

Interactions between retailers and e-bike customers provide an opportunity for data collection on rider demographics as well as a deeper understanding of why people in Orange County are choosing e-bikes. If every customer purchasing an e-bike in the county was prompted to fill out a short questionnaire, OCTA could gain a wide variety of data on perceptions and usage of e-bikes to supplement insights gleaned from implementation of Strategy 5.

To encourage retailer participation in data collection, OCTA could provide a variety of incentives for retailers, including:

- Free bike accessories (helmets, lights, bike bells) to give to customers who take the OCTA survey
- Free e-bike safety training for employees
- Free advertising on OCTA-owned properties (including print/digital materials and environmental advertising on vehicles and at transit stops)
- Raffle or opportunity drawing for a customer to receive a free e-bike (purchase cost covered by OCTA)

OCTA can also prioritize retailers participating in California's E-Bike Incentive Project (launched in 2024), as these retailers have been pre-vetted by the California Air Resources Board and have a demonstrated interest in supporting e-bike encouragement and adoption.

Action 12.3: Invite local retailers to participate in education and encouragement events.

As OCTA continues to host and program e-bike education and encouragement events like e-bike rodeos, staff should invite local retailers to participate. Retailers get the opportunity to meet potential customers, while members of the public can try riding an e-bike in a safe environment that also offers safety education.

TABLE 8 Retailer Collaboration Strategies: Roles and Level of Difficulty

Strategy	Who's involved?			Level of Difficulty (Easy, Medium or Hard)
	OCTA	Local agencies	CBOs, advocacy organizations, other stakeholder groups	
12. Build and sustain relationships with local e-bike retailers, partnering on safety education and encouragement efforts.	Lead	Co-lead	Support	Medium

Funding Resources

Funding Sources

Table 9 lists a variety of funding sources available to implement Plan recommendations, strategies, and actions.

TABLE 9 Potential Funding Sources for Plan Recommendations

Funding / Source	Description	Available Funding and Timeline	Eligible E-Bike Safety Activities
AARP Community Challenge Grant / AARP	Funding to nonprofits and government entities for projects that improve public places, transportation, housing and more, with an emphasis on the needs of adults aged 50 and older.	In 2024, AARP provided $3.8 million in funding across 343 grantees Applications open annually.	Planning and engagement activities, including bike audits and other programming that create vibrant public places, deliver a range of transportation and mobility options for older adults, or increase digital connections.
Active Transportation Program / California Transportation Commission	Funding for infrastructure, non-infrastructure, and planning projects that encourage increased use of active modes of transportation.	In 2024, the CTC expected to provide $168 million in ATP funding. Applications open annually.	New education and encouragement programs for e-bike safety.
Affordable Housing and Sustainable Communities Program / California Strategic Growth Council	Funds land-use, housing, transportation, and land preservation projects to support infill and compact development that reduces greenhouse gas emissions.	In 2024, approximately $675 million was available in funding Applications open annually.	Community educational programs and training for active transportation, including bicycle safety clinics and rodeos. Programs must be available to residents of an AHSC-funded development but can also be available for the general public.
Clean Mobility Options Pilot Program / California Climate Investments	Funding and technical support for clean mobility projects and community transportation needs assessments	Up to $1.5 million vouchers to develop and launch zero-emissions mobility projects, and up to $100,000 vouchers for transportation needs assessments. $34 million is currently available.	Shared e-bike programs (bikeshare, e-bike libraries, fleets for e-bike rodeos) in disadvantaged communities.
Road to Zero Community Traffic Safety Grant / National Safety Council	Funds projects, programs, and research that helps achieve the mission of zero traffic deaths.	Grants range from $50,000 to $250,000. Applications open annually. Applicants must be Road to Zero Coalition members.	Safety research, education, and community campaigns, prioritizing those that use a Safe System Approach.

Funding / Source	Description	Available Funding and Timeline	Eligible E-Bike Safety Activities
Safety Grant Program / California Office of Traffic Safety	Funds projects that help prevent serious injury and death resulting from motor vehicle crashes	In 2023, $127.3 million was available. Applications open annually.	Safety education, encouragement, and enforcement activities that support state programs to reduce distracted driving and improve pedestrian and bicycle safety – examples include bicycle rodeos, traffic safety assessments, data collection, high visibility enforcement, GIS mapping, and crash data analysis.
Safe Streets and Roads for All / USDOT	Funding supports regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries.	$5-$6 billion is available between 2022 and 2026. Applications open annually.	Activities that support an existing Action Plan, which can include safety audits, analysis, and stakeholder engagement.
Sustainable Transportation Planning Grants / Caltrans	Funds for communities to do planning, studies, and design work to identify and evaluate projects, including conducting outreach or implementing pilot projects.	Approximately $35 million is available for the 2025-2026 cycle.	Outreach related to mode shift to electric forms of transportation and data collection/data sharing initiatives.
Sustainable Communities Program – Active Transportation and Safety / Southern California Association of Governments (SCAG)	SCAG funds projects from government entities and nonprofits that improve mobility across the region, especially for children and older adults. The program aims to invest in communities most harmed by traffic injuries and fatalities.	In 2024, SCAG has an estimated $10.4 million in funding. Applications open annually.	Local e-bike safety planning efforts located in disadvantaged communities.
Transformative Climate Communities / Strategic Growth Council and Department of Conservation	Funds community-led development and infrastructure projects that achieve major environmental, health, and economic benefits in the state's most disadvantaged communities.	In 2023, $88.5 million was available for three Implementation Grant awards. Applications open annually.	Community engagement and investments in partner and local staff development for e-bike safety are eligible for Project Development and Planning Grants.

Appendices

Appendix A: How to Toolkit

This toolkit provides resources for public agencies, retailers, school communities, other interested groups, and the general public to develop e-bike safety activities. While some of these resources are specific to e-bikes, others refer to active transportation and bikes more generally. Generally, as e-bike riders must follow the same rules are pedal bike riders, safety, education, and encouragement resources do not need to be adjusted. With the rise in youth ridership in Orange County, many resources for Safe Routes to School are applicable. The toolkit includes additional considerations specific to e-bikes that are included as notes for those using resources that are not specific to e-bikes.

Topic / Audience	Link, Author	Specific to E-Bikes?	Description	Additional considerations for including e-bikes
Safety Skills and Training / General Public	E-Bike Smart, PeopleForBikes	Yes	Online training on e-bike safety for riders, with five modules that include short videos and multiple-choice questions.	N/A
Safety Skills and Training / General public	E-Bike Safety Basics, Pedal Ahead	Yes	Online video with e-bike safety basics.	N/A
Safety Skills and Training / General public	Electric Bicycle Safety and Training, California Highway Patrol	Yes	Online safety manual with 11 modules covering equipment, rules of the road, and best practices for e-bike riding.	N/A
Safety Skills and Training/ Public agencies, school communities, general public	An Organizers Guide to Bicycle Rodeos, Safe Routes to School National Partnership	No	Instructions for planning and hosting a bicycle skills clinic.	Consider providing both e-bikes and pedal bikes for use at the skills course to allow riders to experience the different handling requirements of each, especially for turning, stops, and starts. Ensure that trainers and facilitators are familiar with e-bikes and that age requirements are met for Class 3 e-bikes if used.

Topic / Audience	Link, Author	Specific to E-Bikes?	Description	Additional considerations for including e-bikes
Safety Skills and Training/ General public	How to Prevent an Electric-Bike Fire, Consumer Reports	Yes	Guidance for battery charging, maintenance, and upkeep to prevent fires.	N/A
Safety Skills and Training/ Public agencies, school communities, general public	Roll Up to a Bicycle Skills Clinic, Safe Routes to School National Partnership	No	Instructions for planning and hosting a bicycle skills clinic.	Consider providing both e-bikes and pedal bikes for use at the skills course to allow riders to experience the different handling requirements of each, especially for turning, stops, and starts. Ensure that trainers and facilitators are familiar with e-bikes and that age requirements are met for Class 3 e-bikes if used.
Education and Encouragement / Retailers	E-Bike Advocacy Guide for Retailers, PeopleForBikes	Yes	Guidance for retailers to raise awareness about e-bikes and the resources available to man-age them, as well as make the case for better e-bike access.	N/A
Education and Encouragement / Retailers	Charged Up For E-Bikes, PeopleforBikes	Yes	Online video series providing educational guidance to selling e-bikes.	N/A
Education and encouragement / General public	Everything you Need to Start E-Bike Commuting, Bicycling Magazine	Yes	Guide for selecting an e-bike for commuting as well as guidance for battery maintenance and care.	N/A

