

MICRO-MOBILITY OVERVIEW

What You Need to Know About Electric Micromobility

And Its Impact on Lexington

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April 2025



Who am I?

- Father of two girls in Lexington who commuted entirely by bike for half a year
- Built a road bike
- Mid-drive converted a hybrid bike
- Bought an electric cargo bike



Introduction

- What it is
 - Problems addressed
 - Types of vehicles
 - How it works
- Why it is
 - Why does it matter now?
- Where it is
 - How does it impact Lexington?
- For the tinkerers - make your own

Lexington Town-wide Bicycle and Pedestrian Plan

Accepted by the Select Board on May 6, 2024

PREPARED FOR:

Town of Lexington MA

PREPARED BY:

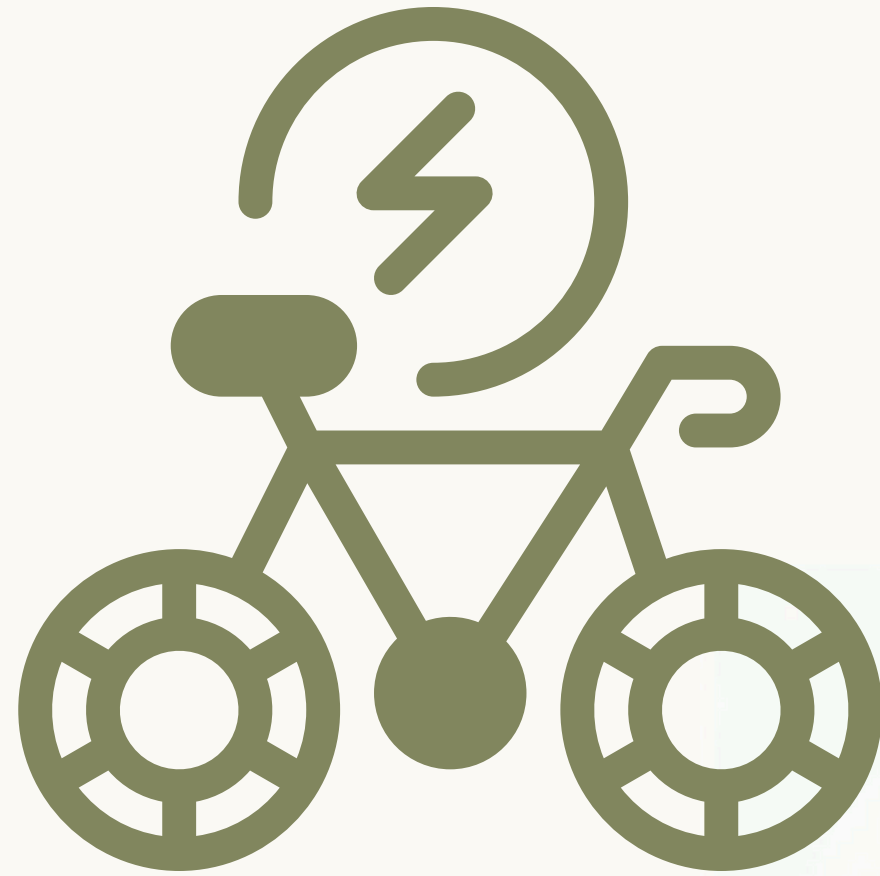


With James Tasse Consulting

April 2024

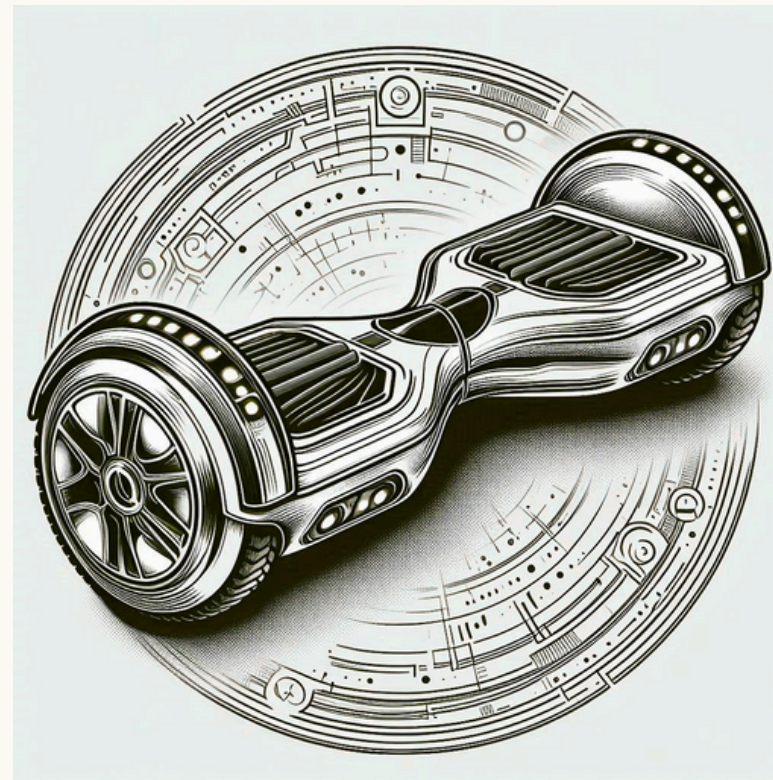
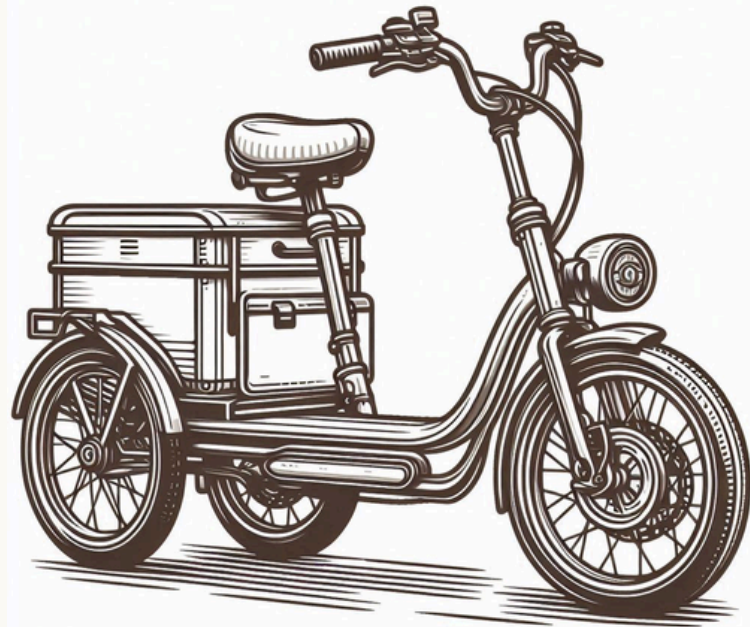


What is Electric Micro Mobility?



