STRIDE | Southeastern Transportation Research, Innovation, Development and Education Center

Sustainable Communities & Mobility

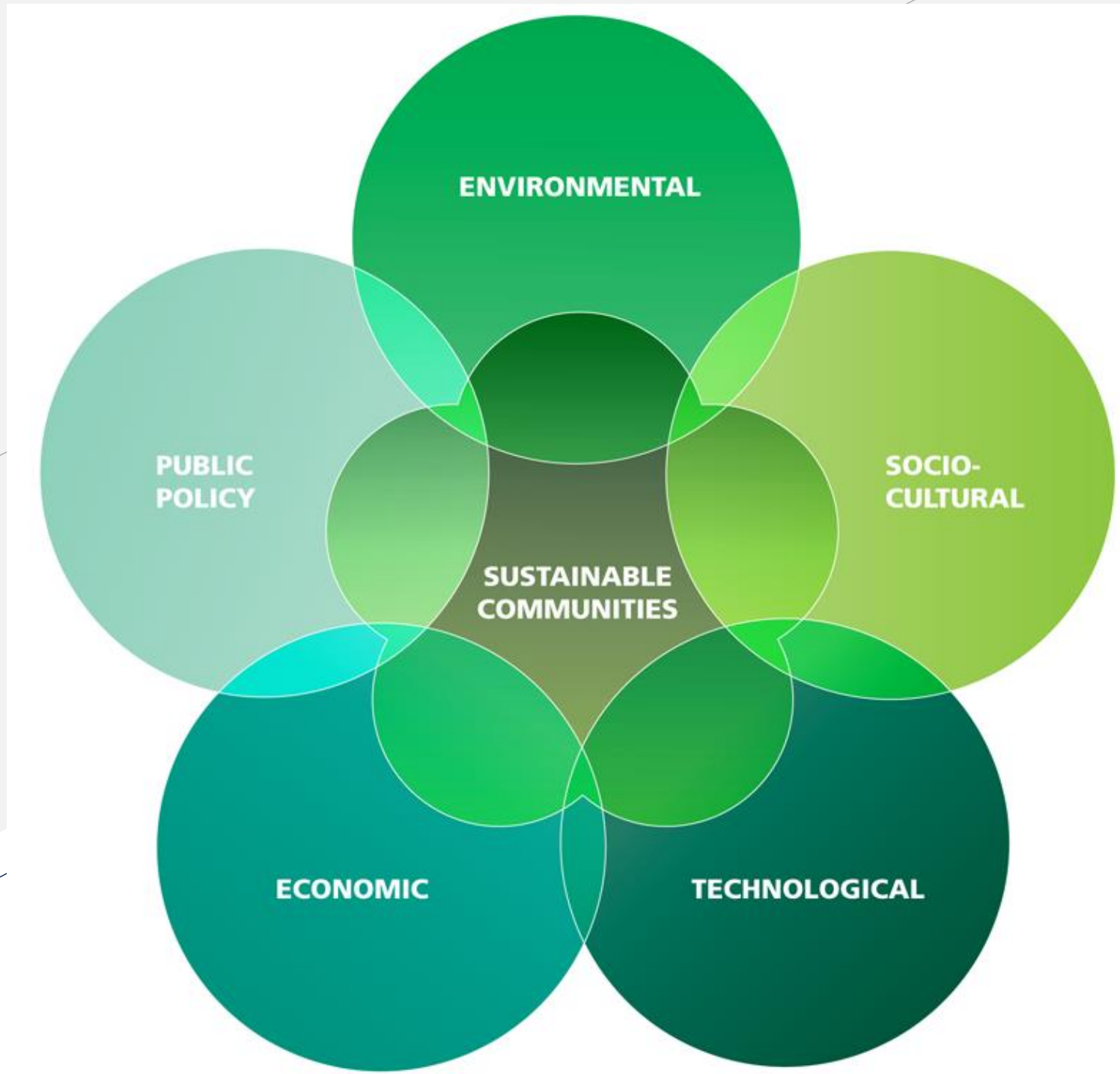
THE CITADEL

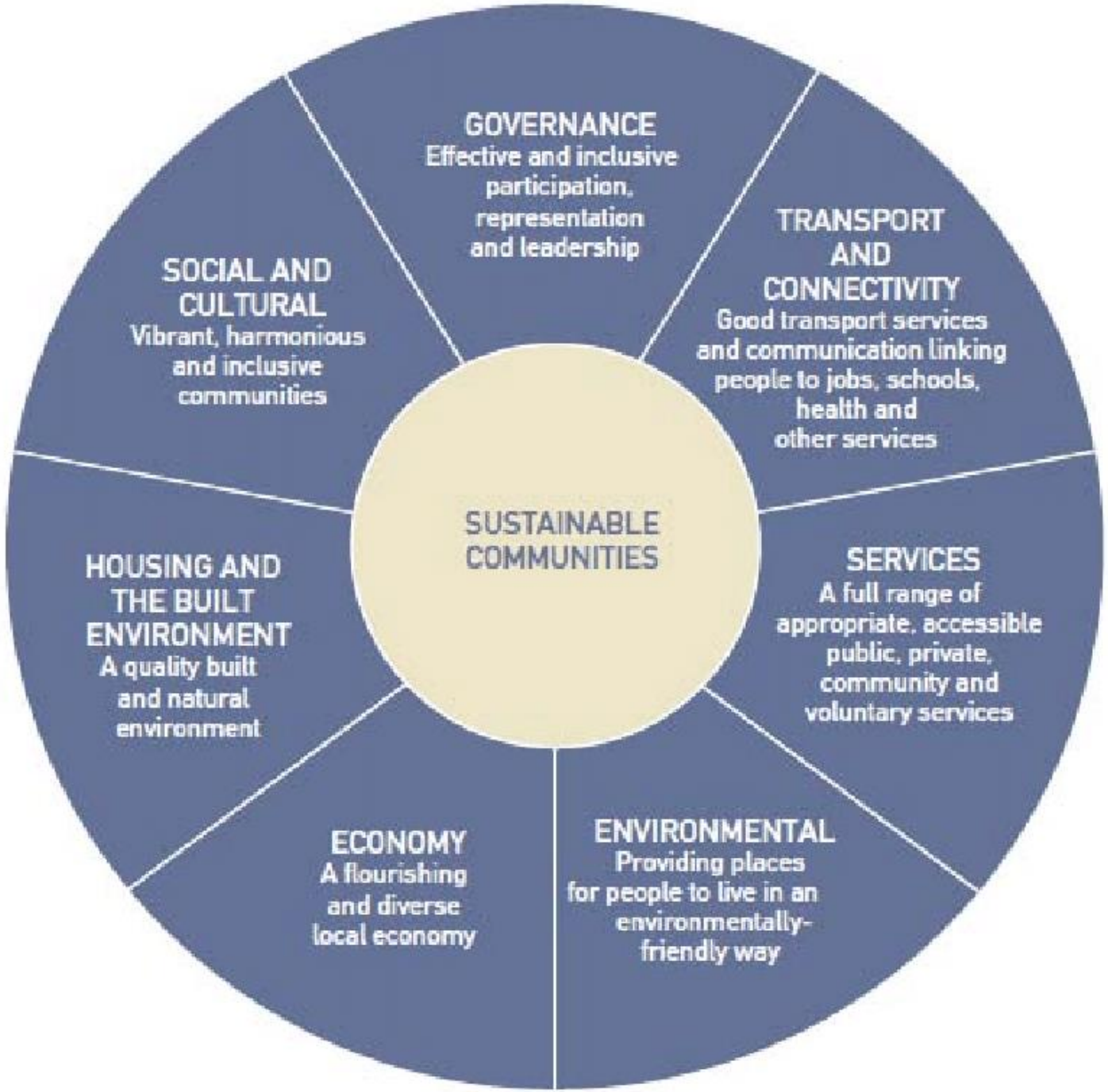
CIVL 642 Public Health, Physical Activity, and Design of the Built Environment