Topic / Audience	Link, Author	Specific to E-Bikes?	Description	Additional considerations for including e-bikes
Education and Encouragement / School communities	Safe Routes to School Messaging for Pros, Safe Routes to School National Partnership	No	Communications toolkit with messaging strategies to encourage walking and biking to school.	Consider additional requirements for e-bikes on campus when developing messaging.
Education and Encouragement / School communities, general public	Are Electric Bikes (E-Bikes) Safe for Children? (American Academy of Pediatrics)	Yes	This overview of e-bikes defines the three classes of e-bikes and includes general rules of the road for children.	N/A
Education and Encouragement / School communities	Roll Bicycle Education into Your Physical Education Program, Safe Routes to School National Partnership	No	A report detailing the benefits of bicycle education and steps to take to develop a bicycle education program for physical education classes.	For programs that incorporate on-bike elements, ensure that trainers and facilitators are familiar with e-bikes and that age requirements are met for Class 3 e-bikes if used.
Education and Encouragement / School communities	E-Bikes: What Parents Should Know (Marin Safe Routes to School Program)	Yes	This two-page guide helps parents determine whether or not their child has the skills for an e-bike and provides an overview of e-bike classes.	N/A
Education and Encouragement / School communities	Are Electric Bikes (E-bikes) Safe for Kids? How to Prevent Injuries (Children's Hospital of Orange County)	Yes	This guide details common injuries caused by e-bikes and offers safety advice to parents.	N/A
Legislation / Public Agencies	Policy Statement on Electric Bicycles, League of American Bicyclists	Yes	High-level policy guidance for regulating e-bikes.	N/A

Appendix B:
Non-Infrastructure Inventory and Data Inventory

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MEMORANDUM

March 11th, 2024

Peter Sotherland, Orange County Transportation Authority (OCTA)
From: Malia Schilling, Trevor Lien, Joanna Wang, Toole Design
Project: OCTA E-bike Safety Plan

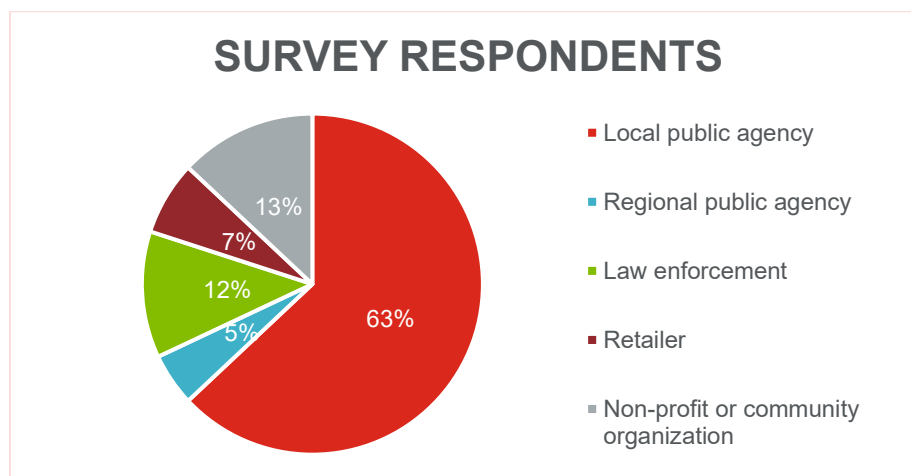**Re: Non-infrastructure efforts inventory**

Background

This memorandum identifies existing non-infrastructure e-bike safety efforts underway in Orange County and categorizes them under Education/Encouragement, Enforcement, and Evaluation.

Process

The findings in this memo are based on the analysis of online surveys distributed between October 2023 and January 2024 to Orange County's local jurisdictions, law enforcement agencies, regional agencies, retailers, and other stakeholders involved in e-bike safety efforts. There were 51 responses to the online survey; distribution is shown in **Figure 1**. The project team also conducted in-depth interviews with five stakeholders representing the American Automobile Association (AAA), local law enforcement (Costa Mesa Police Department), a local healthcare service (Providence Mission Hospital), a local retailer (Super 73), and the Southern California Association of Governments (SCAG). Additionally, the team reviewed local news articles and agency websites for additional research into ongoing non-infrastructure efforts.

Figure 1: Survey Respondents

SURVEY RESPONDENTS

- Local public agency — 63%
- Regional public agency — 5%
- Law enforcement — 12%
- Retailer — 7%
- Non-profit or community organization — 13%

ENVISIONING WHAT COULD BE, THEN BUILDING IT

Non-Infrastructure Efforts

The majority of survey respondents stated that e-bike usage has either moderately increased (30 percent) or majorly increased (51 percent) in the past year, highlighting the rapid adoption of e-bikes across Orange County.

Non-infrastructure efforts varied across survey respondents, with a substantial number reporting that they were unaware of any e-bike safety efforts in their community, and others developing cross-departmental partnerships and collaborations to address the rise of e-bike safety concerns. The most commonly cited type of safety resource available was education/encouragement (Figure 2).

Figure 2: Knowledge of E-Bike Safety Resources (survey responses)
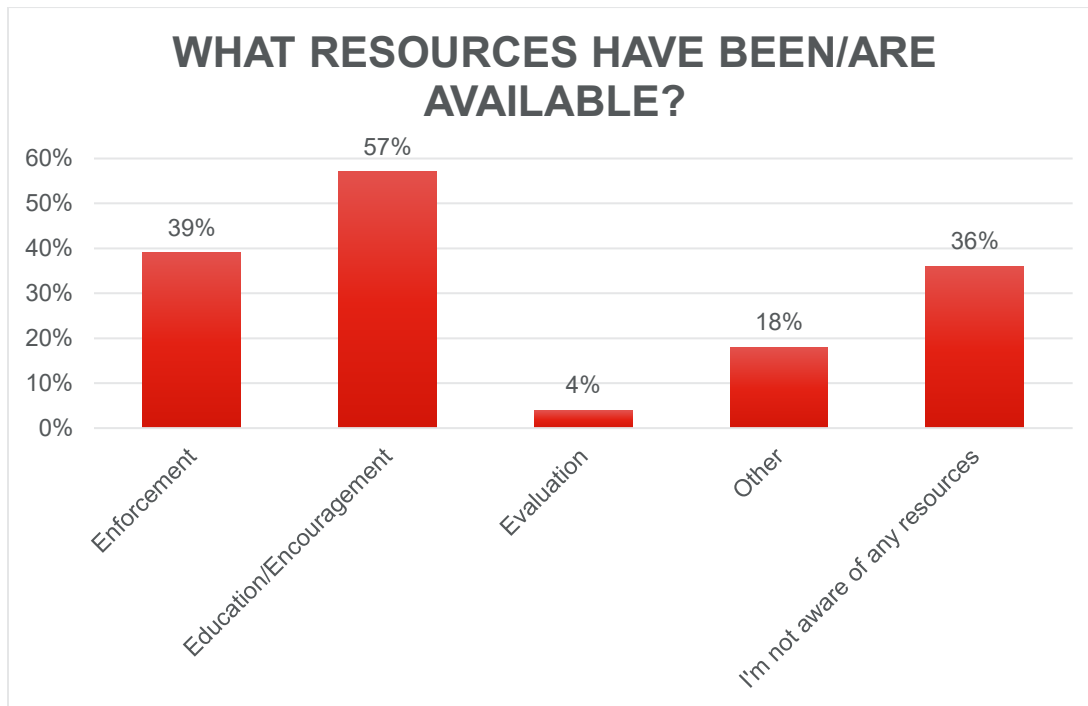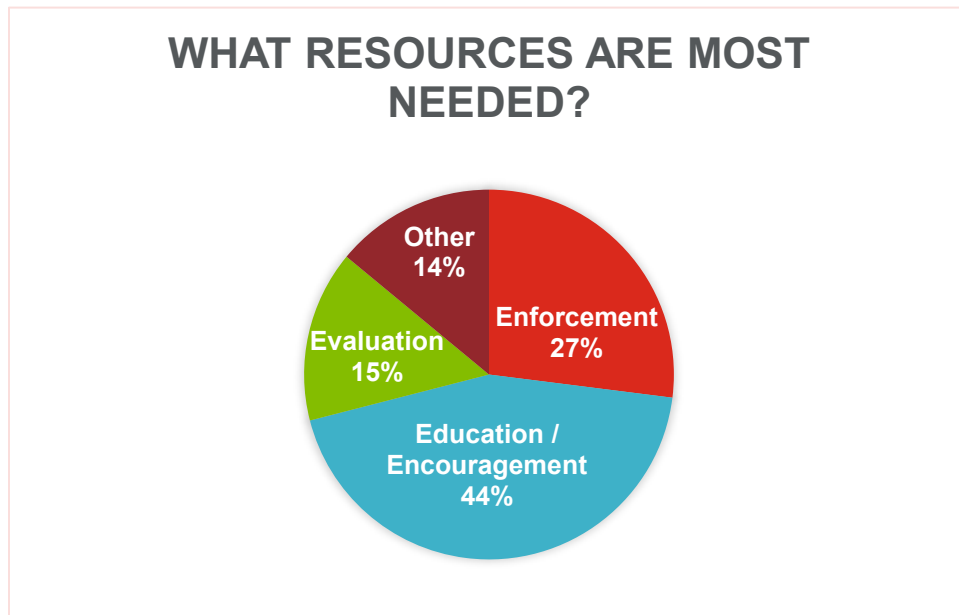

Key themes identified across non-infrastructure efforts included

- a focus on providing education and encouragement to school-aged youth in partnership with law enforcement
- providing hands-on opportunities to build safety skills at bike rodeos
- increasing enforcement with warnings and/or tickets, and sharing informational resources online and in-person.