The **Department of Transportation** says:

“Electric micromobility includes any small, low-speed, electric-powered transportation device, including electric-assist bicycles (e-bikes), electric scooters (e-scooters), and other small, lightweight, wheeled electric-powered conveyances.”



Sources:

<https://www.transportation.gov/rural/electric-vehicles/ev-toolkit/electric-micromobility>

Key Characteristics

Common traits of electric micromobility devices:

- Typically Lithium Ion (NMC/LiFePO4) battery powered
- Charge on household current (e.g. 120V)
- Typically one, two, or three wheeled
- Relatively small and lightweight

Uses:

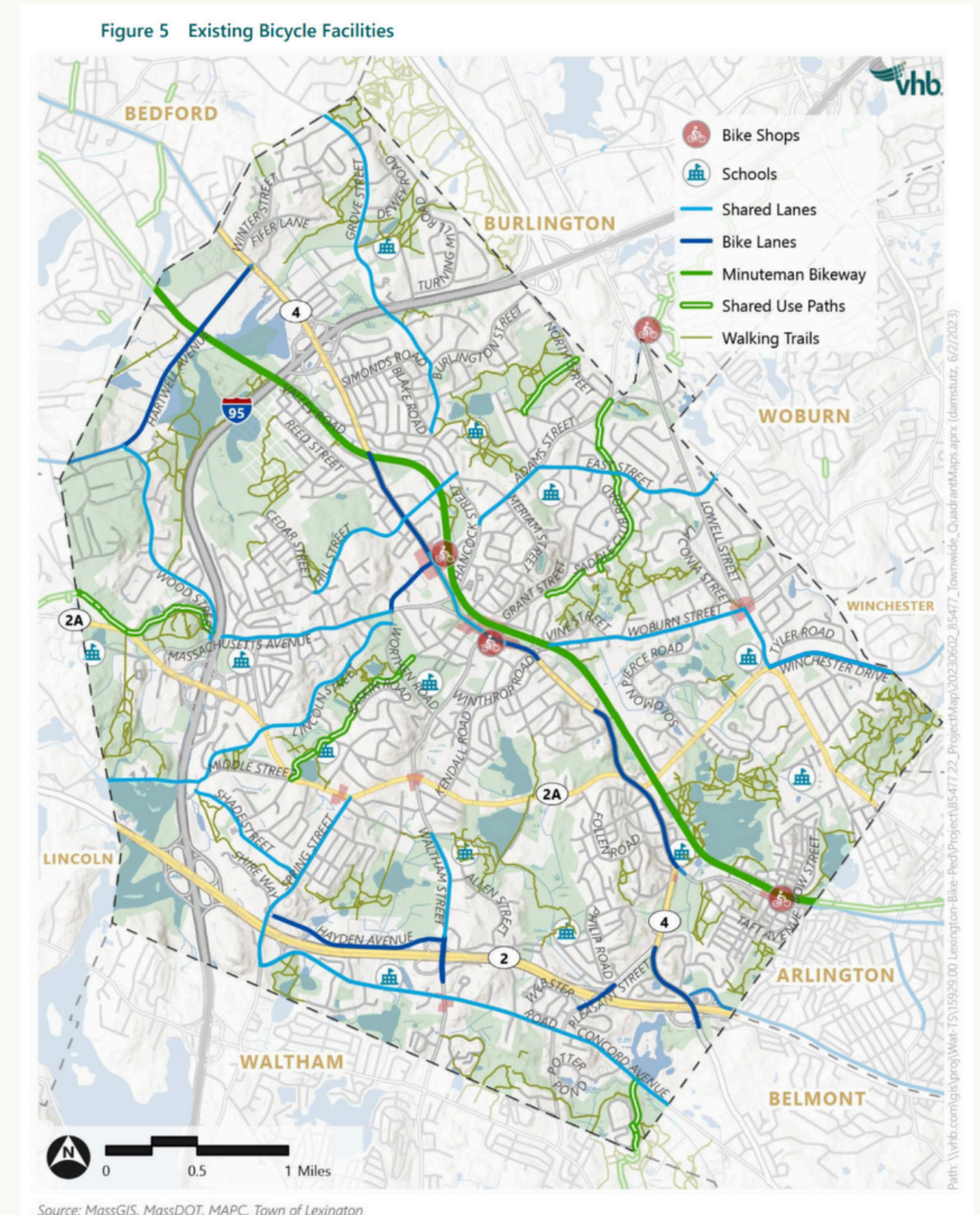
- Commuting: bikes, scooters
- Family transit: cargo bikes
- Accessibility: electric / all terrain wheelchairs
- Cargo hauling: cargo bikes (longtail, front loaders)
- Recreation: tricycle, unicycle, eMTB

