Considering Health Equity for Transportation Infrastructure

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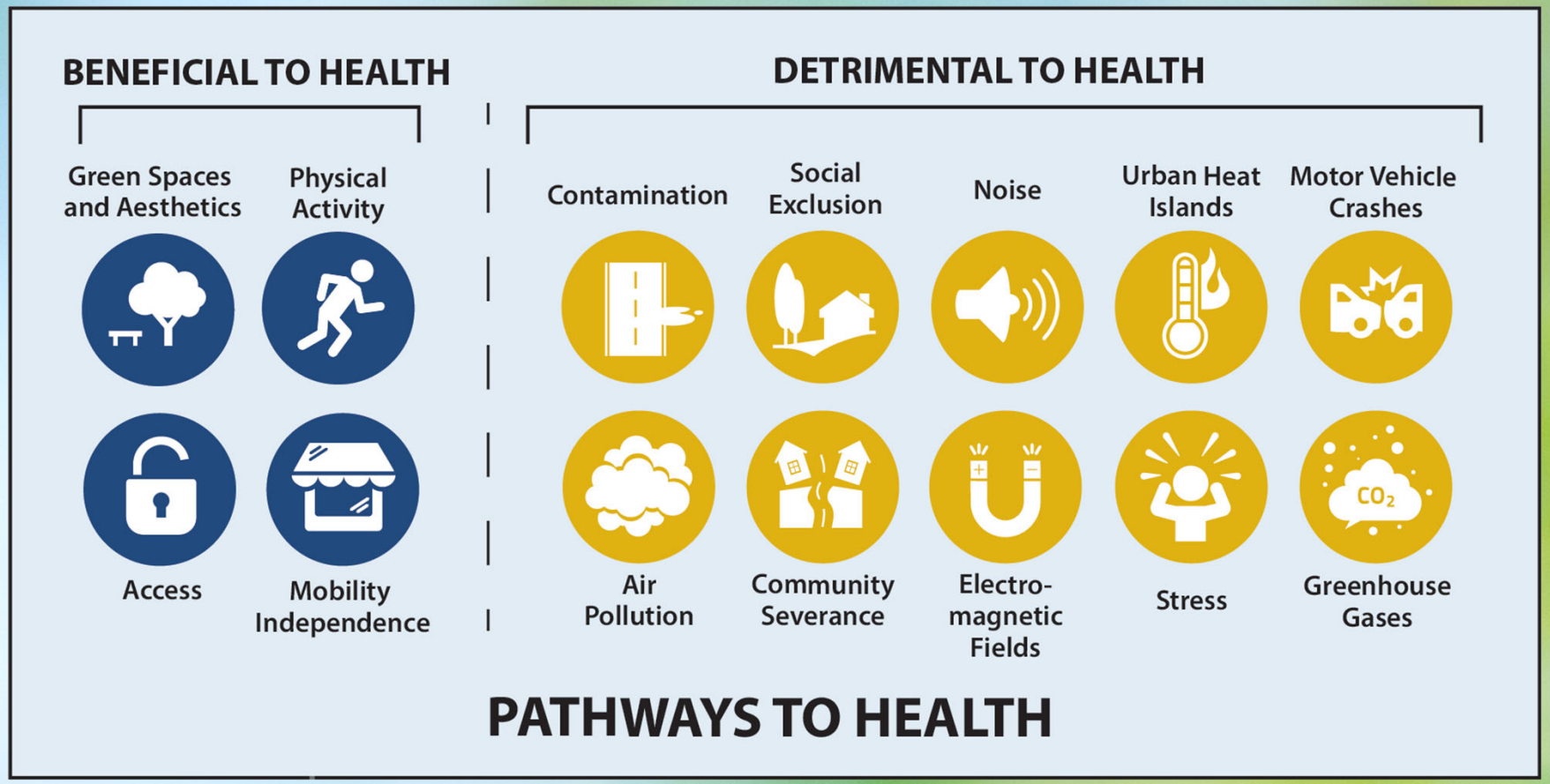
CENTER FOR ADVANCING RESEARCH IN
TRANSPORTATION EMISSIONS, ENERGY, AND HEALTH (CARTEEH)
A USDOT University Transportation Center