Survey respondents also identified which non-infrastructure resources were most needed in their community (see **Figure 3**). The most popular response (44 percent of all respondents) was education/encouragement, which was also the type of resource that was most widely available based on survey respondents' previous answers. This likely indicates that even though educational and encouragement programs and initiatives are already in place, there is room for expansion and growth.

WHAT RESOURCES ARE MOST NEEDED?

Other 14%
Enforcement 27%
Evaluation 15%
Education / Encouragement 44%

Education/Encouragement

Most education and encouragement programs around e-bike safety were concentrated on school initiatives and focused on youth riders.

E-bike Permits/Registration

Multiple school districts (Capistrano Unified School District, Ocean View School District, Los Alamitos Unified School District, Huntington Beach Union High School District, Irvine Unified School District) have specific requirements for students who wish to ride an e-bike to school. Students are usually required to complete a comprehensive bicycle safety training program and are given a registration sticker for their e-bike upon program completion, allowing them to park their e-bike on campus.

Example of School E-bike Permit

Presentations from Law Enforcement

Close partnerships with local law enforcement are also common in areas that see a high number of youth riders. In Irvine, Students are required to attend an e-Vehicle Safety Presentation from the Irvine Police Department (IPD) before they are allowed to ride e-bikes to campus, and IPD officers visit school assemblies to share safety information. In Dana Point and Mission Viejo, School Resource Officers give e-bike safety presentations to students to teach them rules of the road.

Bike/e-bike Rodeos

Multiple cities (Huntington Beach, Laguna Hills, Mission Viejo, and Costa Mesa) have hosted e-bike rodeos targeting middle and high school students. These rodeos usually take place on school property or a local church or community center parking lot and include an overview of rules of the road as well as a safety skills course for riders to practice.

2022 E-Bike Rodeo at Newhart Middle School in Mission Viejo, led by the Orange County Sheriff's Department (Photo credit: CUSD Insider)

Multimedia Resources

Youth in Orange County, like their counterparts across the state and country, are usually digital natives who consume most of their media online. Pew Research Center has found that as of 2023, the majority of today's teens report using YouTube, TikTok, Instagram, and Snapchat[1]. OCTA has already specifically created <u>youth-oriented TikTok/Instagram/Youtube content on e-bike safety</u>, Additionally, OCTA developed e-bike materials such as postcards, hangers, and stickers that focus on safety messaging. Huntington Beach Police Department has created multiple <u>Instagram bike education posts</u>, and the Orange County Sheriff's Department has developed a series of YouTube videos specifically related to youth riding e-bikes:

- <u>General E-bike Safety Video</u> (E-bike section begins at the 1:00 minute mark): This video is geared toward youth and includes regular tips for bike riding as well as information on e-bike classes and warnings to watch your speed.
- <u>Don't Ride Distracted Video</u>: This video shows a youth e-bike rider who doesn't wear a helmet and is struck by a driver, and encourages young riders to wear a helmet and ride responsibly.
- <u>E-bike Safety – Know Your Type Video</u>: This video, geared toward parents, explains the different e-bike classes and associated rules and age restrictions.

Enforcement

All of the seven survey respondents who identified as law enforcement stated that they have adequate resources and are currently undertaking enforcement activities that target helmet usage, age restrictions, and/or other e-bike related laws. Law enforcement officers often focus their enforcement on school areas. For

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[1] <u>Teens and social media: Key findings from Pew Research Center surveys</u>

example, Irvine Public Safety places warnings on e-bikes illegally parked at schools. Often, officer patrols focused on e-bike safety issue warnings instead of issuing tickets. In addition to patrols, Huntington Beach uses radar feedback signs on the beach path to promote slower speeds and sharing space with pedestrians. Multiple respondents noted the rise in motor-driven cycles/mopeds (SurRon, Talaria, etc.) and that they've increased enforcement around these vehicles, which are not classified as e-bikes. The Mission Viejo Police Department now has a zero-tolerance policy for riders of these vehicles who do not have a license, registration, helmet, or are riding off-street.

Enforcement of safe e-bike riding behavior has been a challenge for local law enforcement. Officers require training on how to identify e-bikes, which can often look like traditional pedal bikes, as well as motor-driven cycles that can look like e-bikes. In Costa Mesa, the city council originally directed their local police department to do e-bike safety education instead of enforcement, but in an interview a Costa Mesa police officer stated that this may be starting to shift due to increases in e-bike related collisions and injuries.

Evaluation

Only two survey respondents stated that their community conducts evaluation related to e-bike safety: the City of Newport Beach and Providence Mission Hospital. Newport Beach stated that they include pedestrian and cycling counts as part of their project process, specifically for intersection studies. Providence Mission Hospital produces a quarterly report of pedal bike and e-bike injury trends for the South County and contributes their data to the Emergency Medical Services Authority (EMSA) database, which is a centralized database for trauma visits across the state.

Infrastructure Needs

Although outside the scope of this project, respondents also highlighted the importance of infrastructure improvements. Over half of respondents stated that off-street bikeways (Class I) or separated bike lanes (Class IV) were the types of infrastructure most-needed to support safe e-bike usage (**Figure 5**).

Figure 4: Infrastructure needs (survey responses)
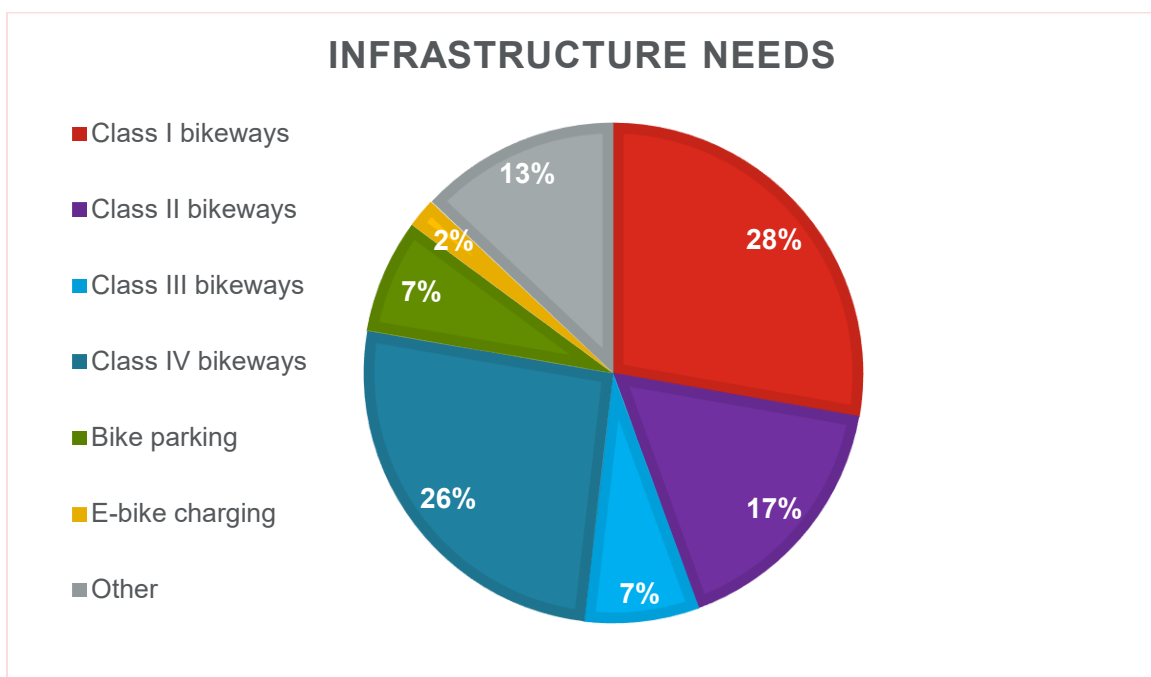
In an interview, staff from the Southern California Association of Governments (SCAG) stated that their member jurisdictions across the six-county region had concerns about the lack of safe bicycle infrastructure as well as theft of e-bikes when parked insecurely in the public right-of-way.

Non-Infrastructure Funding

Local jurisdictions in Orange County can apply for multiple sources of non-infrastructure funding to support education and encouragement around safe e-bike usage:

- Sustainable Transportation Equity Project (STEP): The program makes $2 million available for planning and capacity building grants. Funding is intended to help low-income and disadvantaged communities identify residents' transportation needs and prepare to implement clean transportation and land use projects.
- Office of Traffic Safety (OTS) Grant Program: The program provides annual funds to prevent serious injury and death resulting from motor vehicle crashes so that all roadway users arrive at their destination safely. Funds can be used for bicycle and pedestrian safety (i.e. Bike Rodeos).
- Affordable Housing and Sustainable Communities Program (AHSC): The program funds land-use, housing, transportation, and land preservation projects to support infill and compact development that reduce greenhouse gas emissions. Educational programs funded through AHSC must be connected to the affordable housing component of the grant.

There are two funding options (one forthcoming) for individuals in Orange County to purchase an e-bike:

- California E-Bike Incentive Project: Scheduled to launch in 2024, the project will provide voucher incentives for low-income residents to purchase e-bikes. Safety and education training will be part of the application process before e-bike purchase.
- Replace Your Ride: Individuals can receive an incentive of up to $7,500 toward purchase of an e-bike in exchange for turning in an old gas-powered car.