What Problems Does it Solve?

- Traffic congestion
- Parking limitations
- Last-mile transit gaps
- Carbon emissions
- Accessibility

Source:

https://www.lexingtonma.gov/DocumentCenter/View/11948/VOTED-Lexington-Ped-Bike-Plan-Report-Draft-Clean-5_6_24



Fun Example: All-terrain Chair



Source:
Gui Cavalcanti, Facebook

How They Work: Motors

- Motors:
 - hub vs. mid-drive



Source:

<https://www.explainthatstuff.com/hubmotors.html>

How Motors are Built

- Bafang Factory Tour



source: <https://www.youtube.com/watch?v=nLutGVgpbms>

How They Work: Sensors

Sensors: torque vs cadence

Cadence Sensor Pros

- Cheaper
- Easier to activate pedal assist
- More ebike options
- It takes less effort to ride

Cadence Sensor Cons

- Less responsive- Cadence sensors measure your pedaling speed less frequently.
- The ride quality isn't as good
- Harder to control- There can be a lag before the motor turns on or off.
- Less range

Torque Sensor Pros

- Better ride quality
- More range
- More responsive
- Better handling
- Safer- Torque sensors make the bike easier to control.

Torque Sensor Cons

- Expensive
- Harder to activate pedal assist
- Fewer options
- It takes more effort to ride- You have to continuously provide pedaling force.

Source:

<https://wheretheroadforks.com/ebike-torque-vs-cadence-sensor-pedal-assist-pros-and-cons/>

Power, Range, and Speed

- Typical power: 250W - 750W
- Range: 20-60 miles
- Speed:
 - Class 1/2: 20mph
 - Class 3: 28mph
- There is limited regulation (for now)

Risks and Concerns

- Battery fire risk (partially due to de minimis exemptions)
- Build quality (brakes, frame, weight distribution)
- Speed safety and pedestrian conflict
- Theft



Source:

<https://www.youtube.com/watch?v=1mSYxTj5Exo>

Why It's Popular Now

- Affordable motors
- Cheap batteries
- COVID-era shifts
- Urbanization and traffic
- Climate friendly

Direct-to-Consumer Trends

- Rise of brands like Rad Power, Lectric, Aventon
- Cheaper bikes for consumers
- Cuts out bike shops from bike sales revenue
- Can cause friction with local bike shops dealing with service requests for bikes they did not sell

Cost of Ownership

- Dramatically lower cost of ownership vs. car ownership
- Regular maintenance required, but minimal

... but it can't replace a car in every circumstance

Impact on Lexington

- Increased utilization of Minuteman Bikeway
 - Also increased conflict between pedestrians and bike riders due to more dramatic speed difference
- Risk of vandalism, theft of shared bikes (remember Lime Bikes?)
- Cluttering of sidewalks (downtown policy of prohibiting bike riding on sidewalks helps a lot)



DIY Builds

- Build vs. Buy considerations
 - build if you already have a good candidate bike
 - buy if you want everything to just work
- Decisions:
 - mid-drive or wheel replacement? (Bafang, Swytch)
 - disc brakes (please say yes)
 - where to buy (eBay, online bike shop, etc.)
- Legal considerations for DIY builds
 - top speed is usually a determining factor

Open Questions

- What infrastructure changes are needed?
- How should regulations be updated?
- Anything else?