building SUSTAINABLE COMMUNITIES

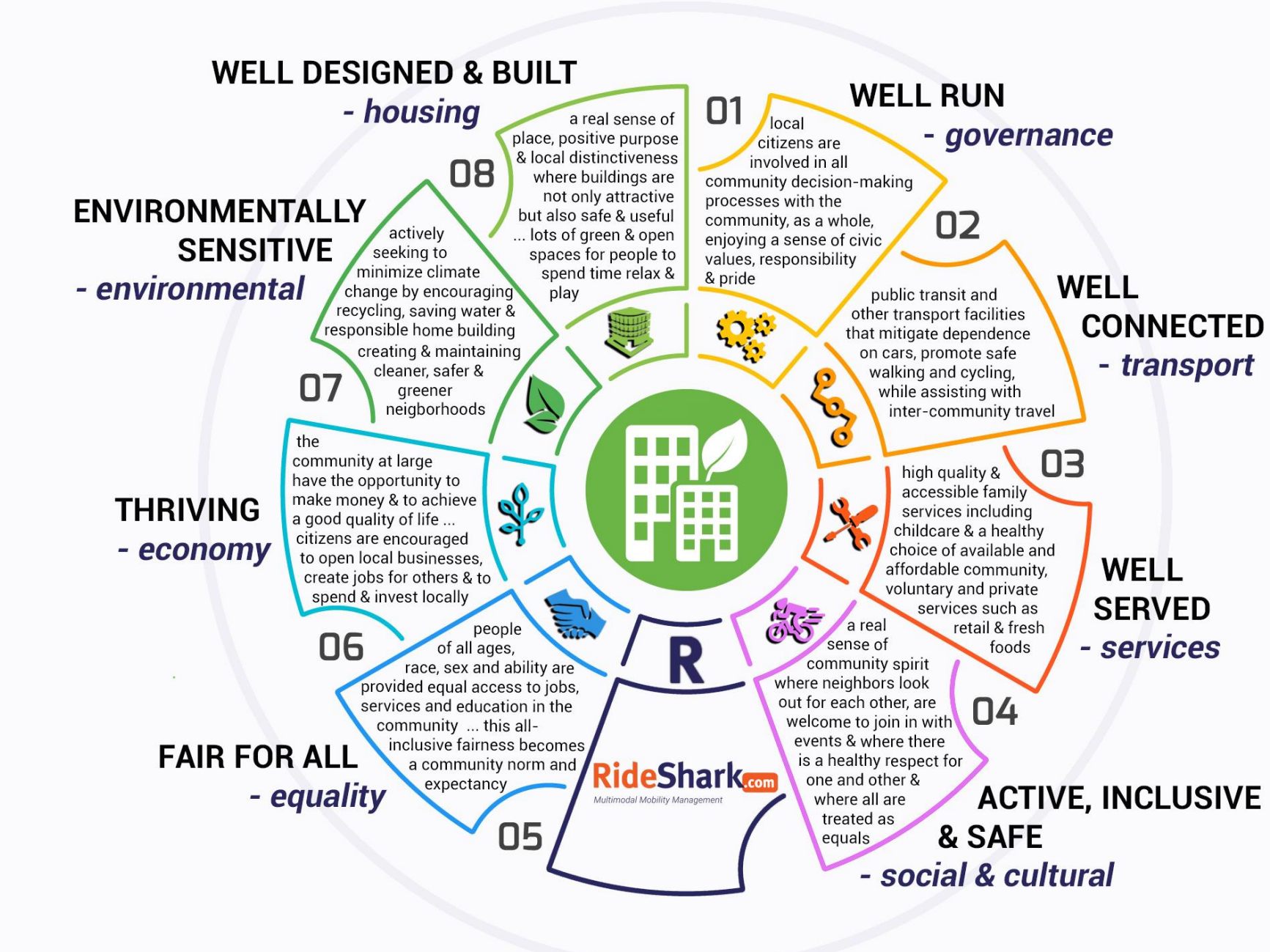
Sustainable Communities

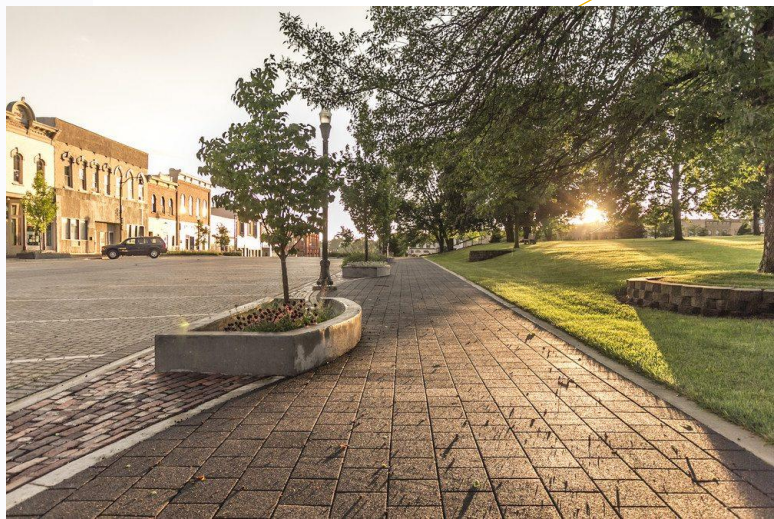
1. **Mixed Use Developments**
   - Sustainable Transportation
   - Land Use Density
   - Trip Mode Choice
2. **Active Living by Design (RWJ)**
   - Walkability
   - Bikeability
3. **Context Sensitive Solutions**
4. **Energy Consumption**
5. **Greenhouse Gas Emissions**


ENVIRONMENTAL
PUBLIC POLICY
SOCIO-CULTURAL
SUSTAINABLE COMMUNITIES
ECONOMIC
TECHNOLOGICAL

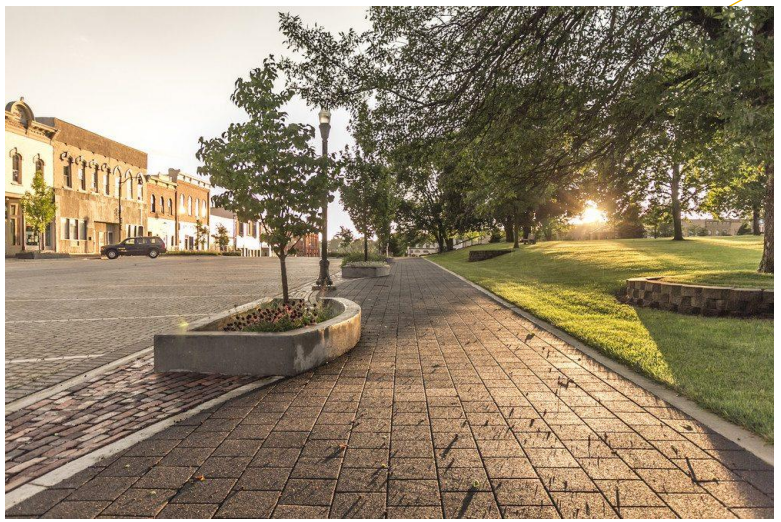

GOVERNANCE
Effective and inclusive participation, representation and leadership
TRANSPORT AND CONNECTIVITY
Good transport services and communication linking people to jobs, schools, health and other services
SERVICES
A full range of appropriate, accessible public, private, community and voluntary services
ENVIRONMENTAL
Providing places for people to live in an environmentally-friendly way
ECONOMY
A flourishing and diverse local economy
HOUSING AND THE BUILT ENVIRONMENT
A quality built and natural environment
SOCIAL AND CULTURAL
Vibrant, harmonious and inclusive communities
SUSTAINABLE COMMUNITIES