Only five of 55 respondents surveyed stated that they had used regional or state funding to support efforts relating to e-bike safety. Funding sources referenced by survey respondents included the California Office of Traffic Safety (OTS) and the California Transportation Commission's (CTC) Active Transportation Program (ATP), but respondents stated that they used these funds more broadly on projects that supported bicycle infrastructure or planning.

Next Steps: Identifying Gaps

As part of Task 5, the project team will conduct a gaps analysis of e-bike safety resources, policies, and programs. This non-infrastructure inventory demonstrates that although there are quite a few jurisdictions and organizations already working on improving e-bike safety, these activities usually do not cross jurisdictional lines and many local agencies are struggling to determine best practices for laws and regulations that promote e-bike safety. The final E-Bike Safety Plan will incorporate the lessons learned from the non-infrastructure inventory, and include strategies to address the need for more education and encouragement around safe e-bike ridership identified in this memo.

TOOLE DESIGN

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MEMORANDUM

March 4th, 2024

To: Peter Sotherland, Orange County Transportation Authority (OCTA)
From: Malia Schilling, Trevor Lien, Joanna Wang, Toole Design
Project: OCTA E-bike Safety Plan

Re: Data Source Inventory Memorandum

This memo on data sources is prepared for OCTA as a part of **Task 4: E-Bike Resource Evaluation**. Through the collection and review of existing data sources relevant to electric bicycles (e-bikes) that would be useful for future policy development and decision-making, this memo does the following:

a) Documents available data that portrays e-bike ridership, sales, and funding.
b) Reviews policies, regulations, and safety metrics in Orange County that would be crucial to understand e-bike patterns in Orange County.
c) Highlights e-bike data collection or monitoring program gaps.

E-bike adoption has grown rapidly in Orange County based on a review of ridership, safety indicators, and local agency's response to ordinances. The review of available data highlights the reality that there remain areas that lack consistent and uniform tracking of key e-bike safety metrics. In addition, the resulting assessment clarifies areas where data are available, consistent, and support decision making for safe e-bike operation. Key takeaways include:

- Collision and injury data specific to e-bikes is limited. There is not currently a standard and dedicated e-bike coding for collisions, leaving it up to local agencies to add coding to their systems without consistency between agencies.
- While agencies report higher ridership, actual count data is limited and constrained by the difficulties in distinguishing e-bikes from pedal bikes.
- National e-bikes sales trends show year over year increases in units sold, but sales data on a local or regional level are not readily accessible from individual and consolidated sources.
- Local agencies are responding to the growing usage of e-bikes with a desire to manage safe operation by implementing ordinances; most agencies have Active Transportation Plans (ATPs), but ATPs often do not have yet incorporated direct attention toward e-bikes from a planning, engineering, and/or programmatic level.

Literature Review

The project team reviewed a selection of studies that analyzed e-bike safety trends, with a focus on the difference between e-bikes and pedal bikes. An overview of reviewed research and a summary of key findings is included in **Table 1**. Current literature suggests that the rate of collisions and injuries are similar for both e-bike riders and pedal bike riders.

Table 1 E-bike Safety Research Summary

Study	Research Overview and Goals	Key Findings
E-bike Safety: A review of Empirical European and North American Studies *(Cherry and MacArthur, 2019)*	Synthesis of existing research in Europe and North America to show differences in e-bike safety outcomes compared to pedal bikes	• Class 1 e-bikes travel marginally faster than pedal bikes (an average of 2-5 km) and have higher conflict rates and safety-oriented maneuvers compared to pedal bikes. • Class 3 e-bikes travel substantially faster than pedal bicycles (around twice the speed), but there is little evidence that they are overrepresented in injury databases • Average e-bike injury severity is the same as pedal bike
The impact of e-cycling on travel behavior: A scoping review **(Bourne et al, 2020)**		• The proportion of e-bike trips that replaced pedal bike trips ranged from 23 percent to 72 percent of total trips, and replacement of private car trips ranged from 20 percent to 86 percent • Studies vary on the impact of e-bike speed on safety: in some studies participants report feeling safer on an e-bike compared to a pedal bike because they can keep up with traffic, while in other studies participants report that e-bike speed created dangerous situations
What do we know about pedal assist e-bikes? A scoping review to inform future directions **(Jenkins et al, 2022)**	A scoping review of existing literature (107 articles) on pedal-assist e-bikes to identify future directions for research, policy, and infrastructure development	• Accidents, injury rates, and violations are generally similar between pedal-assist e-bike riders and pedal bike riders. • Motorist perceptions of pedal-assist e-bike speeds are poor • E-bike speeds are generally under 20 km/hr
Safety of e-bike compared to conventional bicycles: What role does cyclists' health condition play? **(Schepers et al, 2020)**	Cross-sectional case study in the Netherlands comparing e-bike and pedal bike users through a survey and control group data	• E-bike riders had poorer health than pedal bike riders, but were not more likely to be involved in a crash or to sustain more severe injuries

E-Bike Experience: Survey Study of Australian E-Bike Users (Washington et al, 2020)	Survey of e-bike user demographics and travel behavior for riders in Brisbane, Australia	• E-bike riders often choose to use their e-bike for trips they would have otherwise taken using a motor vehicle • E-bike riders preferred to use their e-bike over a pedal bicycle because it allowed them to go up hills, travel further, travel to more places, and was more fun to ride • One-third of e-bike riders experienced at least one crash, but few reported that their e-bike contributed significantly to the crash
Risky riding: Naturalistic methods comparing safety behavior from conventional bicycle riders and electric bike riders (Langford, et al., 2015)	GPS-based safety study in Tennessee to compare e-bike and pedal bike riders' safety behavior	• E-bike riders exhibit nearly identical safety behavior as regular bike riders and should be regulated in similar ways. • E-bike and pedal-bike riders have very high violation rates of traffic control devices (70 percent) • Average on-road speeds of e-bike riders (13.3 kph) were higher than regular bicyclists (10.4 kph) but shared use path (greenway) speeds of e-bike riders (11.0 kph) were lower than regular bicyclists.
E-bike safety: Individual-level factors and incident characteristics (Haustein, et al., 2016)	Analysis of factors that contribute to perceived e-bike safety and involvement in safety critical incidents in Denmark	• Older adults and women had more negative associations with perceived e-bike safety. • Older cyclists were more likely to report problems maintaining balance due to the weight of the e-bike. • Of e-bike riders who experienced a safety incident they believed would not happen on a pedal bike (29 percent), they stated that these incidents were due to issues regulating e-bike speed or other road users underestimating e-bike speeds.
Analysis of ebike dynamics and cyclists' anxiety levels and interactions with road vehicles that influence safety (Pejhan, et.al., 2021)	Investigate factors that affect anxiety level of e-bike riders	• The significant difference in acceleration between e-bikes and conventional bikes does not change the perception of safety for cyclists. • The majority reported perceived risks of cycling on a shared road with other vehicles regardless of the demographic differences. • Dense traffic in the afternoon and the demands of riding a bike in complex traffic conditions result in a higher mental workload even though cyclists slowed down their speeds.

E-bike Collisions and Injuries

This section reviews the safety trends of e-bike related collisions between 2017 and 2021. As an emerging mode of transportation, e-bike presence and segmentation in crashes will become more critical when analyzing safety challenges and conditions related to active transportation.

As of December 2023, the presence of an e-bike at a collision is not systemically coded in the Statewide Integrated Traffic Records System (SWITRS). Some local agencies and healthcare systems in Orange

County have begun to track e-bike crashes, but there is currently no county-level coordination or best practices on how to record e-bike collisions. A summary of the current data availability and existing gaps is presented in **Table 2** and also detailed in the section below.

Table 2: E-bike Collision and Injury Data Availability

E-BIKE CRASHES	DATA TYPE/SOURCE	OVERVIEW
	Collision data from local jurisdictions	• OCTA has begun to collect crash data from agencies, however not all local agencies are currently segmenting e-bike crashes and contributing to countywide collection. OCTA has not yet received crash data from local jurisdictions.
	Statewide Integrated Traffic Records System (SWITRS)	• E-bike involvement in collisions is not systemically coded in the Statewide Integrated Traffic Records System (SWITRS) • The California Highway Patrol (CHP) 555 form does not include segmentation unless an e-bike is towed
	Hospital Records, Health Insurance Claims, Emergency Medical Service (EMS)	• Inconsistent tracking of trauma visit mechanism of injury (i.e. St. Jude doesn't track e-bike related injuries, but Providence Mission Hospital does) • Lack of countywide monitoring or tracking / and/or access to EMSA data that may or may not have e-bike segmentation
	Case Studies	• Local best practices collected and assessed

Statewide Collision Database

Maintained by the California Highway Patrol (CHP), the California Statewide Integrated Traffic Records System (SWITRS) is a centralized crash database for data submitted in California Crash Report Form CHP555. SWITRS contains all crashes reported to CHP by local and state government agencies. The Transportation Injury Mapping System (TIMS) developed by Safe Transportation Research and Education Center (SafeTREC) at University of California, Berkeley cleans and geocodes all injury crashes data from SWITRS to be analysis ready.