BENEFICIAL TO HEALTH
DETRIMENTAL TO HEALTH
Green Spaces and Aesthetics
Physical Activity
Contamination
Social Exclusion
Noise
Urban Heat Islands
Motor Vehicle Crashes
Access
Mobility Independence
Air Pollution
Community Severance
Electro-magnetic Fields
Stress
Greenhouse Gases
CO_2
PATHWAYS TO HEALTH

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Pathways to Health

Health Equity Objectives

1. Reduce vehicle emissions
2. Eliminate traffic violence
3. Increase access to healthy destinations
4. Increase active transportation
5. Increase connectivity and social inclusion
6. Minimize traffic noise
7. Promote green space and reduce heat
8. Reduce run-off and contamination from transportation

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Increasing Health Equity in Transportation Infrastructure

CARTEEH

Reduce vehicle emissions

Reduce traffic violence for all users

Increase access to healthy destinations

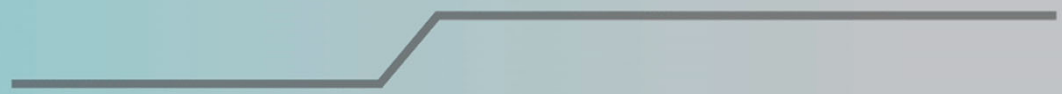
Increase active transportation

Increase connectivity and social inclusion

Minimize traffic noise

Promote green space and reduce heat

Reduce run-off and contamination from transportation



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Reduce traffic violence for all users

Increase access to healthy destinations

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Minimize traffic noise

Promote green space and reduce heat

Reduce run-off and contamination from transportation

Reduce vehicle emissions

Traffic-related air pollution results from the emission and dispersion of toxic substances emitted from transportation sources in the air we breathe. Conservative estimates from the World Bank attribute 184,000 annual deaths worldwide to traffic-related air pollution (Bhalla). Air pollution is also linked to a wide spectrum of global and chronic diseases.

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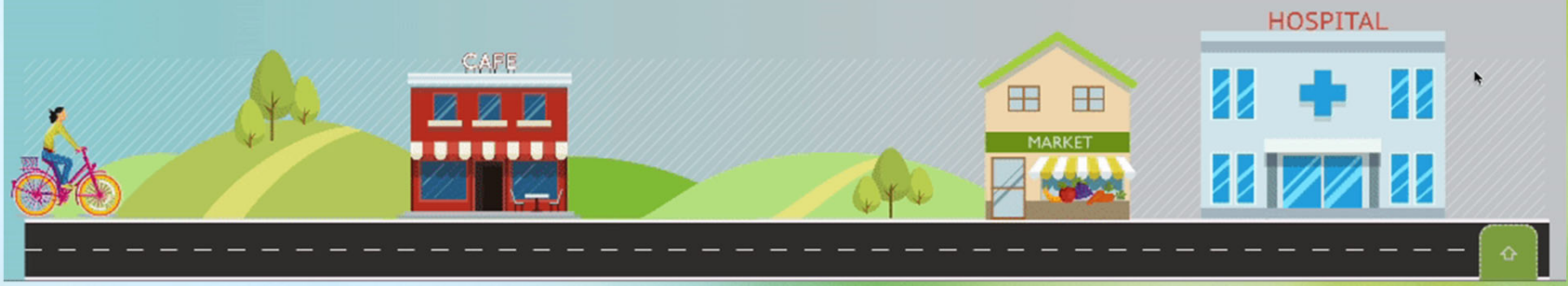
Reduce run-off and contamination from transportation

Increasing access to healthy destinations, including health facilities and services, healthy food (eradicating food deserts), green space, physical activity facilities, jobs, and education, can protect the public's health (Litman). The lack of accessibility to these destinations can lead to social exclusion and community severance (Lucas et al.), which can cause adverse mental health outcomes (Cohen et al.).



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Physical inactivity plays a crucial role in the obesity epidemic (Khreis et al.) and is the fourth largest contributor to global mortality (World Health Organization), resulting in 3.2 million global deaths annually (World Health Organization) and significant health care costs. Additionally, analyses have shown that for each $1 spent on active transportation, there is a $8.41 return on investment (Urban Design 4 Health & AECOM).

