

Energy Savings in Mixed Use Villages

## Mixed-Use Villages and the Related Energy Savings

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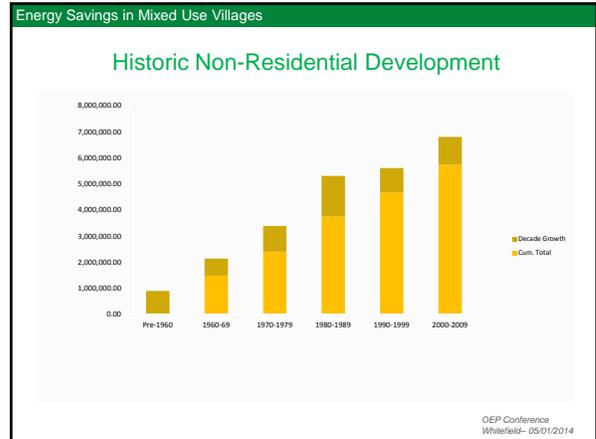
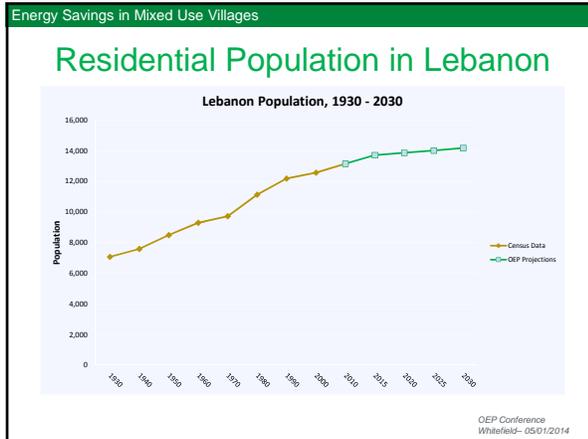
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## Introduction

- Overview of Lebanon
- Planning for Mixed Use Villages in Lebanon
- Non-transportation Benefits of Mixed Use Villages
- Transportation Benefits of Mixed Use Villages
- Energy/Emissions Savings Due to Transportation Mode Shift
  - Mode Shift in General Behavior (Local)
  - Mode Shift due to Sprawl Avoidance (Regional)
- Conclusions

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## Approved Non-Residential Development 2014- 2030 Approved – yet to be built

	Total SF
Iron Horse	667,200
River Park*	714,020
Altaria Industrial PUD*	217,970
Altaria Planned Biz Park	240,000
ICV (Bldg 2)	56,364
DHMC-Williams	162,000
Chaloux Conf. Center	96,306
	2,153,860



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## What do we do with all these people?

- Putting them into “sprawl” development is not desirable
- Concentrating development would be beneficial.
- Creating Mixed Use Villages would be a way to concentrate the development patterns without creating the undesirable negative effects of “density”

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## What is Mixed Use?

**MIXED USE:** MANY MUNICIPAL ZONING ORDINANCES TREAT DIFFERENT LAND USES, SUCH AS HOMES, COMMERCIAL, AND INDUSTRIAL PROPERTIES DIFFERENTLY. A MIXED USE BUILDING OR DEVELOPMENT MEANS A VARIETY OF DIFFERENT USES ARE ALLOWED. A COMMON KIND OF MIXED USE DEVELOPMENT IN NEW ENGLAND IS COMBINING A FIRST-FLOOR STORE WITH A SECOND FLOOR APARTMENT.



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## "Mixed Use" - One Size Does Not Fit All




- Corner Store:**
  - ❑ 1500-3000sqft
  - ❑ Along major local roads at the busiest entry
- Convenience Center:**
  - ❑ 10,000-30,000sqft
  - ❑ Anchored by small specialty food market or pharmacy
  - ❑ Needs ~2000hh
- Neighborhood Center:**
  - ❑ 70,000-90,000sqft
  - ❑ Anchored by full supermarket
  - ❑ 6-8K hh

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## "Mixed Use" - One Size Does Not Fit All




- Community Center:**
  - ❑ 250-350Ksqft
  - ❑ Multiple anchors (small mall)
  - ❑ Pop. 50,000
- Regional Center:**
  - ❑ >900Ksqft
  - ❑ Multiple full-scale anchors (lg mall)
  - ❑ Pop. 150,000
- Lifestyle Center:**
  - ❑ Upscale "town center"
  - ❑ >75K hh, min. salary >\$75K

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## So, What is a Mixed-Use Village?

❑What it isn't?



OR



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## So, What is a Mixed-Use Village?