THE KEY COMPONENTS OF SUSTAINABLE COMMUNITIES

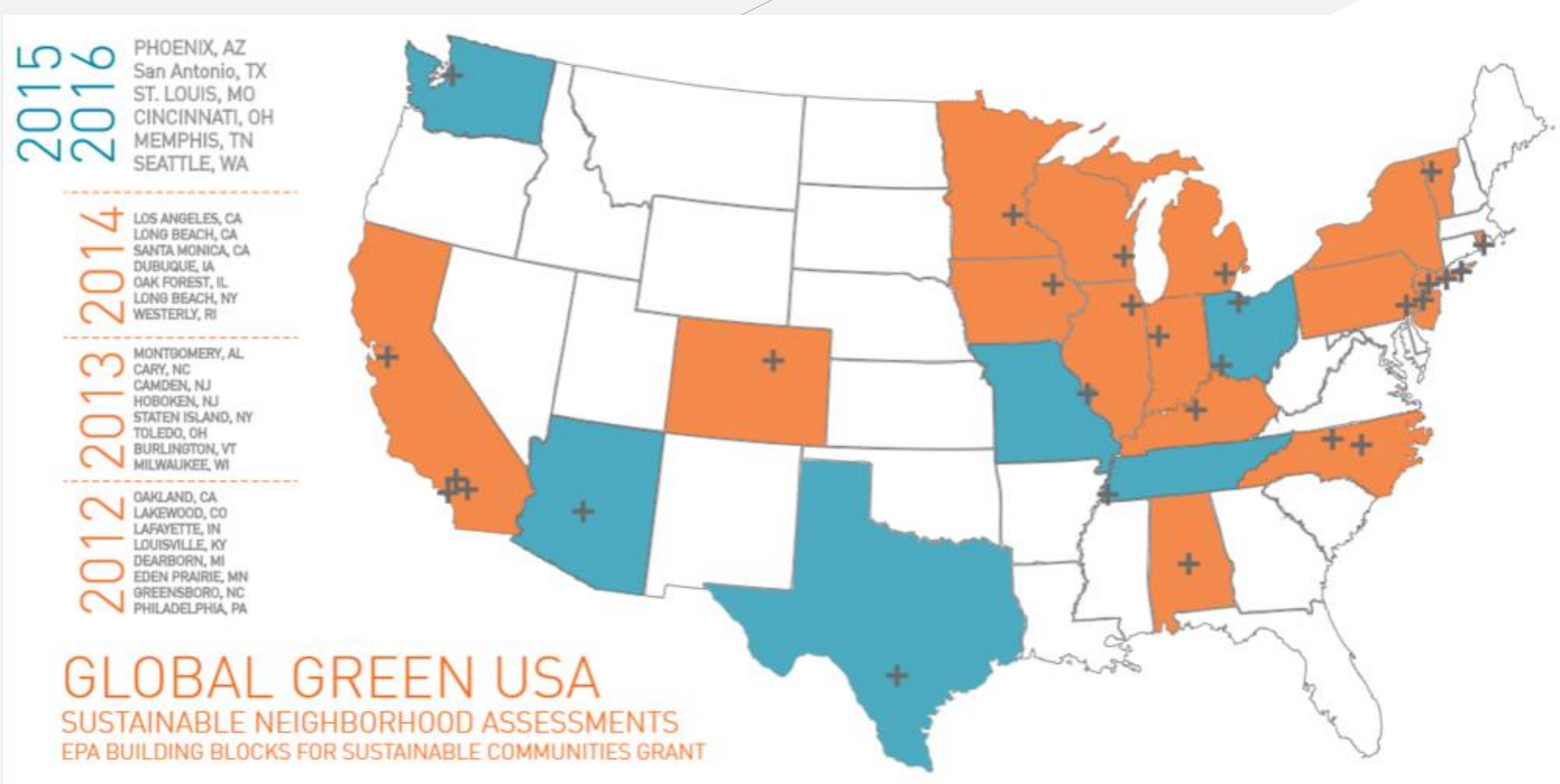





WELL RUN
When decisions are made about a community, local people are included in the decision-making process. The community enjoys a sense of civic values, responsibility and pride.
WELL CONNECTED
The transport facilities, including public transport, help people to travel within and between communities and reduce dependence on cars. There are facilities to encourage safe local walking and cycling.
WELL SERVED
High quality services for families and children (including early years childcare). A good range of affordable public, community, voluntary and private services (eg. retail, fresh food, commercial, utilities, information and advice) that are accessible to the whole community.
ENVIRONMENTALLY SENSITIVE
Actively seek to minimise climate change (eg people are encouraged to recycle and use water, live in homes that do not waste electricity and are built on brownfield sites that no new forest/fields are destroyed). Create greener, safer and greener neighbourhoods (eg by reducing graffiti and maintaining pleasant public spaces).
FAIR FOR EVERYONE
People of all ages, races, sexes and abilities are given access to services, jobs and education in the community. This fairness is not a luxury; it is normal to everyone. This fairness lasts to provide opportunities for future generations.
THRIVING
Local people have the opportunity to make money and have a good quality of life. They are encouraged to open up small businesses and spend their wages locally to help improve other businesses. Successful businesses create more jobs for people, and better standards of living for more people in the community.
WELL DESIGNED & BUILT
A sense of place (eg a place with a positive 'feeling' for people and local distinctiveness). Buildings are attractive, safe and useful to the people who use them. Buildings that people want to go into. Lots of open space for people to play and relax.
ACTIVE INCLUSIVE & SAFE
A community spirit is created. People are always welcome to join in events (eg. sports, fundraising and festivals). Neighbours look out for one another and respect each other. All people are treated fairly. There are low levels of crime, drugs and anti-social behaviour with viable, effective and community friendly policing.
GOVERNANCE
TRANSPORT
SERVICES
ENVIRONMENTAL
EQUALITY
ECONOMY
HOUSING
SOCIAL
SUSTAINABLE COMMUNITIES




Sustainable communities
Social and cultural
Governance
Transport and connectivity
Services
Economy
Equity
Environmental
Housing and the Built environment
Active, inclusive and safe - fair, tolerant and cohesive with a strong local culture and other shared community activities
Well run - with effective and inclusive participation, representation and leadership
Well connected - with good transport services and communication linking people to jobs, health and other services
Well served - with public, private, community and voluntary services that are appropriate to people's needs and accessible to all
Thriving - with a flourishing and diverse local economy
Well designed and built - featuring a quality built and natural environment
Fair for everyone -including those in other communities, now and in the future
Environmental sensitive - providing places for people to live that are considerate of the environment



https://www.globalgreen.org/blog/sustainable-neighborhood-assesments

CARY, NC

SUSTAINABLE NEIGHBORHOOD ASSESSMENT

LEED-ND

LEED PLATINUM

U.S. GREEN BUILDING COUNCIL

USGBC ™

LEED for Neighborhood Development: Project Assessment Checklist

Neighborhood Pattern and Design

TOWN CENTER

CARY, NORTH CAROLINA

Baseline Conditions	Local/Regional Planning Priority	Regulatory Support	Technical feasibility	Market Support	Neighborhood Need/ Stakeholder Input

Legend
✓ Achieved
? Unkown
X Not Achieved
Does not exist/ NA
Explicit support/ no technical issues
Lack of explicit support/ minor technical issues
Opposition/ signficant technical issues
Not Applicable

Neighborhood Pattern and Design

X	P 1	Walkable Streets- Principal Entries
X	P 1	Walkable Streets- Building Height to Street Width Ratio
X	P 1	Walkable Streets-Continuous Sidewalks
X	P 1	Walkable Streets-Garage and Service Bays
X	P 2	Compact Development
✓	P 3	Connected and Open Community
X	C 1a	Walkable Streets : Facades and Entries
X	C 1b	Walkable Streets: Ground-Level Use and Parking
✓	C 1c	Walkable Streets:Design Speed for Safe Ped and Bike Travel
X	C 1d	Walkable Streets: Sidewalk Intrusions
X	C 2	Compact Development
X	C 3	Mixed-Use Neighborhood Centers
X	C 4	Mixed-Income
X	C 4	Diverse Communities
X	C 5	Reduced Parking Footprint
X	C 6	Street Network
X	C 7	Transit Facilities
–	C 8	Transportation Demand Management
✓	C 9	Access to Civic and Public Spaces
✓	C 10	Access to Recreation Facilities
–	C 11	Visitability and Universal Design
✓	C 12	Community Outreach and Involvement
✓	C 13	Local Food Production
✓	C 14	Tree-Lined and Shaded Streets
✓	C 15	Neighborhood Schools

LEED for Neighborhood Development: Project Assessment Checklist

Green Infrastructure and Building

TOWN CENTER

CARY, NORTH CAROLINA

Baseline Conditions	Local/Regional Planning Priority	Regulatory Support	Technical feasibility	Market Support	Neighborhood Need/ Stakeholder Input

Legend
✓ Achieved
? Unkown
X Not Achieved
Does not exist/ NA
Explicit support/ no technical issues
Lack of explicit support/ minor technical issues
Opposition/ signficant technical issues
Not Applicable