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Increase connectivity and social inclusion

Disconnecting communities through community severance results from transportation infrastructure that interferes with the ability of individuals to access goods, services, and personal networks (Mindell et al.), contributing to mental health problems and premature mortality (Anciaes et al.). Social inclusion avoids transportation-related depravations that limit the opportunity to socially participate in community activities (Julien et al.).

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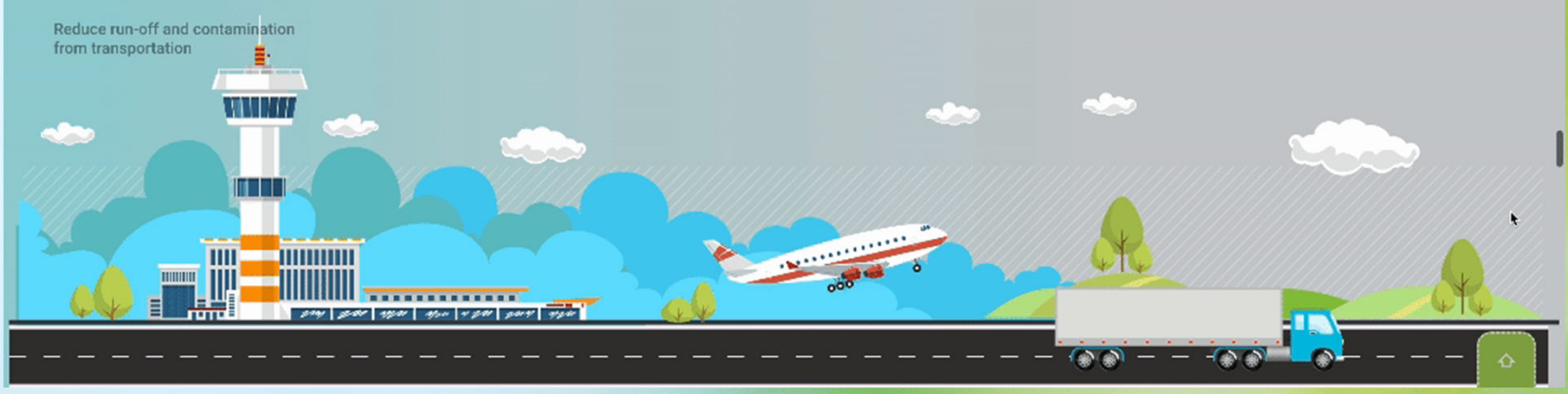
Minimize traffic noise

Traffic noise at levels detrimental to health can be emitted from motorized vehicles, as well as other transportation modes, such as airplanes and trains. Noise level is dependent on factors like road networks, junctions, traffic flow and speed, acoustics, and meteorological conditions (Zuo et al.; Bell et al.; Foraster et al.).



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CARTEEH

- Reduce vehicle emissions
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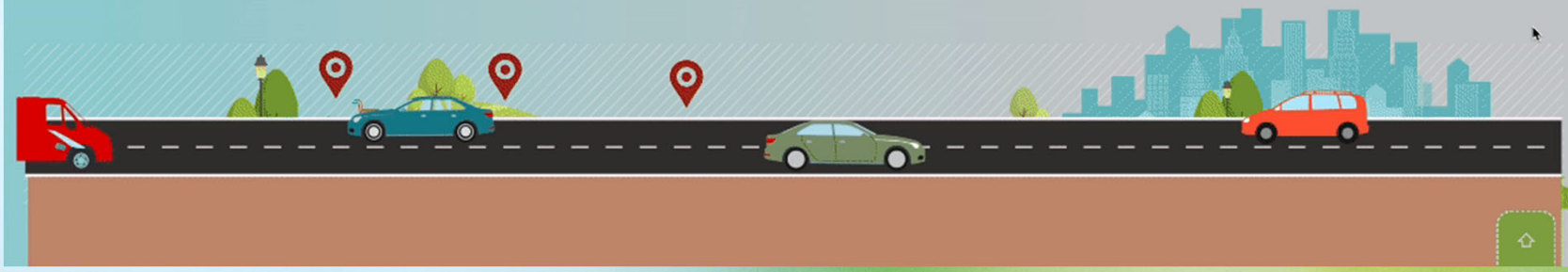
- Increase access to healthy destinations
- Increase active transportation
- Increase connectivity and social inclusion
- Minimize traffic noise
- Reduce run-off and contamination from transportation