- ❑What it is
- ❑ A walkable community with a mixed-use core or "Main Street" at its most accessible location (usually its center)

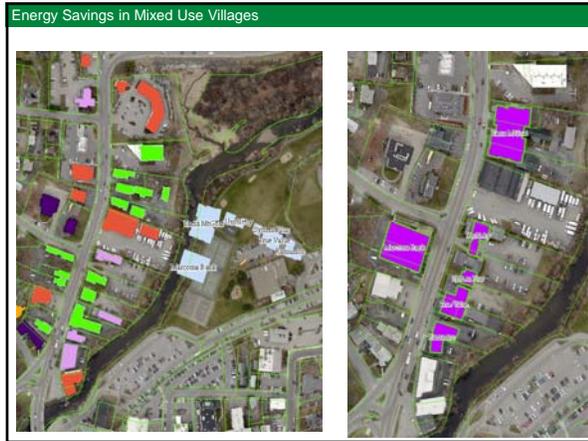
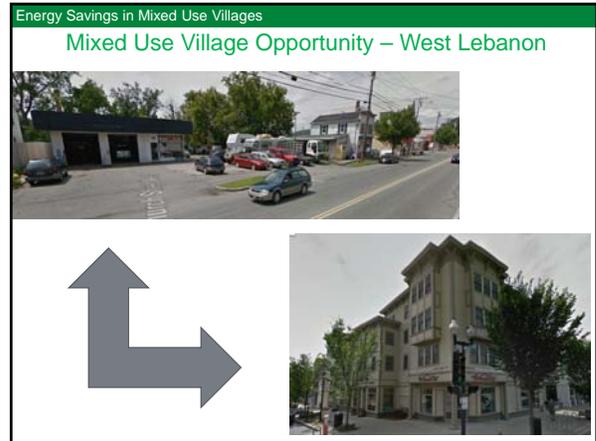
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## Same Size – 1 mixed use, 1 not




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### Planning Layers Co-Align with Mixed Use Villages

**Overview:** Lebanon is trying to bring the Vision of the City Master Plan into reality with the help of its residents. There will be a series of village walkabouts, or interactive tours, for the public to learn what is the proposed Vision for the future of their villages. These walkabouts depend on citizen participation and will provide information on the critical components of the City's future and how they work together: transportation, land use, public utilities, recreation, and natural resources.

- Level 0: Lebanon's Mixed Use Villages:** How will your village look in 20 years - especially its Main Street? What will people do and what kinds of businesses and housing will be there? What makes each village unique and how can it evolve to best to identify?
- Level 1: Long Range Multimodal Plan (LRMP):** Transportation should provide service to homes and businesses and includes all forms of travel. Where is it best to walk, bike, drive a car, or ride a bus? How should the transportation planning envision all of these different travel modes working together?
- Level 2: Village Connections:** There are nine distinct village areas in Lebanon. Some historic, some brand new, some that need a little coaxing to become a recognizable village. Each village is connected with the others and rural areas through the City's road network. How should these connections work?
- Level 3: Lighting Level:** LRMP informs how the streets are being used. How can the City reduce the need for headlights while maintaining functional, safe streets for all modes of travel?
- Level 4: Safe Routes to Play Level:** Lebanon has a wide range of recreation areas throughout the city, an important asset to the community quality of life. How can residents and visitors best access these recreation areas? What can be done to encourage safe walking and biking to and from these parks and open spaces?
- Level 5: Green Infrastructure Level:** How important is the natural environment to current and future land use and the community's quality of life? Undeveloped areas, protected natural spaces, water and wetlands are all part of the landscape, but what place do they have in Lebanon's future?

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- ### Mixed Use Advantages
- Organizing in terms of Villages enables Lebanon to do many things with fewer resources.
    - Fewer miles of roads to achieve the same connectivity.
    - Park and rides, transit stops and bike parking occur at village centers allowing access to everything without need for cars.
    - Allows someone to "park once" and not need to get back in a car to go to other things
    - Could allow intensification in villages enabling district power generation, combined heat and power systems, and village-by-village recycling.
    - Allows buildings to intensify as well, allowing more activities in a smaller area consuming less resources (e.g. less area consumed by parking)
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- ### Mixed Use Villages are generally a good idea for municipalities
- Cost 10% per household (hh) less in police, fire and ambulance services
  - Cost 10-50% less on infrastructure per hh
  - GENERATE MORE THAN 10X THE TAX REVENUE!**
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## Because They Told Us to!