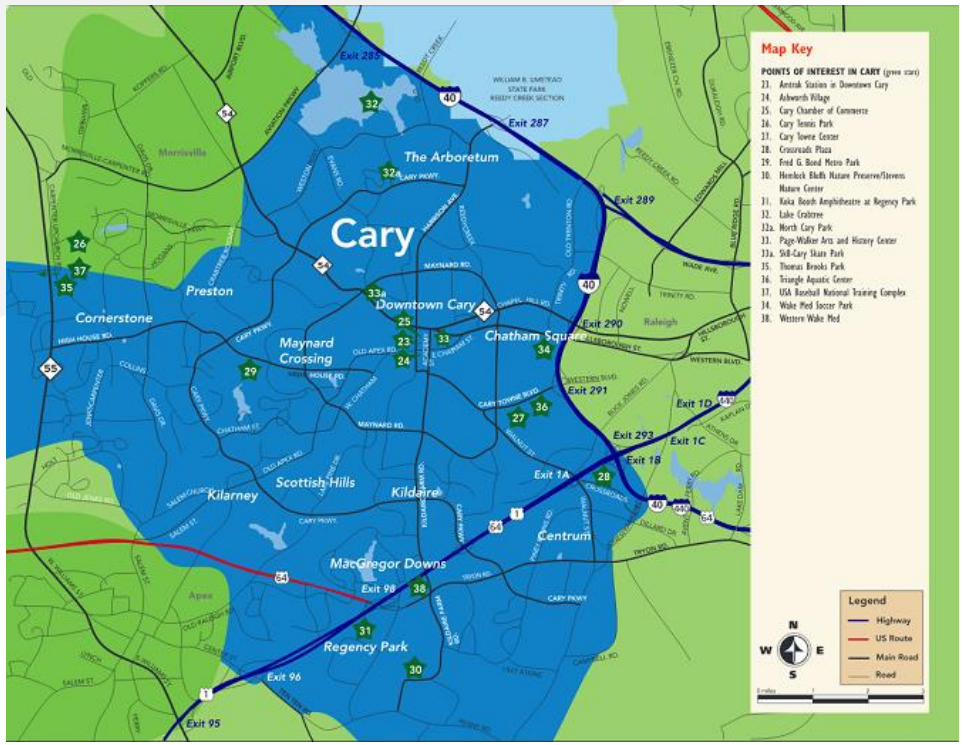
Green Infrastructure and Buildings

X	P 1	Certified Green Building
✓	P 2	Minimum Building Energy Efficiency
X	P 3	Minimum Building Water Efficiency
✓	P 4	Construction Activity Pollution Prevention
X	C 1	Certified Green Buildings
X	C 2	Building Energy Efficiency
X	C 3	Building Water Efficiency
✓	C 4	Water-Efficient Landscaping
✓	C 5	Existing Building Use
?	C 6	Historic Resource Preservation and Adaptive Reuse
–	C 7	Minimized Site Disturbance in Design and Construction
X	C 8	Stormwater Management
?	C 9	Heat Island Reduction
✓	C 10	Solar Orientation
X	C 11	On-Site Renewable Energy Sources
X	C 12	District Heating and Cooling
?	C 13	Infrastructure Energy Efficiency
–	C 14	Wastewater Management
?	C 15	Recycled Content in Infrastructure
✓	C 16	Solid Waste Management Infrastructure
	C 17	Light Pollution Reduction

CARY, NC

SUSTAINABLE NEIGHBORHOOD ASSESSMENT

LEED-ND



Point Requirements for LEED-ND Certification

Certified:	40-49
Silver:	50-59
Gold:	60-79
Platinum:	80+

Town of Cary

LEED for Neighborhood Development

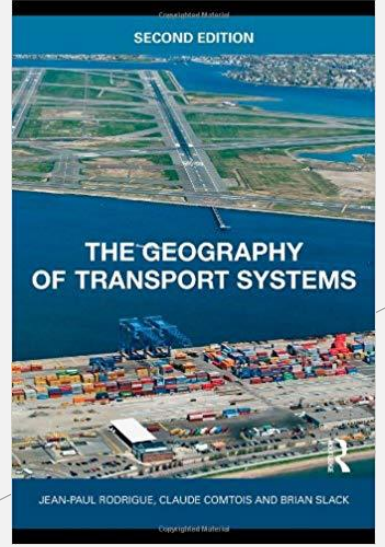
	Total	Achievable	Possible
Smart Location & Linkage	27	8	11
Neighborhood Pattern & Design	44	21	12
Green Building & Infrastructure	29	13	12
	100	42	34

Related LEED-ND Credits

Connections
Category: Smart Location & Linkages
Locations w/Reduced Auto Dependence
(credit 3)
Bicycle Network & Storage
(credit 4)
Category: Neighborhood Pattern & Design
Walkable Streets
(prerequisite & credit 1)
Mixed-Use Neighborhood Centers
(credit 3)
Transit Facilities
(credit 7)
Tree-Lined & Shaded Streets
(credit 14)

Town Park Site
Category: Neighborhood Pattern & Design
Mixed-Use Neighborhood Centers
(credit 3)
Access to Civic & Public Space
(credit 9)
Access to Recreational Facilities
(credit 10)
Local Food Production
(credit 13)

Downtown
Category: Smart Location & Linkages
Preferred Location
(credit 1)
Brownfield Redevelopment
(credit 2)
Category: Neighborhood Pattern & Design
Access to Civic and Public Spaces
(credit 9)
Access to Recreation Facilities
(credit 10)
Local Food Production
(credit 13)
Category: Green Infrastructure & Building
Stormwater Management
(credit 4)
Water Efficient Landscaping
(credit 4)



Sustainable Transportation

1. **Sustainable Development & Transport**

   Geography of Transport Systems, Dr. Jean-Paul Rodrigue

   https://transportgeography.org/?page_id=5725

2. **Sustainable Transportation**

   American Society of Landscape Architects

   https://www.asla.org/sustainabletransportation.aspx

3. **Transportation Sustainability Research Center**

   Univ. of California Berkeley

   https://tsrc.berkeley.edu/

tsrc
UNIVERSITY OF CALIFORNIA Berkeley
Transportation Sustainability
RESEARCH CENTER

UNIVERSITY OF CALIFORNIA Berkeley
Transportation Sustainability RESEARCH CENTER
tsrc

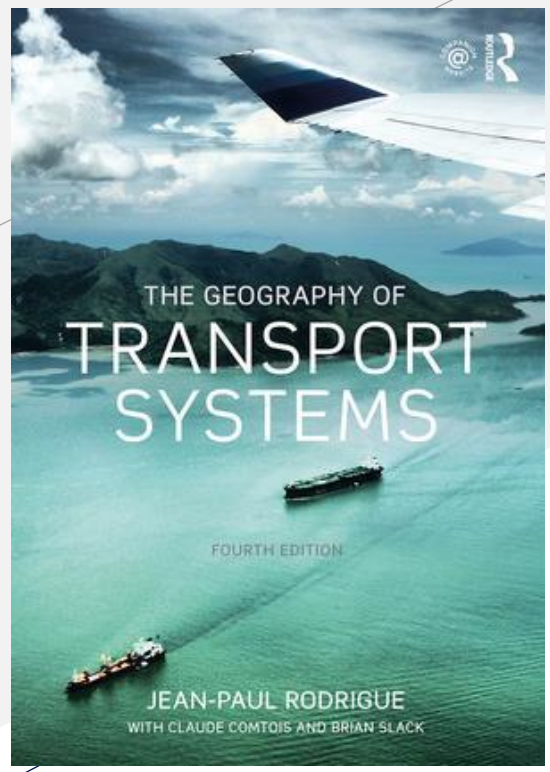
American Society of Landscape Architects

Sustainable Transportation (UC- Berkeley)

1. Advanced Vehicles & Fuels
2. Energy & Infrastructure
3. Future of Mobility
4. Goods Movement
5. Mobility for Special Populations
6. Shared Mobility

Sustainable Transportation (ASLA)

1. Transportation responsible for 30% of greenhouse gas emissions
2. 40% of American adults are obese, those most reliant on cars, most at risk
3. Adverse impact of Interstate routes in cities mostly on vulnerable populations
4. Access to jobs, services and community is too dependent on automobile ownership
5. Stormwater runoff water-quality issues heavily influenced by automobile pollutants