Promote green space and reduce heat

Green space is land that is partly or completely covered with vegetation and accessible by the public. Green spaces contribute to physical activity (Ying et al.) and reduce negative mental health outcomes (Zijlema et al.) and premature mortality (Gascon et al.; Khan & Strand). They reduce the effects of transportation-induced exposures, such as urban heat islands, pollution, and noise (Lanki et al.; Nieuwenhuijsen).

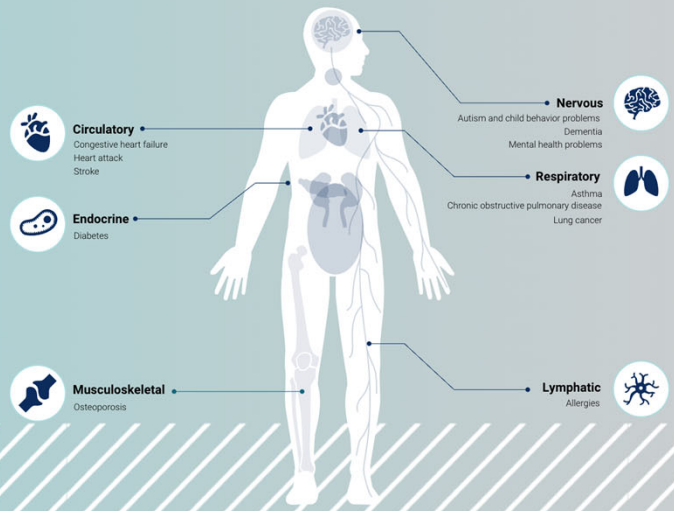


TRANSPORTATION

IMPACTS ON HUMAN SYSTEMS

Reduce vehicle emissions

Emissions | Violence | Healthy Destinations | Active Transportation | Inclusion | Noise | Green Space | Contamination



References

Reduce vehicle emissions

TRANSPORTATION

IMPACTS ON HUMAN SYSTEMS

Promote green space and reduce heat

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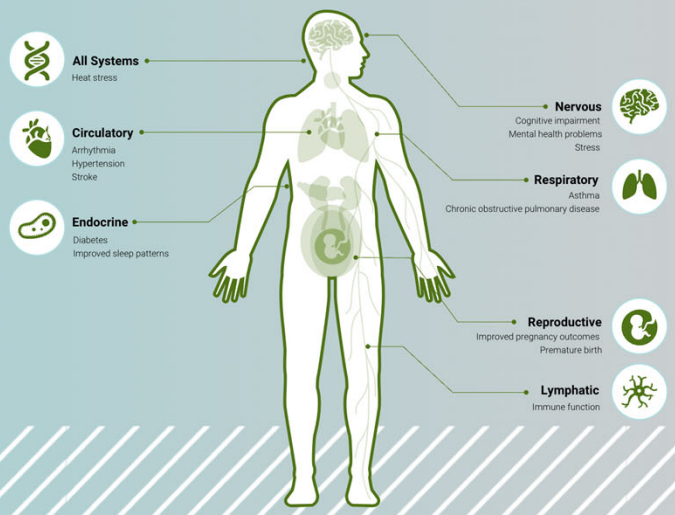