Currently, e-bikes are only documented in SWITRS when they become inoperable after a crash and need to be towed by CHP: The "CHP Vehicle Type Towing" attribute in the party table lists "Electric Bicycle (Class 1, 2, and 3)" as one of the possible values. **Figure 1** summarizes the number of crashes where an e-bike is noted as being towed by CHP for a five-year period from 2017-2021. 2020 and 2021 saw a significant increase in crashes, resulting in e-bikes being towed compared to previous years.
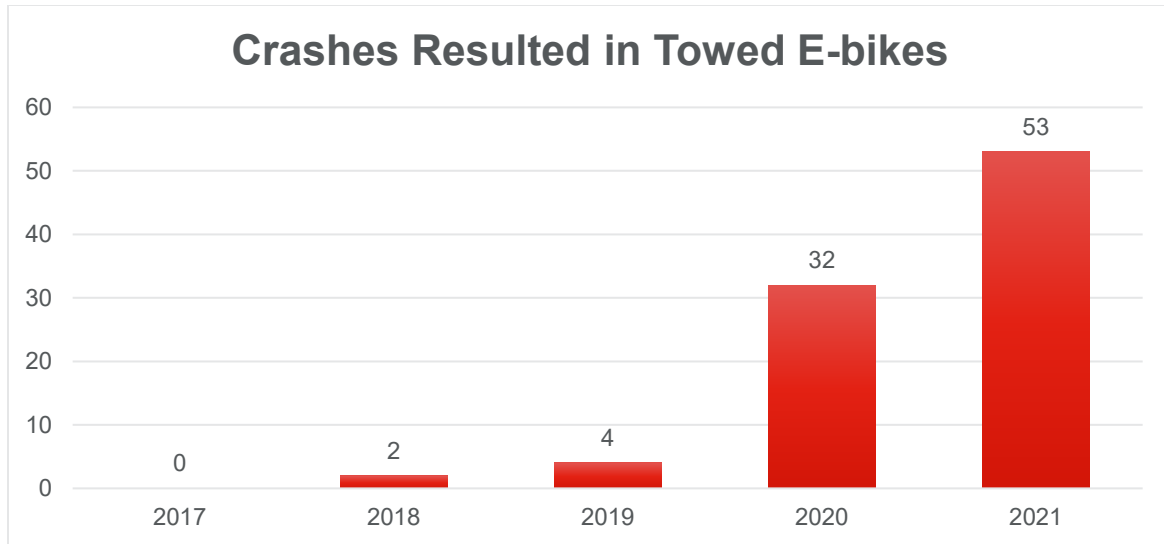
Crashes Resulted in Towed E-bikes

Year	Crashes
2017	0
2018	2
2019	4
2020	32
2021	53

Figure 1 Number of Crashes Resulted in Towed E-bikes by Year (2017 to 2021)

Among the 91 crashes that involved towing an e-bike, cyclists were stated as at fault for 78 percent. 19 (21 percent) of the collisions resulted in fatalities or severe injuries. The top two contributing factors for collisions were cyclist unsafe speeding and motorist improper turning. Demographics for the e-bike riders involved in these collisions were as follows: 31 percent were female, 23 percent were 16-years old or younger, 15 percent were aged 56-65, and 22 percent were BIPOC.

Figure 2 maps out the locations of the e-bike-involved crashes. The vast majority of collisions (89 percent) were clustered in Newport Beach, with some scattered occurrences of KSI crashes in Westminster and San Clemente. Notably, cities like Huntington Beach, Anaheim, and Santa Ana that have reported significant levels of e-bike activities do not see any e-bike crashes. It is unclear whether the absence of crashes is due to inconsistent crash report documentation across police departments in different jurisdictions.

The vehicle towing type attribute in SWITRS can be an important metric to monitor for e-bike crashes. Further understanding of jurisdictions' processes for filling the California Crash Report Form CHP555 can potentially improve data completeness and data quality across the county.
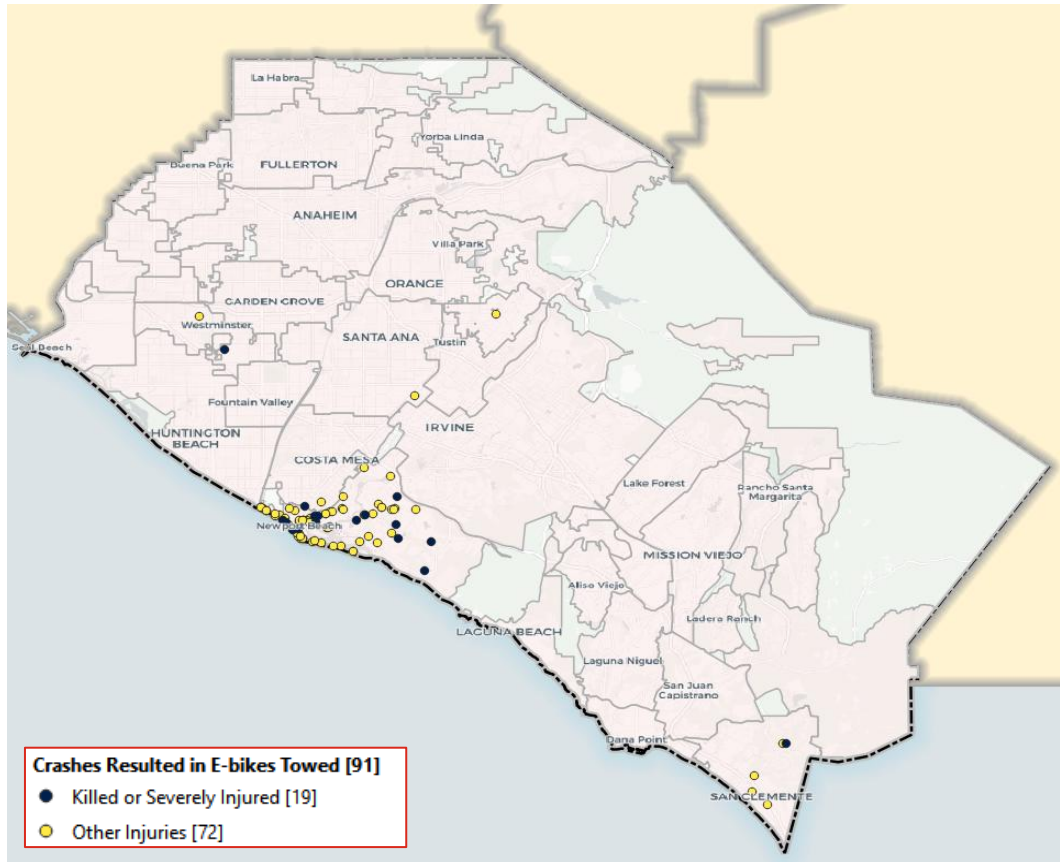
Figure 2 Locations of Towed E-bike Crashes by Severity (2017 to 2021)

Hospital Records and Emergency Medical Service (EMS)

Public health and emergency medical services can serve an important role in reporting on e-bike injuries. The project team reached out to contacts at regional hospitals and the Orange County Health Care Agency (OCHCA) to learn about the e-bike trauma injuries programs in place.

The efforts of Providence Hospital at Mission Viejo provide an example of a medical center conducting ongoing data collection and an opportunity to understand regional e-bike injury trends. The project team reviewed the data reports from Providence Hospital Trauma Services and interviewed the Trauma Injury Prevention Coordinator, Georgi Mercado.

The Trauma Center at Providence Mission Hospital has been tracking e-bike related injuries since 2019 (see **Figure 3**).[1] Their records show that e-bike related trauma patients in South Orange County have increased dramatically - from 15 patients in 2019 to 221 patients in 2022. In comparison, the number of pedal-bicycle-related trauma patients has been in decline, and motorcycle trauma patients have stayed steady. As e-bikes are a new and emerging form of transportation, Providence Mission Hospital had some inconsistencies in tracking e-bike related injuries between 2018 and 2020, and some may have been miscategorized as pedal-bike- or motorcycle-related.