- ❑ Master Plan connection
  - Mixed Use in Land Use chapter
  - Transportation chapter
  - Energy chapter

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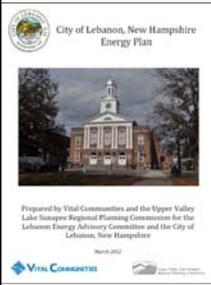
## Support for Mixed Use Villages

- ❑ Local encouragement to promote/support mixed-use villages
  - With over 100 references to mixed use and infill and over 400 references to energy (savings). Over 250 references to pedestrians and walking and over 125 references to bikes and bicycling. Whereas cars and automobiles are mentioned less than 100 times.
  - Walkabouts support for village centers, anti-sprawl
  - City organizing implementation around the village concept

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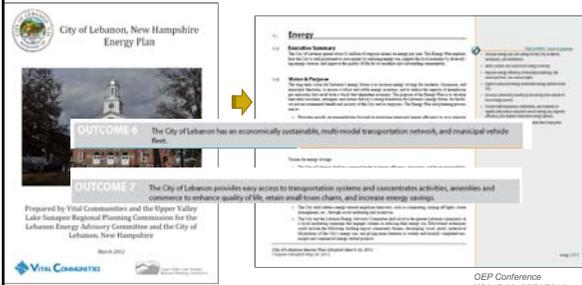
## Energy adopted into Lebanon's Master Plan



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## Energy adopted into Lebanon's Master Plan



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## List of ancillary benefits, indirectly related to energy savings

- ❑ Streetlights
- ❑ Climate resiliency
- ❑ Distributed generation and local trips
- ❑ Increased building efficiencies
- ❑ Self reliance (N.B. NH generates almost no energy of its own)

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## Consideration: Lighting

**Lighting is not really just about streetlamps:**

- ❑ How does lighting relate to streets and villages?
- ❑ What roles does lighting play?

**Why is this important?**

- Redesign may result in substantial cost savings
- Redesign will set standards for future City streets
- Public safety is a priority
- Redesign would curb light pollution




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### Consideration: Lighting

**Streetlights in the Community**

- ❑ Commercial districts
- ❑ Residential neighborhoods
- ❑ Rural areas

**Energy Efficiency Options**

- ❑ Privately owned.
  - Efficiency grants and financing opportunities.
- ❑ Utility owned.
  - What can they do according to their own billing structure?



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### Consideration: Lighting

**Streetlights in a Mixed Use District – Comingling Uses**

- ❑ Colocation of commercial and residential uses – shared use of a resource.
- ❑ Higher intensity use of land translates to higher efficiency and lower per capita costs.

**Goals of the Lebanon Streetlight Redesign Project**

- ◆ Maintain public safety & sense of security.
- ◆ Reduce costs & energy consumption.
- ◆ Maintenance program for existing streetlights.
- ◆ Design guidelines for new streetlights.
- ◆ Reduce light pollution.



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### Energy Savings Due to Transportation Changes Based on Mixed Use Villages

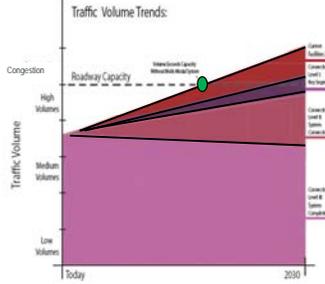
- ❑ Need to shift away from Single Occupancy Vehicle (i.e. cars) transportation
  - Because of lack of capacity
  - Because of costs other than energy

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### Traffic Management Trends

Continued growth in single-occupancy vehicle travel may exceed the capacity of the downtown street system without a multimodal system

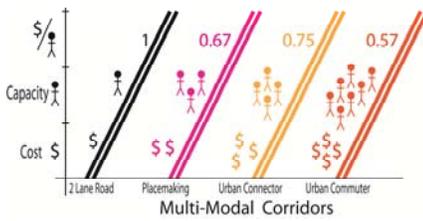


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### Cost to Move People

Through additional facilities are added on a given thoroughfare, the capacity to move people is increased even more, so the cost to move people actually goes down.



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### Mode Shift

- ❑ What is Mode Shift?
  - Shifting from car mode to other modes of transportation i.e. multimodal transportation
- ❑ How do we get Mode Shift?
  - Shifting to multimodal transportation requires not only multimodal infrastructure, but distances that can be easily, efficiently and cost-effectively managed by willing multimodal traffic – i.e. land use must also enable the mode shift.

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## Mode Shift Benefits (Local)

□ How could the implementation of a mixed-use, village-based development pattern in Lebanon affect transportation for today's Lebanon residents, and what energy and environmental benefits could result from that change?

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### How do people move in Lebanon today (mode share)?