References

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IMPACTS ON HUMAN SYSTEMS

Promote green space and reduce heat

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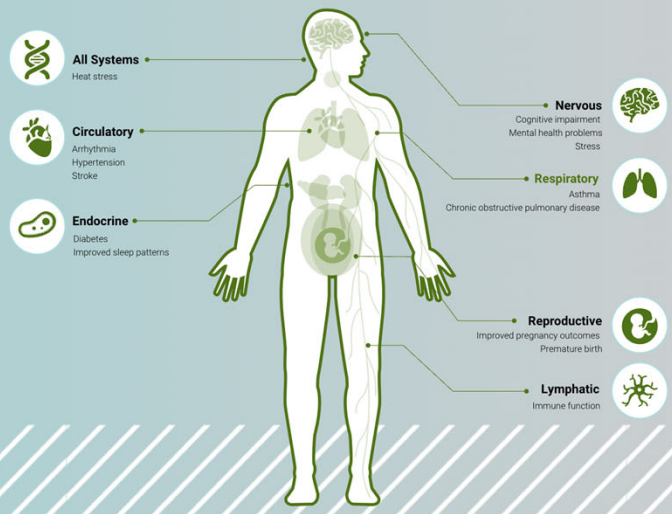
Respiratory system

The respiratory system is responsible for breathing, which is the controlled movement of air in and out of the body (ventilation). It also moves oxygen and carbon dioxide into and out of the bloodstream (respiration).



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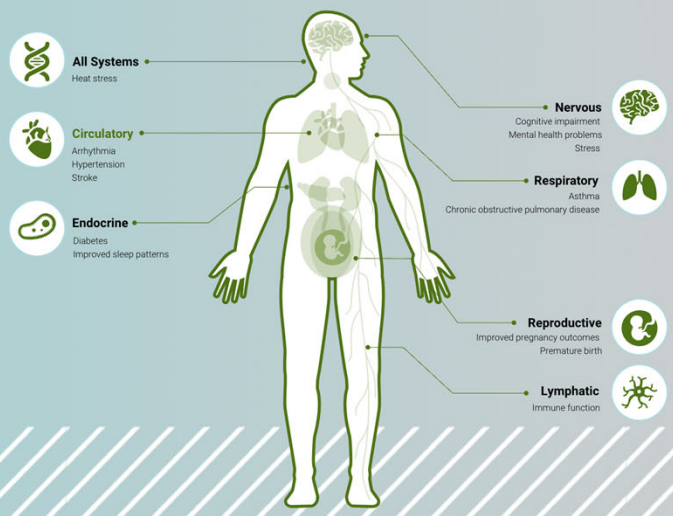

Circulatory system

The circulatory system transports oxygen and nutrients to all corners of the body. It also carries away carbon dioxide and other waste products.

References

Promote green space and reduce heat

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All Systems
Heat stress

Circulatory
Arrhythmia
Hypertension
Stroke

Nervous
Cognitive impairment
Mental health problems
Stress

Respiratory
Asthma
Chronic obstructive pulmonary disease

References

Promote green space and reduce heat

Stroke
Gascon et al. (2016). Residential green spaces and mortality: A systematic review.
http://www.sciencedirect.com/science/article/pii/S0160412015300799

Bunker et al. (2016). Effects of Air Temperature on Climate-Sensitive Mortality and Morbidity Outcomes in the Elderly; a Systematic Review and Meta-analysis of Epidemiological Evidence.
https://doi.org/10.1016/j.ebiom.2016.02.034

Heat Stress
Lemonsu et al. (2015). Vulnerability to heat waves: Impact of urban expansion scenarios on urban heat island and heat stress in Paris (France).
http://www.sciencedirect.com/science/article/pii/S2212095515300316

Arrhythmia
Bunker et al. (2016). Effects of Air Temperature on Climate-Sensitive Mortality and Morbidity Outcomes in the Elderly; a Systematic Review and Meta-analysis of Epidemiological Evidence.
https://doi.org/10.1016/j.ebiom.2016.02.034

Hypertension
Bunker et al. (2016). Effects of Air Temperature on Climate-Sensitive Mortality and Morbidity Outcomes in the Elderly; a Systematic Review and Meta-analysis of Epidemiological Evidence.
https://doi.org/10.1016/j.ebiom.2016.02.034

Diabetes
Twohig-Bennett & Jones. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes.
http://www.sciencedirect.com/science/article/pii/S0013935118303323

Bunker et al. (2016). Effects of Air Temperature on Climate-Sensitive Mortality and Morbidity Outcomes in the Elderly; a Systematic Review and Meta-analysis of Epidemiological Evidence.
https://doi.org/10.1016/j.ebiom.2016.02.034