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[1] E-Bike Trauma Injuries Continue To Increase, Trauma Services, Providence Mission Hospital (2022)
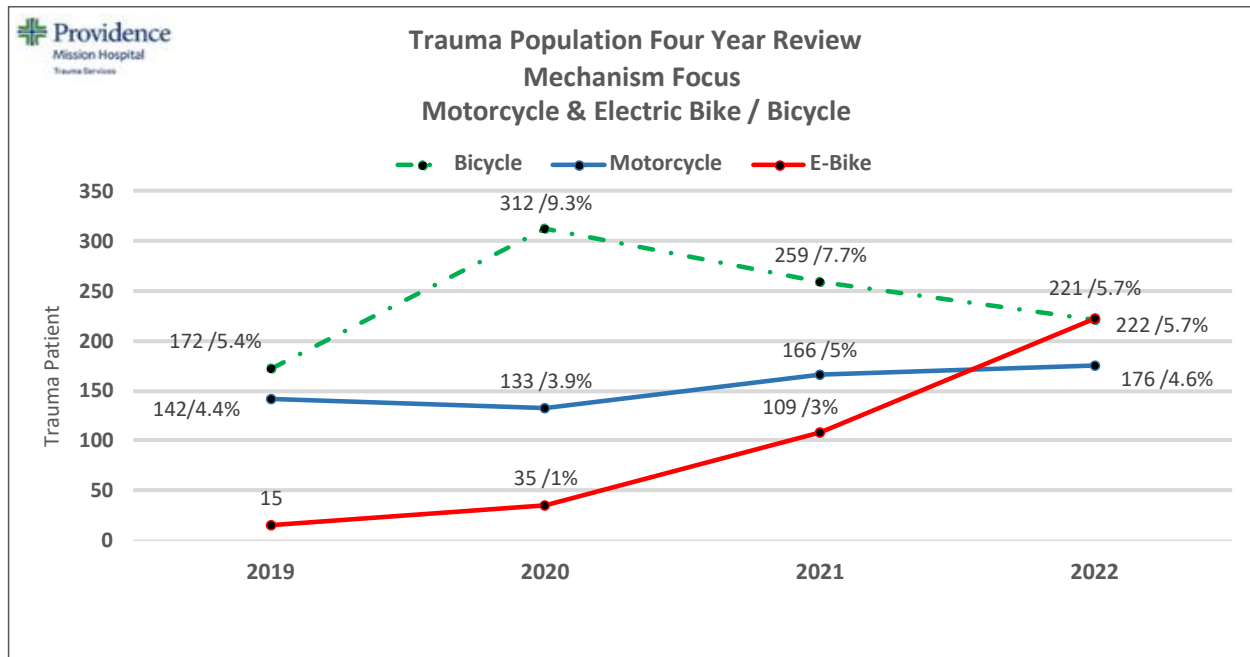
Figure 3 Trauma Patients by Mode and Year (Data Source: Providence Hospital, 2022)

Helmet wearing and the influence of drugs or alcohol have been identified as risk factors for trauma e-bike injuries; e-bike rider age is also an important factor.[2] **Table 3** shows that during the spikes of e-bike trauma patients between 2020 and 2022, the number of pediatric patients aged 17 and under grew significantly faster than other age groups. This could be attributed to the growing popularity of e-bikes among the youth population and indicates the need for targeted educational and programmatic efforts to reduce serious and fatal injuries in youth e-bike riders. In 2021, Providence Hospital launched the "Save the Brain" campaign as part of the trauma injury prevention outreach and offer free multisport helmets to youths.

Table 3 Growth in E-bike Trauma Patients by Age Groups (Providence Mission Hospital)

Year	Growth in E-bike Trauma Patients	Age Groups		
		Growth in patients 17 and under	Growth in patients 18-54	Growth in patients 55 and above
2020-2021	211%	450%	154%	177%
2021-2022	104%	134%	121%	28%

The project team will explore opportunities for further coordination with Trauma Centers across the county to monitor countywide performance on e-bike trauma injuries. Suggestions from conversations with Providence Mission Hospital staff included a standard coding system for documenting e-bike trauma injuries and identification of a set of measurable performance metrics to report, which can be important for consistent tracking across the county. Hospitals can also contribute data to the National Electronic Injury Surveillance System (NEISS), which collects data on consumer product-related injuries in the United States. A study of NEISS data found that injury rates have increased from 2012 to 2017 from 0.05 injuries per 100,000 people to 0.25 injuries per 100,000 – approximately 1.4 injuries per 1,000 e-bikes.[3]

Collision Records from Local Jurisdictions

In 2023, OCTA started coordination to acquire crash data reporting directly from member jurisdictions. So far, OCTA has identified point of contacts from the City of Laguna Niguel, which started tracking e-bike related crashes. Establishing direct reporting channels for e-bike related collisions with serious and severe injuries could allow OCTA to get the pulse of e-bike safety conditions and measure the performance of new safety programs and initiatives. Direct reporting can also provide faster status updates than the SWITRS database and enable OCTA to be more responsive to e-bike related safety trends.

E-bike Ridership, Sales, and Funding

Understanding the shift in e-bike activity can provide context to interpret the e-bike related roadway crashes and injuries. This section summarizes the data sources used to depict e-bike usage and ridership trends in Orange County, through a review of annual cyclic counts, e-bike sales, and funding sources for e-bike-related programmatic activities and infrastructure. A summary of the e-bike ridership, sales, and funding activity data gaps is presented in **Table 4** and detailed in the section below.

Table 4 E-bike Ridership, Sales, and Funding Data Availability

E-BIKE ACTIVITY	DATA ITEM	OVERVIEW
	E-bike traffic counts	• Advancements in e-bike battery technology have made it more difficult to differentiate bike vs e-bikes • Select count locations based on recent e-bike safety trends and ensure equity representation countywide
	E-bike sales	• Lack of retailer participation in providing aggregated and high-level sales data • No clear data for OC related e-bike sales data and/or segmented across different areas of the county
	E-bike funding for programmatic activities and/or funding for infrastructure	• Evolving grant opportunities requires close monitoring

[3] Jamerson, F. E. and E. Benjamin (2016). Electric Bikes Worldwide Reports - Light Electric Vehicles / EV Technology with 2016 update.

OCTA has conducted annual cyclic counts since 2020. Each year, 120 locations are identified for screen-line counts, with the goal of getting a representative coverage of countywide geography as well as a balance between existing and planned facilities. These locations may differ from one year to the next, unless a specific location needs a comparison of bike volume fluctuations across years. E-bikes are visually distinguished from conventional bikes and tallied separately, although the recent battery technology improvements have made it more difficult to visually differentiate e-bikes.

Figure 4 shows the level of e-bike activities in 2020 and 2023, separated by weekday and weekend. When comparing the weekday trends between 2020 and 2023, there was a shift and expansion of e-bike activities from coastal cities to inland cities like Anaheim, Santa Ana, Irvine, and Mission Viejo. Weekday activities have grown faster than weekend activities, possibly related to the return to office commute patterns after the COVID-19 pandemic.
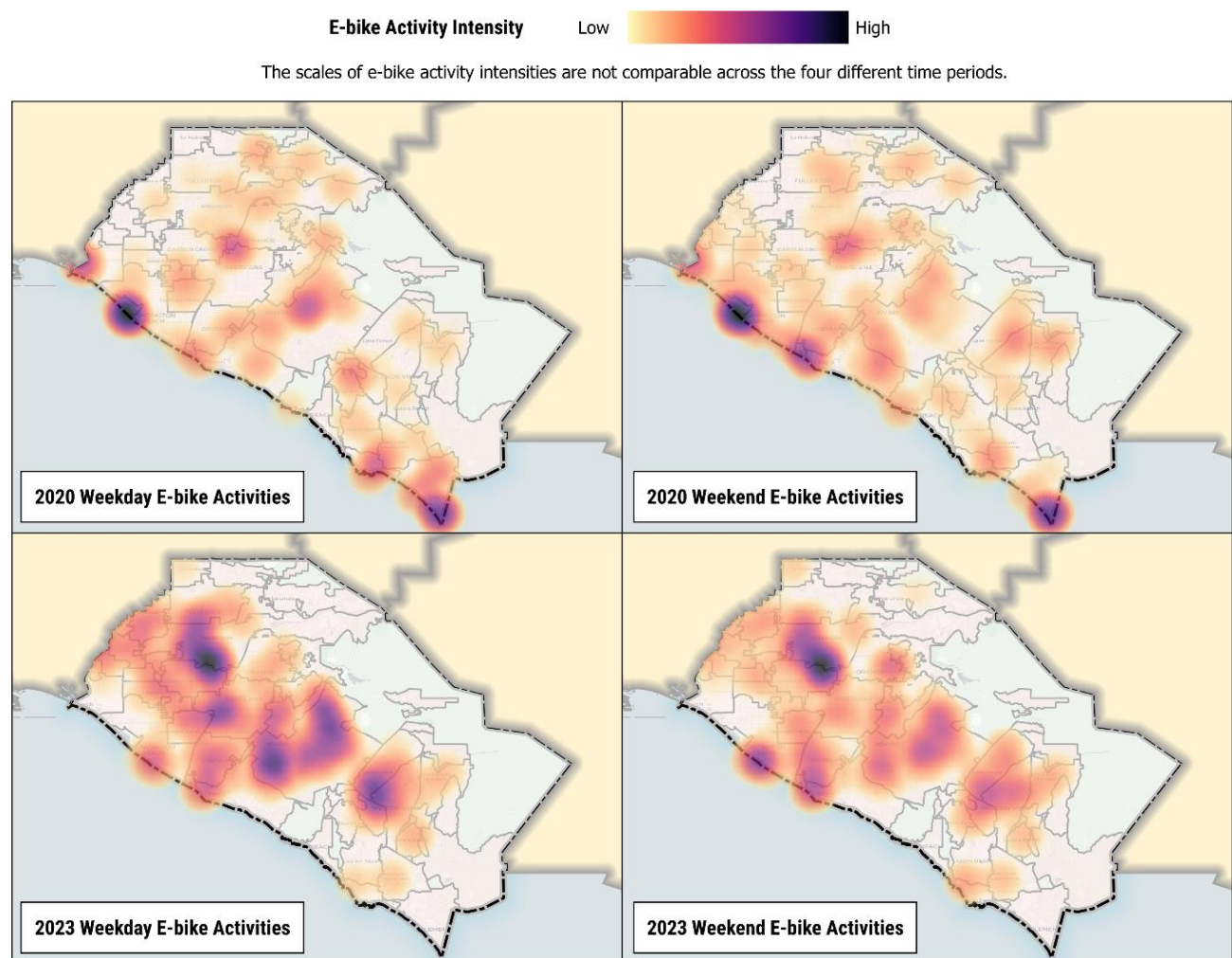

Figure 4 E-bike Volumes in 2020 and 2023 (Data Source: OCTA)

OCTA currently has a well-established bike count program that conducts annual, countywide counts that provide detailed insights on e-bike travel trends separated from conventional bikes. The count location selection process can benefit from the inclusion of safety measures, so OCTA can better understand if a

concentration of e-bike activities is correlated to high frequency of e-bike crashes. Similarly, having representative count locations in both equity priority areas and affluent neighborhoods in the county can provide some context for OCTA to evaluate the equity implication of the growing e-bike popularity.