Sustainable Development

Sustainable Transportation

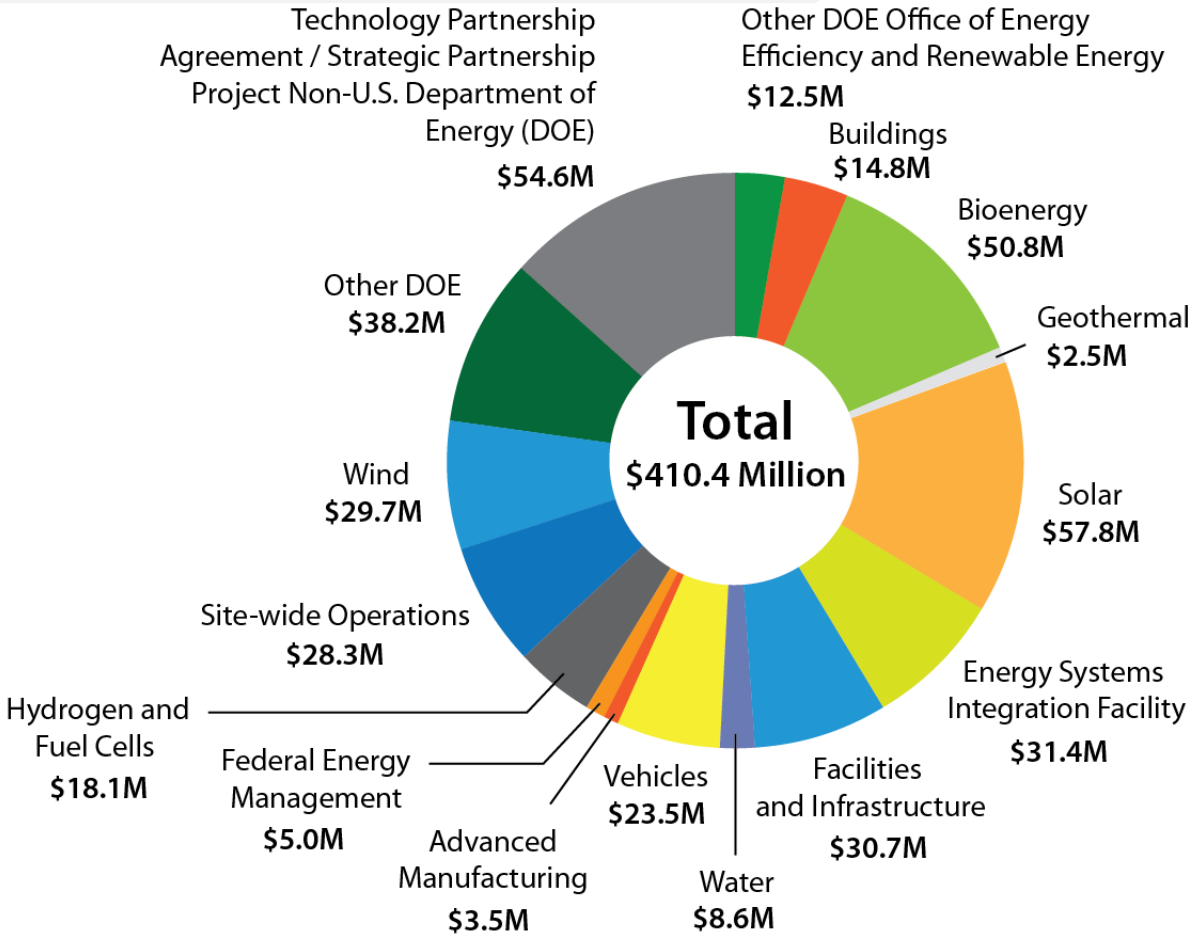
- Modes
- Infrastructures
- Operations

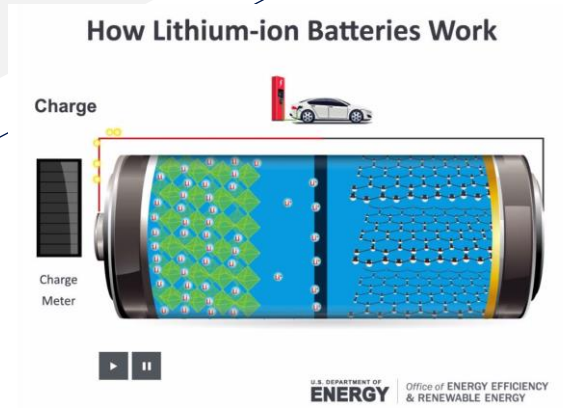
Environment	Economy	Society
Climate Change	*Materials and Energy*	*Safety*
Air quality	*Growth*	*Health*
Noise	*Employment*	*Disturbance*
Land Use	*Pricing*	*Access*
Waste	*Competitiveness*	*Equity*

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

VEHICLE TECHNOLOGIES OFFICE

1. Batteries, Charging, & Electric Vehicles
2. Energy Efficient Mobility Systems
3. Advanced Combustion Systems & Fuels
4. Lightweight & Propulsion Materials
5. Technology Integration

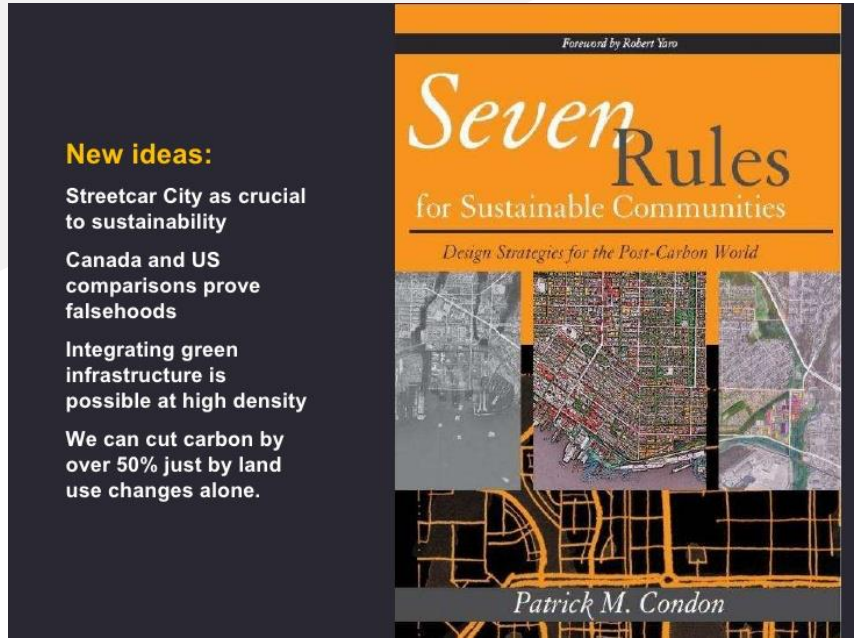


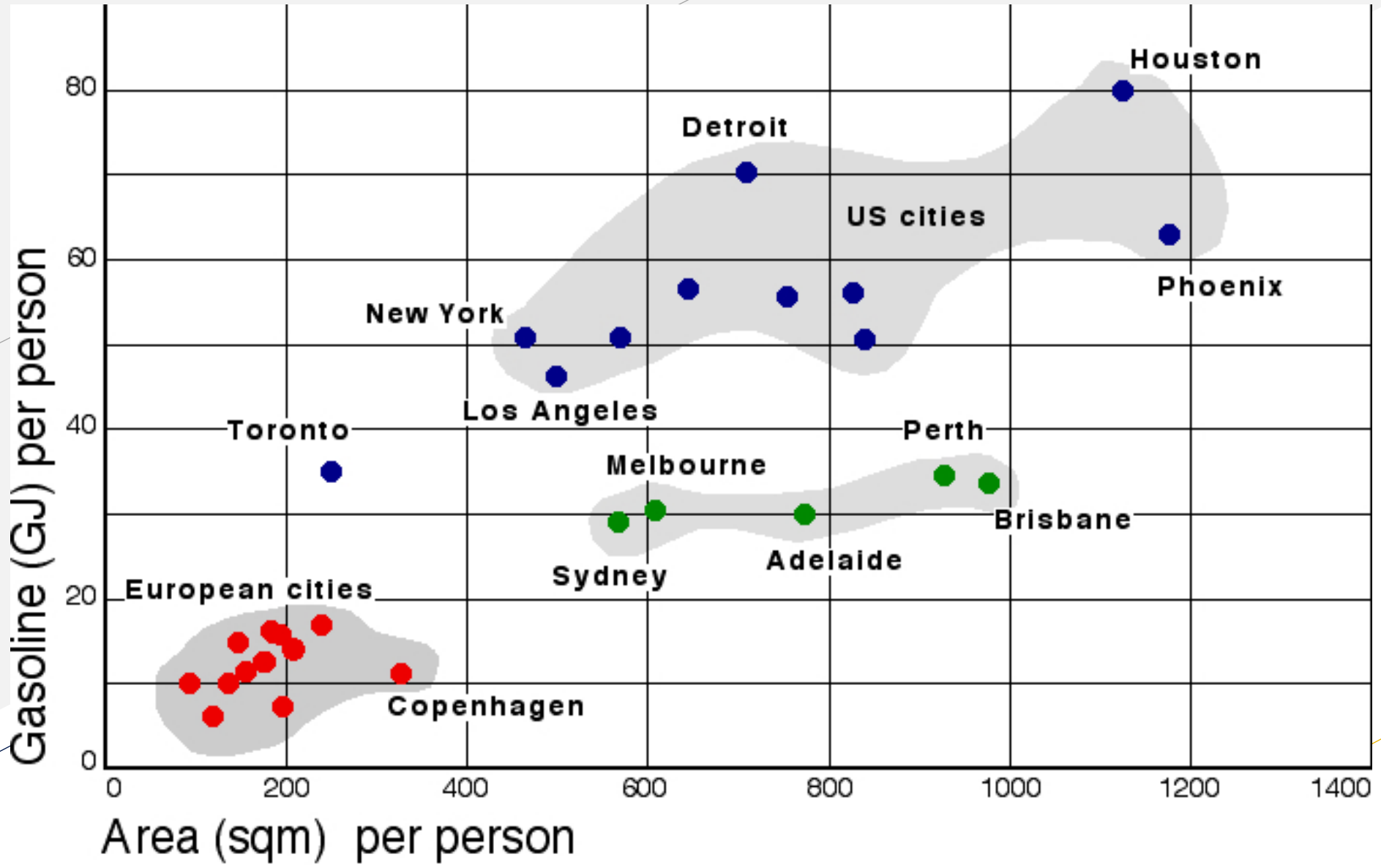


7 Rules for Sustainable Communities ~ *P.M. Condon*

1. Restore the street car city
2. Design an Interconnected street system
3. Locate commercial services, transit & schools within a 5-minute walk
4. Locate good jobs close to affordable homes
5. Provide a diversity of housing types
6. Create a linked system of natural areas & parks
7. Invest in lighter, greener, cheaper & smarter infrastructure.