Improved sleep patterns
Astell-Burt et al. (2013). Does access to neighbourhood green space promote a healthy duration of sleep? Novel findings from a cross-sectional study of 259,319 Australians.
https://bmjopen.bmj.com/content/bmjopen/3/8/e003094.full.pdf

Cognitive impairment
Kondo et al. (2018). Urban Green Space and Its Impact on Human Health.
https://pubmed.ncbi.nlm.nih.gov/29510520

Mental health problems
Gascon et al. (2015). Mental health benefits of long-term exposure to residential green and blue spaces: a systematic review.
https://doi.org/10.3390/ijerph120404354

Zijlema et al. (2018). Active commuting through natural environments is associated with better mental health: Results from the PHENOTYPE project.
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Gascon et al. (2015). Mental health benefits of long-term exposure to residential green and blue spaces: a systematic review.
https://doi.org/10.3390/ijerph120404354

Zijlema et al. (2018). Active commuting through natural environments is associated with better mental health: Results from the PHENOTYPE project.
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Asthma
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https://doi.org/10.1016/j.ebiom.2016.02.034

COPD
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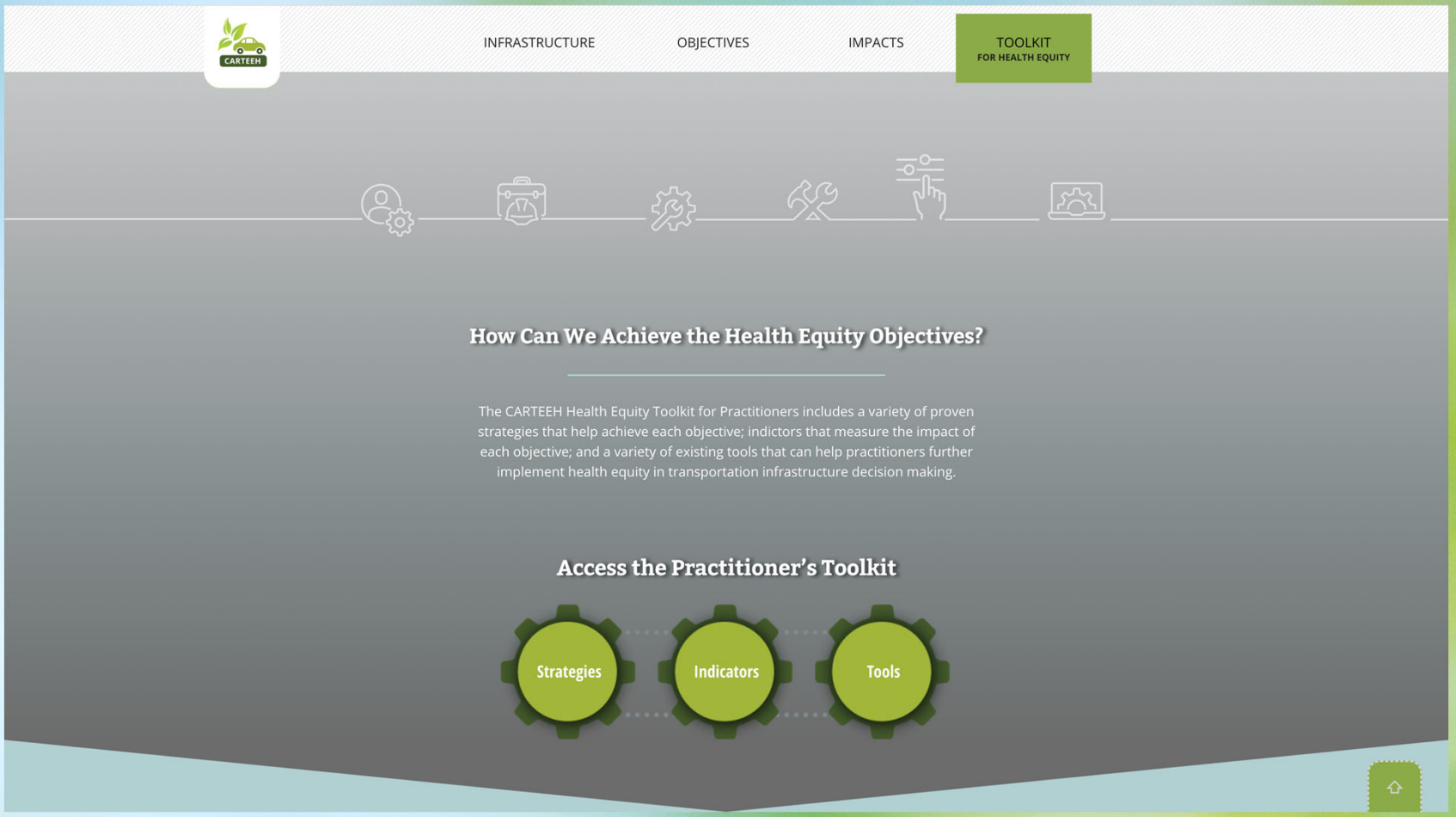
https://doi.org/10.1016/j.ebiom.2016.02.034