Apart from the countywide e-bike activity tracking that OCTA conducts annually, the City of Laguna Niguel has taken local actions to track e-bike activities at public schools.[4]

E-bike Sales

E-bike sales trends demonstrate the rise in ridership and provide context for the increase in e-bike injuries. As local Orange County data was unavailable, the project team researched national e-bike sales trends between 2018 and 2022 (see **Figure 5**). While the nationwide e-bike sales were stable around 300,000 per year in 2018 and 2019, there was a significant increase starting in 2020. By 2022, annual sales more than doubled the 2018 baseline, and reached around 1.1 million sales per year.
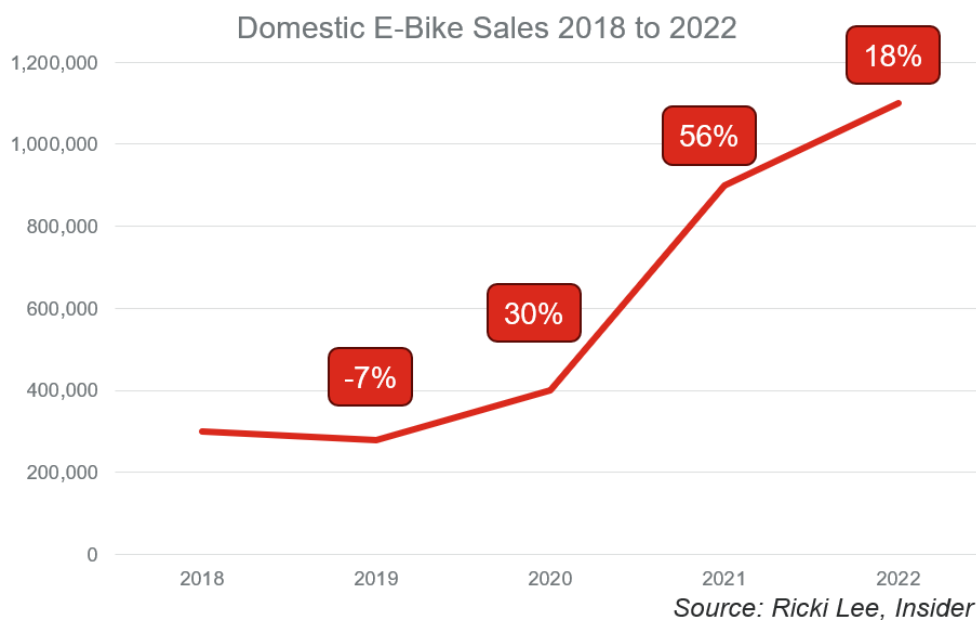

Domestic E-Bike Sales 2018 to 2022

Source: Ricki Lee, Insider

Figure 5 Domestic E-bike Sales, 2018 to 2022

The project team contacted seven e-bike vendors in Orange County[5] to better understand local trends in e-bike purchases and rentals in the past five years. While no retailers provided detailed sales trends data, some corroborated that the national trend applied to their local experience: there has been a significant spike in e-bike sales since 2020.

While the project team found anecdotal evidence of an increase in e-bike sales in Orange County, currently, there is no clear, established channels to track the growth in e-bike ownership. The e-bike retailers in Orange County can become important hubs for monitoring the growing popularity of e-bikes, while disseminating e-bike resources to cyclists.

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[4] Paul Martin on behalf of Laguna Niguel, emailed OCTA a compiled spreadsheet to document e-bike and e-scooter activity at public schools.

[5] Rad Power Bikes, Wheel Fun Rentals, Pedego HB, Super 73, Electric Bike Co, Fat Bikes, and Groove E-bikes

E-bike Funding Opportunities

Existing funding streams that directly or indirectly support e-bike programmatic and infrastructure activities are compiled in **Table 5**. The Grant Programmatic Manager at OCTA provided the below short list of potential funding sources for consideration. The quick evolution of grant opportunities further highlights the need to have a close pulse on grants that are phasing out and those coming online as they relate to e-bikes. Most grant programs do not specifically include e-bikes in their descriptions of eligible projects or prioritize funding projects that promote e-bike safety specifically, but this may change as e-bike adoption grows.

Table 5 E-bike Funding Sources and Opportunities

	FUNDING SOURCE	DESCRIPTION
FEDERAL	FEMA Congestion Mitigation and Air Quality Improvement Program (CMAQ)	Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas). CMAQ is a flexible program that can fund infrastructure and other projects and programs related to e-bike safety.
	FHWA Carbon Reduction Program (CRP)	Funds provided for projects designed to reduce transportation emissions, defined as carbon dioxide (CO_2) emissions from on-road highway sources. CRP is a flexible program that can fund infrastructure and other projects and programs related to e-bike safety.
	FHWA Surface Transportation Block Grant Program (STBG)	The Surface Transportation Block Grant program (STBG) provides flexible funding that may be used by localities for projects to preserve and improve the conditions and performance on any Federal-aid facilities including pedestrian and bicycle infrastructure. STGB is a flexible program that can fund infrastructure and other projects and programs related to e-bike safety.
	USDOT Safe Streets and Roads for All (SS4A)	Systemic safety improvements could benefit e-bike users in infrastructure developments that seek to mitigate safety concerns. SS4A can fund infrastructure, planning, and quick-build demonstration projects.
STATE	SB1 Local Partnership Program (LPP)	Funding provided to counties, cities, districts, and regional transportation agencies in which voters have approved fees or taxes dedicated solely to transportation improvements or that have imposed fees, including uniform developer fees, dedicated solely to transportation improvements. LPP can fund infrastructure projects that promote active transportation modes and improve e-bike safety.

	Caltrans Office of Traffic and Safety (OTS) Grants	Grants should support a priority program area, like pedestrian and bicycle safety, roadway safety and traffic records, or public relations, advertising, and marketing programs. Funding is assessed by safety metrics and can support e-bike programming like bike rodeos.
	SB1 Solutions for Congested Corridors Program (SCCP)	This is a statewide, competitive program that provides funding to achieve a balanced set of transportation, environmental, and community access improvements to reduce congestion throughout the state. • Infrastructure projects that improve e-bike safety can be funded through SCCP.
	Caltrans Active Transportation Program (ATP)	ATP grants encourage increased use of active modes of transportation. • E-bikes are included in the intended mode shift goals of this funding stream.
REGIONAL	SCAG Regional Pilot Initiatives (RPI) Partnership Program	Targets investments towards critical infrastructure that improve mobility, quality of life, and economic potential for the 19 million people who call this region home and the 3.7 million new residents projected by 2045. • RPI can fund infrastructure projects that improve e-bike safety.
	SCAG Regional Early Action Planning Grants (REAP 2.0)	A flexible program that seeks to accelerate progress towards state housing goals and climate commitments through a partnership between the state, its regions, and local entities. • REAP 2.0 can fund planning, programming, and engineering projects that improve e-bike safety.

E-bike Policies and Regulations

This section highlights the different levels of regulations and ordinances that are in place for e-bike operation in Orange County. A summary of the e-bike policy and regulation data gaps is presented in **Table 6**, and also detailed in the section below.

Table 6 Summary of E-bike Policies and Regulation Data Availability

E-BIKE POLICIES AND REGULATIONS	DATA ITEM	CURRENT STATUS
	Countywide e-bike regulations	E-bike riders in Orange County are subject to California Vehicle Code (CVC) and Orange County Code of Ordinance (OCCO).
	Local Regulations and Ordinances	Some cities have adopted specific e-bike regulations to address enforcement issues.
	Local Active Transportation Plans (ATP)	Almost all agencies have ATPs available that plan for pedestrian and bicycle improvements on- and off-street, as well as programming and potential funding sources.

Countywide E-bike Regulations

Like pedal bike riders and drivers, e-bike riders in Orange County are subject to California Vehicle Code (CVC) and Orange County Code of Ordinance (OCCO).