Mode	Share (%)
Drive Alone	76.8%
Carpooled	7.6%
Public Transportation	4.4%
Bicycle	0.8%
Walked	1.6%
Telecommute	6.0%
Other	2.9%

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### How could mode share change if Lebanon implemented a mixed-use, village-based development pattern?

Mode	Current (%)	Target (%)
Drove Alone	76.8%	70.0%
Carpooled	7.6%	9.4%
Public Transportation	4.4%	6.0%
Bicycle	0.8%	3.0%
Walked	1.6%	3.1%
Telecommute	6.0%	6.0%
Other	2.9%	2.9%

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### Public Transportation

Current Mode Share in Lebanon: 4.4% Target: 6.0%

Advance Transit Fixed Route Ridership (1992-2012)

- Target is based on regional goal of one million fixed-route rides by 2030.
- Mixed-use village development would make transit service even more viable because of increased population density and co-location of housing and employment centers.

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### Carpooling

Current Mode Share in Lebanon: 7.6% Target: 9.4%

Many local, regional, and statewide partners are already trying to improve carpool mode share in the Upper Valley.

- Target is based on meeting the current regional average carpool mode share of 9.4%.
- Mixed-use village development would make carpooling more viable because increased population density will make it easier for people to find convenient rideshare matches.

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### Walking

Current Mode Share in Lebanon: 1.6% Target: 3.1%

Improved sidewalk infrastructure connects Lebanon's key arteries to the City Green.

- Target is based on meeting the current statewide average walking mode share of 3.1%.
- Mixed-use village development would make walking more viable because of the co-location of housing and employment centers, as well as the pedestrian amenities provided in Lebanon's proposed street design guidelines.

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### Bicycling

Current Mode Share in Lebanon: 0.8% Target: 2.0%



Improved bicycle accommodations on Bank Street (U.S. Route 4 in downtown Lebanon).

- Target is based on meeting a 2.0% local goal for bicycle mode share.
- Mixed-use village development would make biking more viable because of the co-location of housing and employment centers, as well as bike infrastructure proposed in Lebanon's street design guidelines.

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### If Lebanon achieves this, what would that mean for real world environmental and energy benefits?

Achieving the targeted mode shifts would result in the following changes in travel patterns in Lebanon (based on today's population):

- Driving Alone:** 886 **less** trips per day
- Carpooling:** 266 **more** trips per day
- Public Transportation:** 225 **more** trips per day
- Bicycle:** 177 **more** trips per day
- Walking:** 218 **more** trips per day

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### If Lebanon achieves this, what would that mean for real world environmental and energy benefits (time for some math)?

(Conservative) Assumptions:  
 Average trip length across all modes in Lebanon: 4.6 Miles  
 Average carpool size: 2 people  
 Percentage of public transit riders with a car available: 53%

➔ **BLACK BOX**  
(aka Microsoft Excel)

↓

**2,915 Vehicle Miles Traveled (VMT) would reduced/avoided in the City of Lebanon every day.**

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### Time for (more) math...

- Let's be conservative in our estimates again, and assume that VMT reductions are only achieved on "business days" (i.e. not on weekends or holidays).
- Assuming there are 250 business days in the average year, Lebanon would achieve...

250 Days/Year X 2,915 VMT Avoided/Day

↓

**728,750 VMT Avoided/Year**

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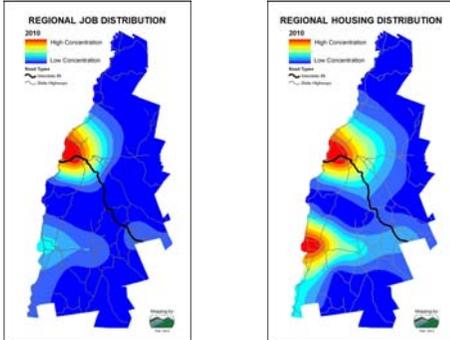
### Mode Shift Benefits (Regional)

- How could the implementation of a mixed-use, village-based development pattern in Lebanon affect transportation for residents of the region, and what energy and environmental benefits could result from that change?