Improved pregnancy outcomes
Twohig-Bennett & Jones. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes.
http://www.sciencedirect.com/science/article/pii/S0013935118303323

Premature birth
Schifano et al. (2016). Heat and air pollution exposure as triggers of delivery: A survival analysis of population-based pregnancy cohorts in Rome and Barcelona.
http://www.sciencedirect.com/science/article/pii/S0160412015301173

Immune function
Egorov et al. (2017). Vegetated land cover near residence is associated with reduced allostatic load and improved biomarkers of neuroendocrine, metabolic and immune functions.
http://www.sciencedirect.com/science/article/pii/S0013935117304825


CARTEEH
INFRASTRUCTURE
OBJECTIVES
IMPACTS
TOOLKIT
FOR HEALTH EQUITY
How Can We Achieve the Health Equity Objectives?
The CARTEEH Health Equity Toolkit for Practitioners includes a variety of proven strategies that help achieve each objective; indictors that measure the impact of each objective; and a variety of existing tools that can help practitioners further implement health equity in transportation infrastructure decision making.
Access the Practitioner's Toolkit
Strategies
Indicators
Tools

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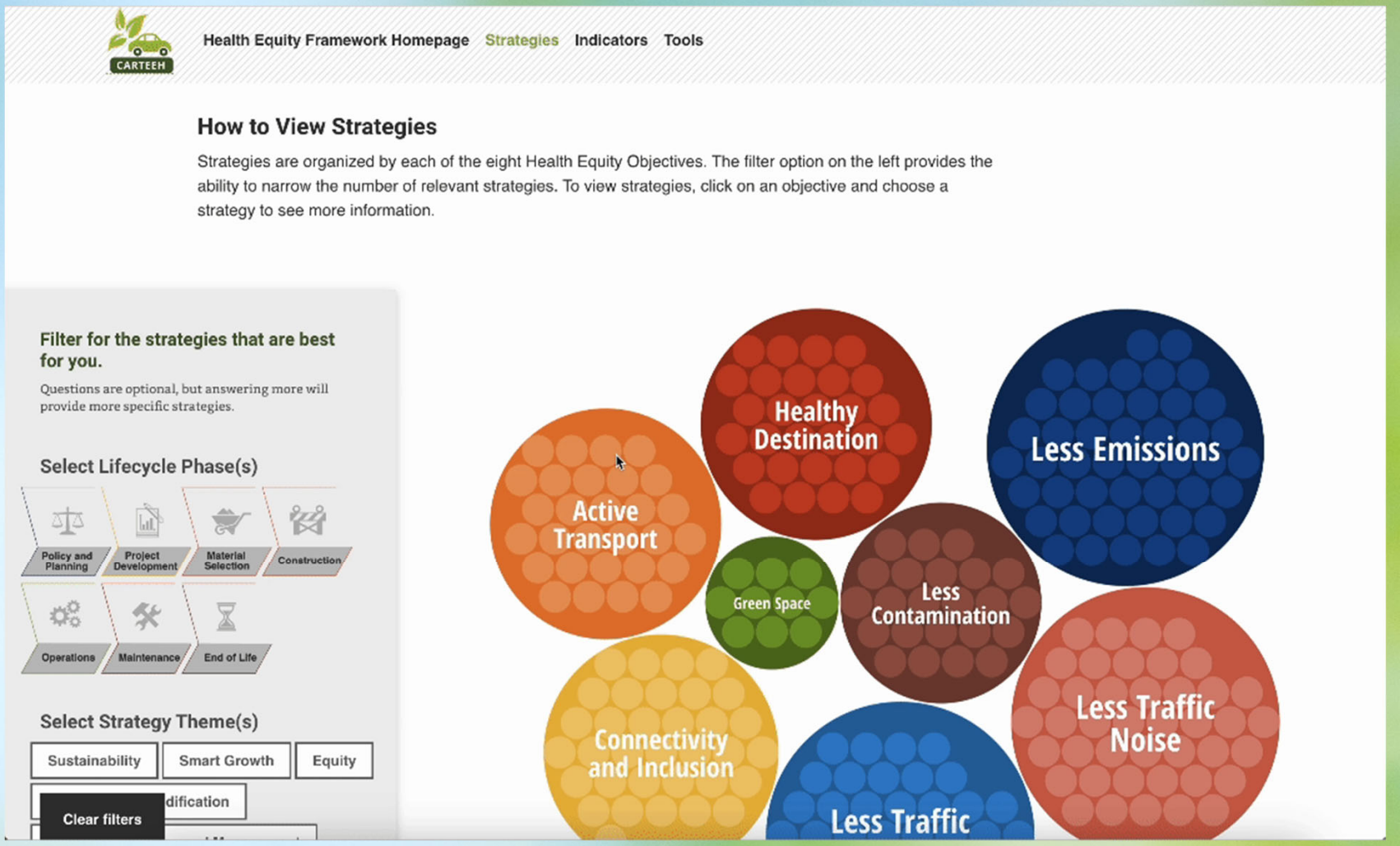
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Health Equity Framework Homepage
Strategies
Indicators
Tools
How to View Strategies
Strategies are organized by each of the eight Health Equity Objectives. The filter option on the left provides the ability to narrow the number of relevant strategies. To view strategies, click on an objective and choose a strategy to see more information.
Filter for the strategies that are best for you.
Questions are optional, but answering more will provide more specific strategies.
Select Lifecycle Phase(s)
Policy and Planning
Project Development
Material Selection
Construction
Operations
Maintenance
End of Life
Select Strategy Theme(s)
Sustainability
Smart Growth
Equity
Clear filters