California Vehicle Code Section 312.5 defines the three classes of e-bikes based on the level of electricity-powered assistance the e-bike could provide. **Figure 6** summarizes the additional rules that e-bikes are subject to, based on their classes. Orange County Codified Ordinance OCCO 2-5-29(n) allows Class 1 and Class 2 electric bicycles on more than 75 miles of those regional paved, off-road bikeways in Orange County.[6]

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[6] https://www.ocparks.com/news/electric-bicycles-now-permitted-regional-bikeways

Class 1 / Class 2	Class 3
Equipped with an electric motor and pedal assisted (Class 1) and/or throttle assisted (Class 2), reaches the **speed of 20 miles per hour.** *CVC 312.5(a)(1)/(2)*	Equipped with a motor that provides assistance only when the rider is pedaling, and that ceases to provide assistance when the bicycle reaches the **speed of 28 miles per hour** and equipped with a speedometer. *CVC 312.5(a)(3)*
MOVING: CVC 21200.5 DUI Alcohol/Drugs on Bicycle (M) CVC 21202(a) Right half of Roadway CVC 21203 Hitching rides on vehicles CVC 21204(b) Passenger must be seat on permanent seat/Passenger under 4 yrs/40 lbs must be seated away from moving parts CVC 21205 Carrying articles, not holding handlebars CVC 21211(b) Impede/Block others on bicycle trail/path CVC 21212(a) Under 18 must wear helmet CVC 21456.2(a) Failure to obey traffic control signs CVC 21650.1 Travel same direction of vehicles (on roadway) CVC 22110(a)/(b)/(c) Failure to use hand and arm signals **EQUIPMENT:** CVC 21201(a) Wheel brake required CVC 21201(b) Handlebar height no higher than shoulders CVC 21201(c) Operator able to reach ground CVC 21201(d)(1-4) Lights/reflectors during darkness CVC 21204(a) Must have permanent seat attached CVC 24016(d) Modify/Tamper to increase speed	**MOVING:** CVC 21200.5 DUI Alcohol/Drugs on Bicycle (M) CVC 21201(c) Operator able to reach ground CVC 21202(a) Right half of Roadway CVC 21203 Hitching rides on vehicles CVC 21204(b) Passenger must be seat on permanent seat/Passenger under 4 yrs/40 lbs must be seated away from moving parts CVC 21205 Carrying articles, not holding handlebars CVC 21207.5 Riding on bicycle trail/path/lane, hiking/equestrian/recreation trail CVC 21211(b) Impede/Block others on bicycle trail/path CVC 21213(a) Under 16 yrs. old operating CVC 21213(b) No helmet (Any Age) CVC 21456.2(a) Failure to obey traffic control signs CVC 21650.1 Travel same direction of vehicles (on roadway) CVC 22110(a)/(b)/(c) Failure to use hand and arm signals **EQUIPMENT:** CVC 21201(a) Wheel brake required CVC 21201(b) Handlebar height no higher than shoulders CVC 21201(d)(1-4) Lights/reflectors during darkness CVC 21204(a) Must have permanent seat attached CVC 24016(d) Modify/Tamper to increase speed
*Property-CANNOT BE TOWED/IMPOUNDED	*Property-CANNOT BE TOWED/IMPOUNDED

Figure 6 Orange County Sheriff's Department E-Bicycle Enforcement Guide (2022)[7]

Local Regulations and Ordinances

Some cities have begun to establish e-bike ordinances to better regulate safe e-bike usage. **Figure 7** visualizes the local jurisdictions that have established different levels of e-bike ordinances to the best of the project teams' understanding during this research. A "Generic e-bike ordinance" indicates that e-bike rules are similar to bicycle policies or rules of the road; a "specific e-bike ordinance" refers to when cities explicitly call out the restrictions or rules on using e-bikes; examples are listed in **Table 7**.

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[7] ocsheriff.gov/sites/ocsd/files/2023-01/Bulletin%2023-01%20Enforcement%20and%20Handling%20of%20Electric%20Bicycles%2C%20Motorcycles%20and%20Motorized%20Scooters_Redacted.pdf
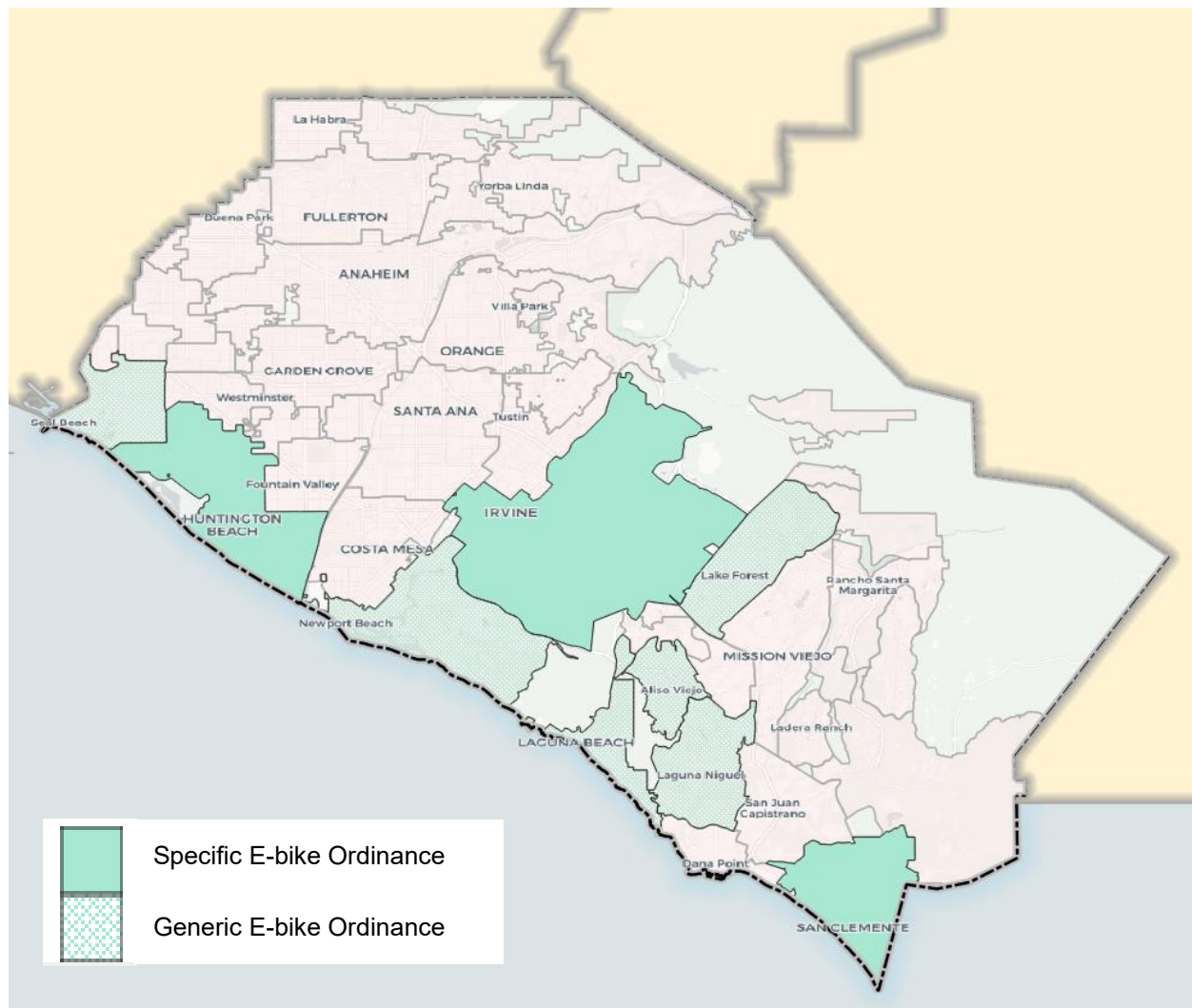
Figure 7 Cities with specific and generic e-bike ordinances (2023)

Table 7 Specific and Generic Ordinance Examples in Orange County

ORDINANCE TYPE	EXAMPLE
Generic	Newport Beach Code of Ordinances 12.56.080 Motorized Bicycles • The licensing requirements of this chapter are applicable to motorized bicycles as that term is defined by the California Vehicle Code. (Ord. 97-41 § 5 (part), 1997: Ord. 1699 § 1, 1976)
SPECIFIC	San Clemente Code of Ordinances 12.32.130 E • No person shall drive, operate, or propel any electric bicycle, motorized scooter, electrically motorized board, or other similar motorized recreational device, however powered, upon any portion of the beach or beach trail.

Cities known to have high volumes of bike activities, including Irvine and San Clemente, are developing specific e-bike ordinances. The City of Huntington Beach, as of 2023, has developed specific e-bike ordinances focused on safe e-bike operation and clarity to what is and is not an e-bike. [8] Seal Beach, Laguna Niguel, Newport Beach, Laguna Beach, Lake Forest, and Aliso Viejo have specified that e-bike should follow rules of the road or adhere to bicycle rules. In comparison, cities with emerging e-bike activity hot spots like Anaheim and Santa Ana have not developed any e-bike ordinances.

OCTA should continue to track and monitor the development of e-bike ordinances in its member jurisdictions and provide resources for cities that are starting to develop local regulations in a "best practices" format that best aligns with the county's direction for safe e-bike operation.

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[8] https://www.huntingtonbeachca.gov/government/departments/pd/traffic/alternative_vehicle.cfm