https://www.slideshare.net/IslandPress/seven-rules-for-sustainable-communities-wash-dc-building-museum-2011





Newman, Kenworthy's 1989, revised 2006

Urban Design to Reduce Automobile Dependence

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.543.5452&rep=rep1&type=pdf

Does Mass Transit Help Low-Income Workers? – Cato Institute

https://www.cato.org/multimedia/cato-daily-podcast/does-mass-transit-help-low-income-workers

Transportation, Land Use & Freedom

https://www.libertarianism.org/media/free-thoughts/transportation-land-use-freedom

Zoning, Land-Use Planning, and Housing Affordability

https://www.cato.org/multimedia/cato-daily-podcast/zoning-land-use-planning-housing-affordability

CATO INSTITUTE

History of US Transportation:
Role of Government, Innovation

Vehicles

https://visual.ly/community/infographic/transportation/history-transportation

https://www.infoplease.com/science-health/transportation/road

Railroads

http://www.trainhistory.net/railway-history/railroad-timeline/

Public Transit

http://www.trainhistory.net/railway-history/railroad-timeline/

Highways

http://www.greatachievements.org/?id=3786

https://www.transportation.gov/50/timeline

CONGRESS **EXECUTIVE** **JUDICIAL** *Branch of Government*

Budgeting & Legislation Appointments/Vision/Agenda/Appointments Rulings on Legal Actions *Means of Influence*

US DEPT. OF TRANSPORTATION

FAA Air	**US Coast Guard Maritime**	**FHWA Highways**	Motor Carrier Trucking	**Fed RR Railroads**	**FTA Transit**	NHTSA Safety	**Trans. Engineering Network Elements**
							Policy Planning (Integration) Network Priorities Engineering/Design Construction Operation Maintenance Management
Local/Regional Airport Authorities	**US Army Corps of Engineers** State Port Auth.	**State DOT's** Local Gov.. & AAA	Trucking Association	RR Corps State RR's	Local Transit Authorities		Major Coordinating Agency/Industry Partners
Airport fields Terminals Landside NAVAIDS	Ports Harbors Channels Terminals	Interstates NHS Rural roads Urban streets		Track Design Switch yards Stations Right-of-way	Bus routes Fixed Guideways Terminals Paratransit		Facility Network Infrastructure
Com. Aircraft Gen. Aviation Military Aircraft	Container ships RO/RO ships Break Bulk ships Inland barges Multimodal	Urban trips Rural trips Commerce HOV Toll roads	Local deliveries Long haul 2-3 trailer rigs	Locomotives Box Cars Container cars Rolling Stock	Buses Rolling Stock Light Rail Heavy Rail People Movers PRT		Vehicles Usage Type
Noise Security	Dredging Environment Capacity Landside access	Safety Air Quality Energy Congestion	Safety Weight Haz Mat Regulation	Safety Haz Mat Access	Reliability Cost/Trip Density	Safety Accident data Investigations	Major Engineering Issues & Factors

Mode Choice – travel forecasting is used for:

1. Major transportation **capital investment** projects to evaluate competing modes
2. Transit **service changes**, which may encourage/discourage use of transit
3. **Pricing** policy analyses, which may discourage use of modes w/ increased prices
4. Long range forecasts, changes in demographics or travel conditions may alter relative worth of different modes for some or all travelers;
5. Land use planning analyses, where changes in development patterns may make certain modes more or less attractive relative to others.
6. For transit modes, other characteristics usually part of mode choice include:
   - Walk access time
   - Auto access time
   - Initial wait time
   - Transfer wait time
   - Transfer travel time (e.g. walking between stops)
   - Fare

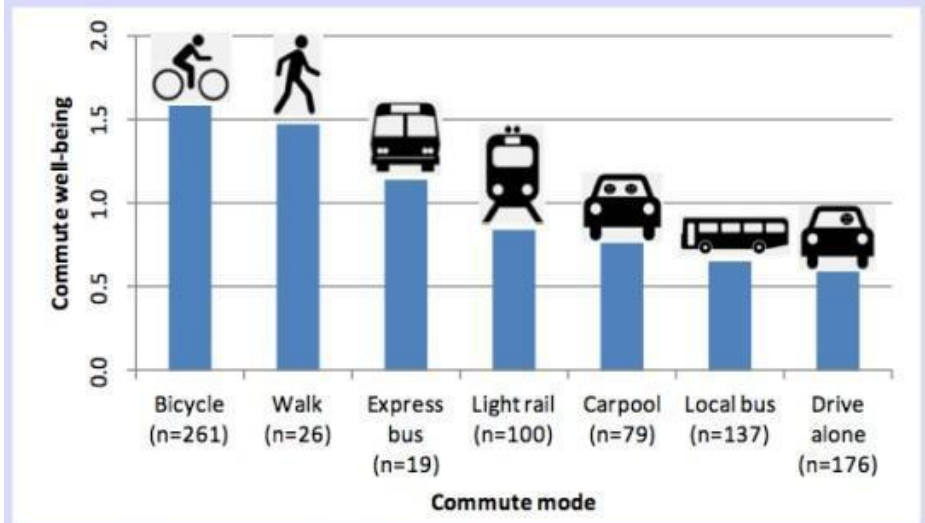


Fig. 3. Variation in commute well-being by mode

Urban Travel Modes & Public Transit

- MaaS –Bike Share, Scooter Share, Ride Share, Car Share
- Auto – SOV, Taxi, Shuttle, Van Pool, HOV, HOT
- Light Rail (Street Car)
- Heavy rail
- Commuter rail
- People Mover Systems
- Local bus service
- Express bus service
- Paratransit service
- Busways (Bus Rapid Transit)

Walkability, Bikeability, Active Living by Design

Complete Communities (video)

https://www.completecommunitiesde.org/planning/healthy-and-livable/designing-walkable/

Walkability & Bikeability

Walk Score dominates evaluation

CDC Walkability Audit Too

https://www.cdc.gov/physicalactivity/worksite-pa/pdf/walkability_audit_tool.pdf

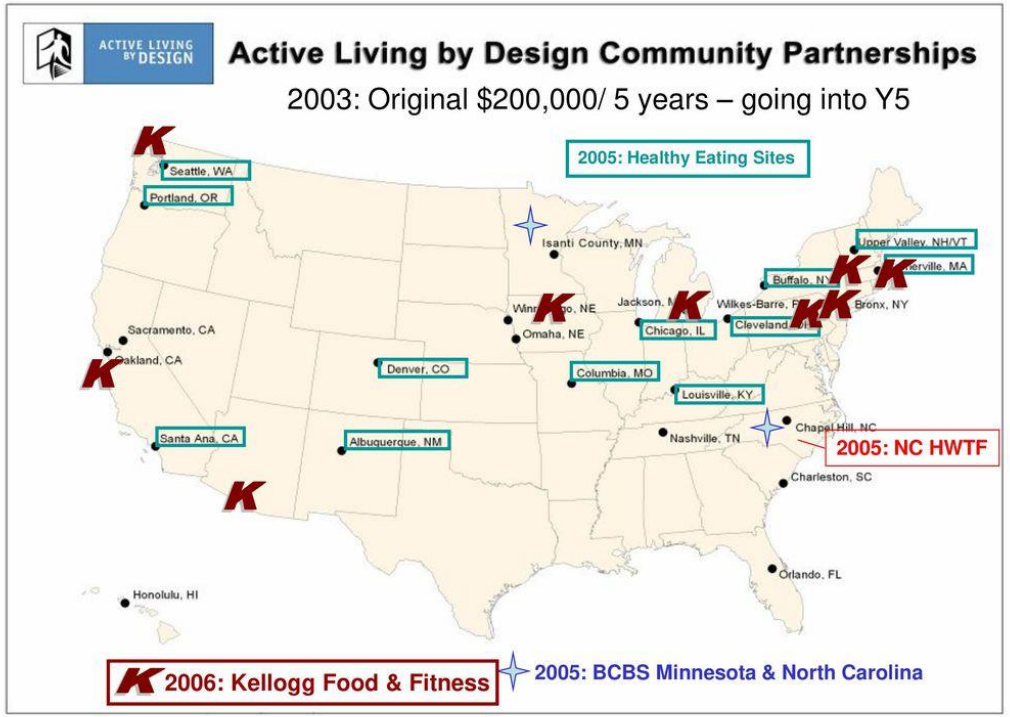
San Francisco Bikeability & LOS

http://sustainablecities.weebly.com/uploads/1/2/3/3/12335040/stanford_sustainable_cities_bikeability_report.pdf

Robert Woods Johnson Foundation

https://www.rwjf.org/en/library/research/2011/10/active-living-by-design.html

https://dirt.asla.org/2011/01/26/designing-for-active-living/



Context Sensitive Solutions

Federal Highway Administration

https://www.fhwa.dot.gov/planning/css/

Complete Communities

https://www.completecommunitiesde.org/planning/complete-streets/css/

Context Sensitive Solutions

Definition:
Context sensitive solutions (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. This approach leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions.