Healthy Destination
Less Emissions
Active Transport
Green Space
Less Contamination
Less Traffic Noise
Connectivity and Inclusion
Less Traffic


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Construction
Operations
Maintenance
End of Life
Select Strategy Theme(s)
Sustainability
Smart Growth
Equity
Infrastructure Modification
Transportation Demand Management
Transportation System Management
Who's Involved?
Automakers
Automobile repair shops
Car owners
Carsharing and ridesharing apps
Clear filters
Healthy Destination
Less Emissions
Active Transport
Green Space
Less Contamination
Less Traffic Violence
Connectivity and Inclusion
Less Traffic Noise

CARTEEH

Choose Fuel-Efficient Vehicles

In recent years, there has been an increased focus on fuel-efficient vehicles, including battery-electric or plug-in hybrid-electric vehicles.[1] Electric vehicles (EVs) are becoming more commonplace—particularly in cities where more EV charging infrastructure is currently located—but there is still a long way to go to increase EV adoption rates across the country.

Considering this strategy will help achieve the goal of the following objectives

Transportation lifecycle phases

This strategy is associated with the following transportation lifecycle phases:

Who's involved

Automakers
Car owners
Federal agencies
Local governments
Policymakers
State governments

https://www.carteeh.org/strategy/choose-fuel-efficient-vehicles

Key Takeaways:

- Comprehensive and holistic approach to considering health equity in all aspects of transportation infrastructure development
- Practitioner-focused toolkit provides strategies, indicators, and tools that will immediately improve health equity in transportation infrastructure.
- Expand practitioner's focus beyond "the big three" (air pollution, traffic violence, and physical activity) and see opportunities that have greater impact on health equity in transportation infrastructure development.

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