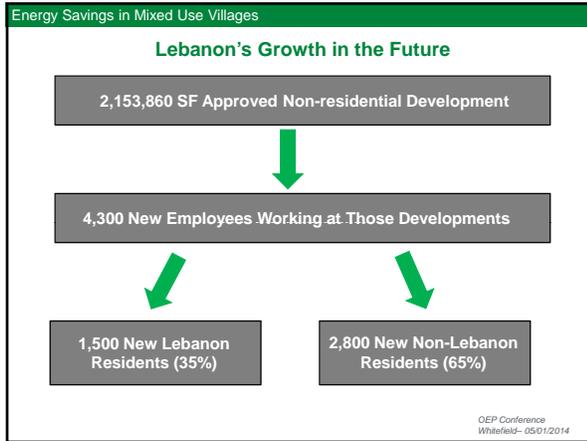
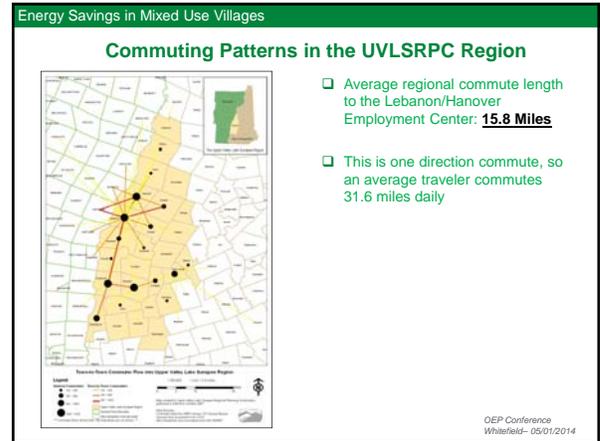
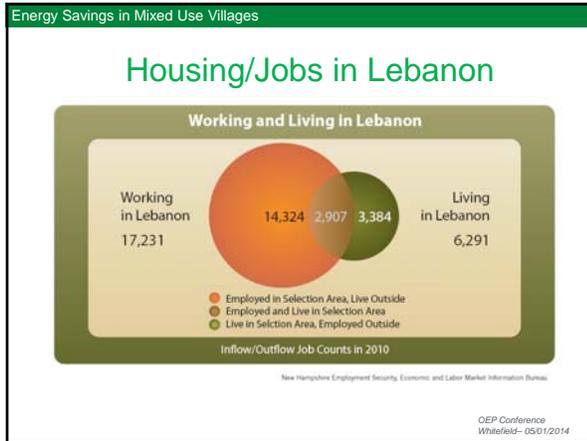
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### Housing/Jobs Distribution at a Regional Scale



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### Regional Benefits

- What if Lebanon's mixed-use, village-based development pattern is successful?
  - People recognize the financial benefits of living closer to where they work, and thus, more people choose to live in Lebanon rather than rural communities farther away from the employment center.
  - Thus, more people have access to multimodal transportation AND are not driving as far, if they commute by car.
- Let's assume that because of these benefits, 50% of Lebanon's new employees choose to live in Lebanon rather than the historical average of 35%.

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### Regional Benefits

- Instead of 2,800 (65%) new Lebanon employees living outside of Lebanon, only 2,150 (50%) live outside of Lebanon.
- Thus, 650 People will have an average commute of only 4.6 miles instead of an average commute of 15.8 miles.
- Each person choosing to live in Lebanon would save an average of 11.2 miles both commuting to and from work day...for an average daily savings of 22.4 miles per day per person.

↓

**3,640,000 VMT Avoided per Year**

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### What's the Total?

Savings from Today's Lebanon Population

**728,750 VMT Avoided per Year**

+

Savings from Tomorrow's (Expected) Lebanon Population

**151,340 VMT Avoided per Year**

+

Potential Regional Benefit of Lebanon's Land Use Changes

**3,640,000 VMT Avoided per Year**

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### What's the Total?

**4,520,090 VMT Avoided per Year**

**What does 4,520,090 VMT avoided per year translate into?**

- Approx. **191,529 Gallons** of Fuel Saved per year
  - Average fuel economy of automobiles is currently 23.6 miles/gallon
- Approx. **2.02 Tons** of Volatile Organic Compound (VOC) emissions avoided per year
- Approx. **65.33 Tons** of Carbon Monoxide (CO) emissions avoided per year
- Approx. **1.82 Tons** of Oxides of Nitrogen (NOx) emissions avoided per year

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### Conclusions From this Analysis

- Better land use patterns can bring many benefits when dealing with existing and new development – both to municipalities and residents
- Land use changes can induce transportation mode shifts, and this should be considered during local master planning processes.
- Small changes in transportation mode splits can have big impacts on energy use and emissions.
- Lebanon, NH (with approximately 1% of New Hampshire's population), could reduce over 4.5 million VMT per year even under conservative mode shift assumptions through its land use decisions.

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Final Note: Land use changes can heavily influence travel choices, but actually affecting the mode shift requires capable partners providing good, reliable services (e.g. public transportation and rideshare matching).

➔ We need you to help make this possible!

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## Thank you

Additional questions or comments:

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