Principles:
These core principles apply to transportation processes, outcomes, and decision-making:

- Strive toward a shared stakeholder vision to provide a basis for decisions.
- Demonstrate a comprehensive understanding of contexts.
- Foster continuing communication and collaboration to achieve consensus.
- Exercise flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments.

Why does MaineDOT utilize CSS?
Transportation facilities (highways, bridges, airports, walking trails, intermodal facilities, etc.) impact communities in ways beyond facilitating travel from one point to another. These facilities are integral components to the regional landscape and as such construction or modifications to them could have positive or adverse impacts. MaineDOT's utilization of CSS is a dynamic process reflective of the uniqueness of different communities in Maine as well as features that may be exclusive of a specific transportation facility.

CSS projects in Maine typically follow these steps:

1. Problem Identification
2. Formation of Multidisciplinary Teams
3. Stakeholder Identification
4. Purpose and Need Identification
5. Stakeholder Outreach Plan
6. Alternative Identification and Evaluation
7. Policy Decision
8. Inter-local Agreement
9. Design
10. Construction
11. Evaluation

The CSS process leads to outcomes that:

- Are in harmony with the community and preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area.
- Are safe for all users.
- Solve problems that are agreed upon by a range of stakeholders.
- Meet or exceed the expectations of both designers and stakeholders, thereby adding lasting value to the community, the environment, and the transportation system.
- Demonstrate effective and efficient use of resources (people, time, budget, etc.) among all parties.

For more information:

www.contextsensitivesolutions.org

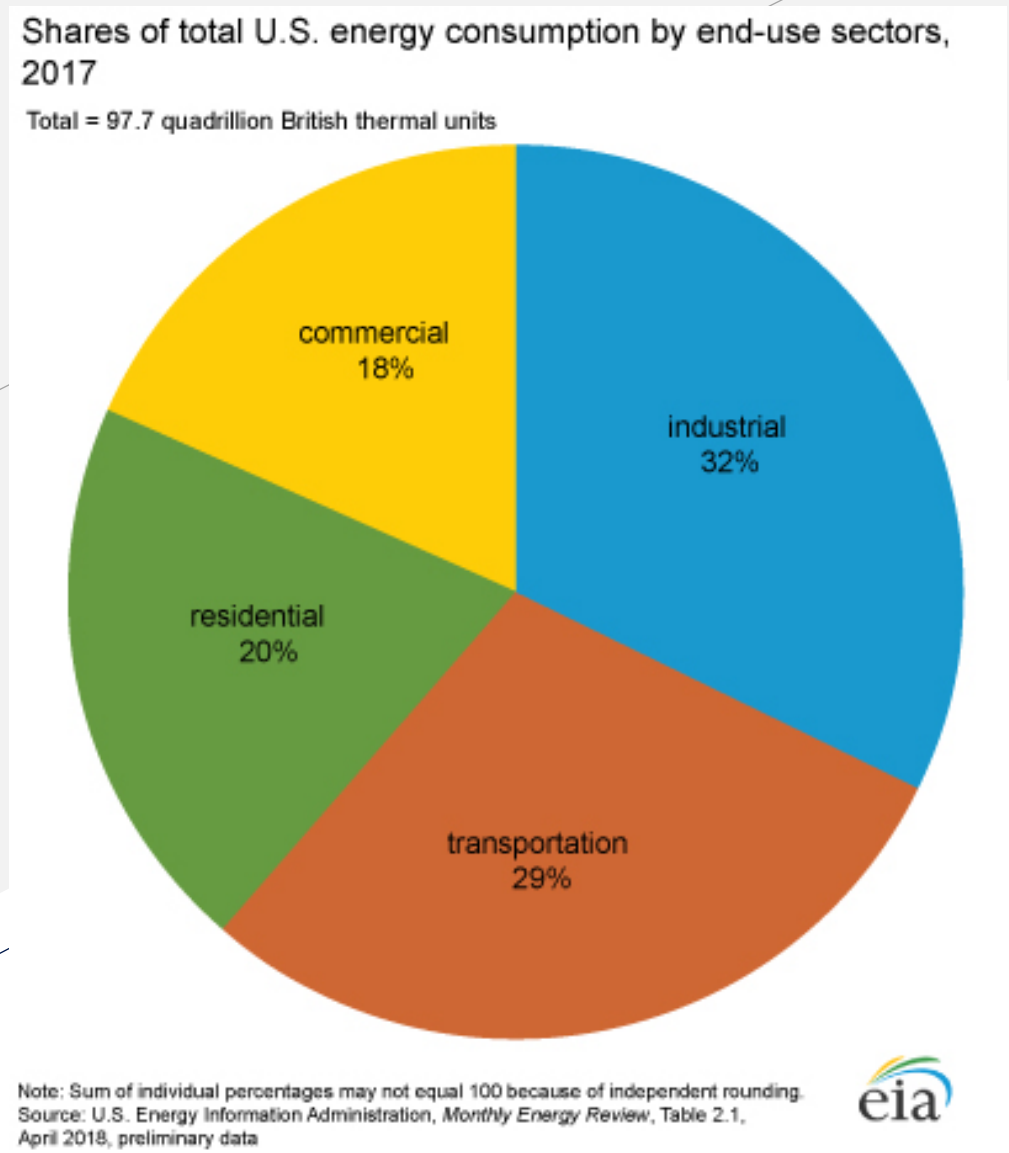
www.fhwa.dot.gov

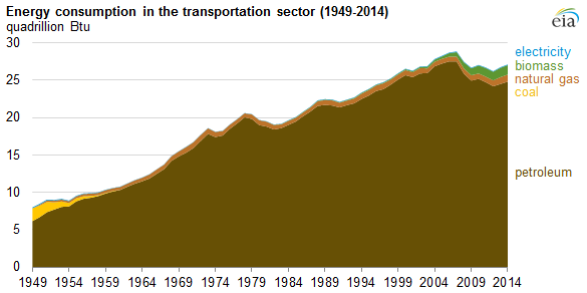
http://www.fhwa.dot.gov/safetealu/

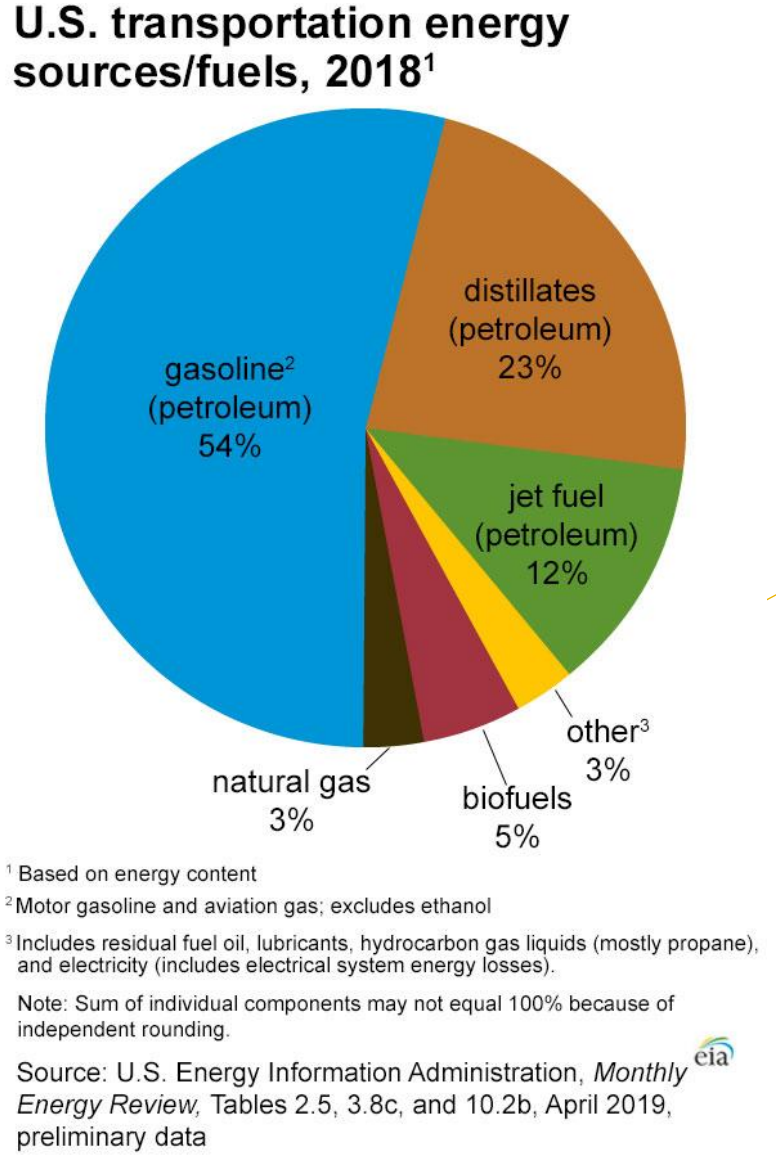
www.nepa.gov

http://www.maine.gov/mdot/planning-documents/stpa/index.htm

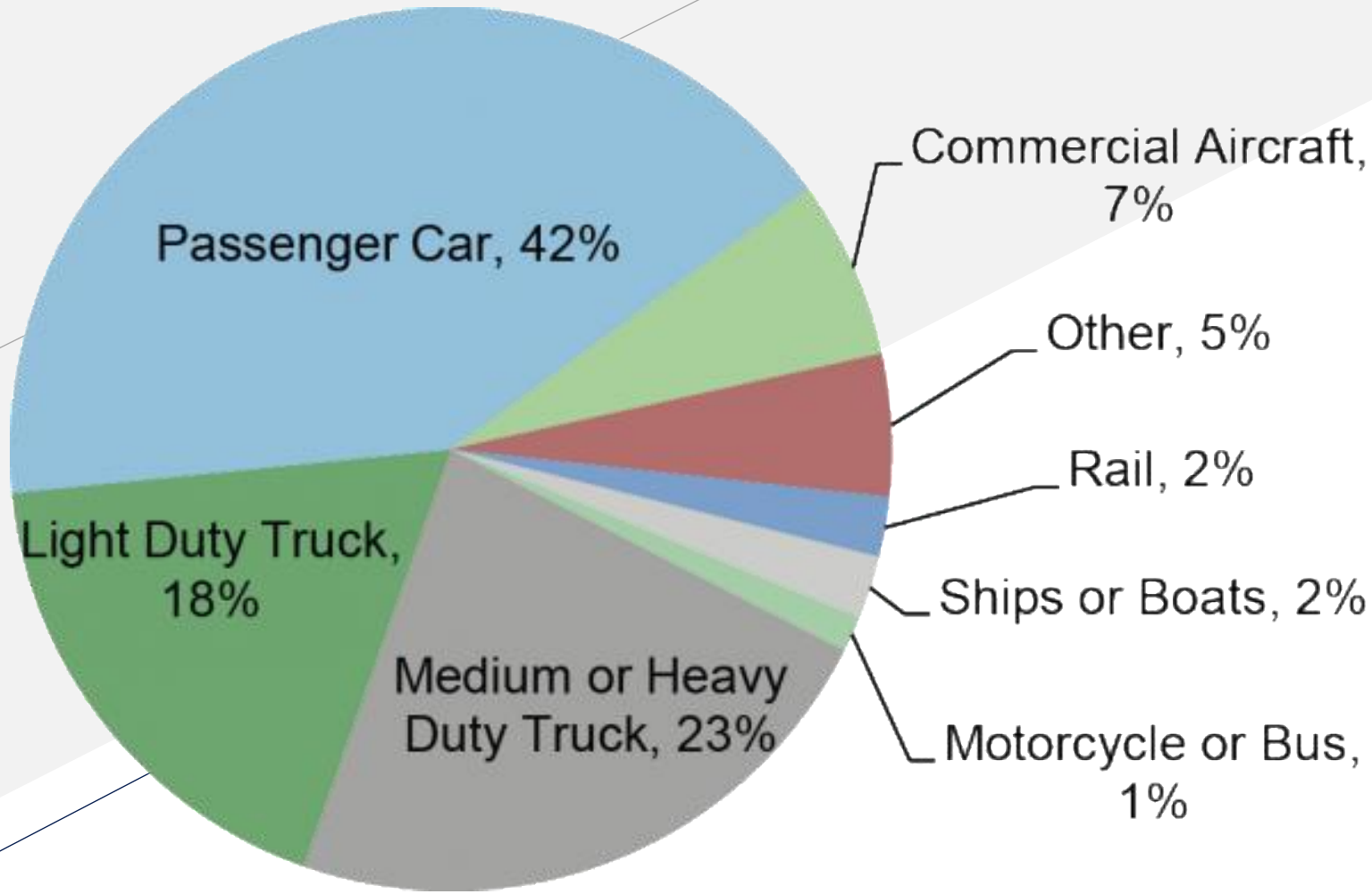
Energy consumption & greenhouse gas emission



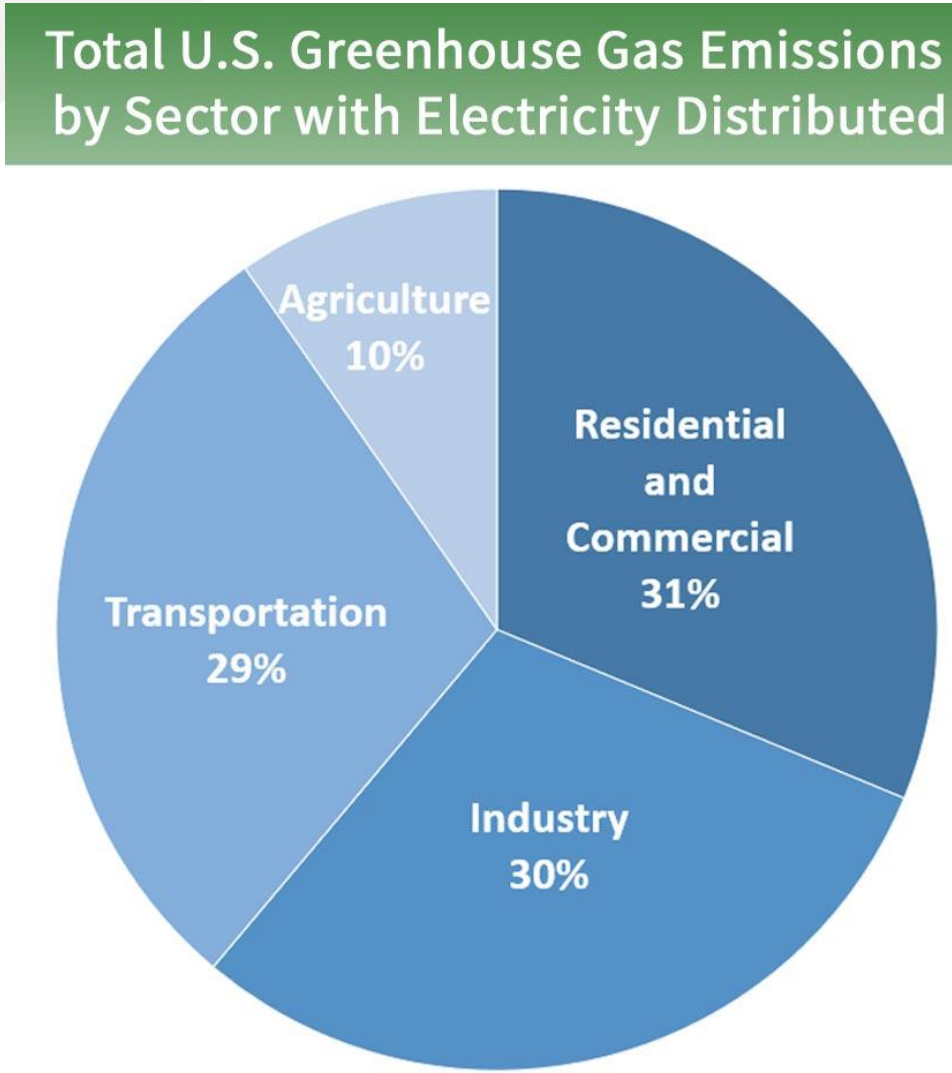




Energy consumption & greenhouse gas emission



Transportation Mobility Share of Carbon Footprint



U.S. Environmental Protection Agency (2019). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017

STRIDE | Southeastern Transportation Research, Innovation, Development and Education Center

Sustainable Communities & Mobility

Thank You.

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www.citadel.edu/root/cee

THE CITADEL

CIVL 642 Public Health, Physical Activity, and Design of the Built Environment