



Making the Connection

A guide to achieving comprehensive
land use & transportation planning

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Introduction to the Principles of Land Use & Transportation

While there has been an increased emphasis on the connection between transportation and land use planning, they have often occurred independently over the past century, creating an automobile dependent society. Communities zone for compatible land uses, separate residential and commercial areas, and dictate the density of these uses within their municipal boundaries. But communities are also faced with the challenge of efficiently and safely moving people between these locations through their transportation networks. As communities begin to address concerns about sprawl, increasing costs of maintaining existing infrastructure, and air pollution, there is a need for strategies that integrate land use and transportation planning to create both livable and mobile communities.



Defining Land Use & Transportation Planning

Transportation planning deals with the facilities, modes, and sectors of transporting people and goods across communities, states, countries, and the world. Ultimately, the transportation planner is responsible for planning why, where, and how people are traveling and for operating a safe and efficient system.

Transportation facilities include streets, highways, railroads, sidewalks, bike lanes, multi-use trails and paths, and public transportation. The mode of travel chosen depends on the type of facility available. For example, people may choose to travel on foot or bicycle if sidewalks and bike lanes are available.

Transportation planning also involves identifying the origins and destinations of travel, such as home, work, school, daycare, and errands. Planning for transportation facilities between these origins and destinations requires identifying how they can be accessed. Do I need a car to buy groceries? Are there sidewalks to walk to school? Can I ride my bike to my doctor's appointment? What types of goods are being delivered and is there off-street delivery access? These travel needs will determine how a person or good arrives at its destination.

Transportation planning also considers sectors – passenger (moving people) versus freight (moving goods). Planners often focus on passenger travel, but much of the transportation system is freight movement, an important component of the economy. Because freight movement occurs across large geographic areas, transportation planning must consider the interconnections between facilities.

Land Use Planning takes into account the social, economic, and environmental elements of human development or management of land. At a macro level, land use planning considers overall development and land use patterns in a community, such as the location of industrial and residential uses as well as the size, shape, and characteristics of a particular town or city. At the micro level, planners deal with individual properties and plan for their specific uses and characteristics. At this level, planners address more intense development issues such as soils, access management, and setbacks from roads and property lines.

There are many different types of land uses, including residential, commercial, industrial, institutional, agricultural, and recreational. Developers and land owners must determine the density and design of the land use, given both natural constraints (climate, soils, geography) and institutional constraints (land use planning and zoning laws). Density refers to the intensity of the use, including the number residents, buildings, jobs, and parking spaces per unit of land area. Design and form regulations are applied to buildings (height and setbacks), sites (impervious surface area), and their relationships with surrounding locations. When planning for density and design, land use planners consider the movement of people, goods, and services. This is one of the common connections between transportation and land use planning, which is discussed in the following section.



The distance a building is set back from the street contributes to the feel of the site. Large setbacks in residential neighborhoods create lawns and a suburban feel, while buildings located right along a sidewalk invoke a traditional downtown experience.



Sound land use planning locates buildings, parking lots, and other impervious surfaces on the parts of the site best suited for development. This helps to protect sensitive habitat areas, preserve natural drainage, and prevent potential property damage.

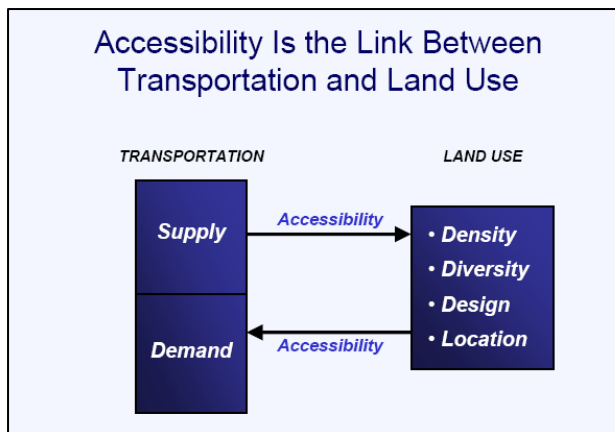
The Land Use & Transportation Planning Connection

Land use and transportation are often addressed as two separate topics, however, as the following diagrams illustrate, they are highly dependent upon each other. Transportation and land use are an interactive system. The transportation system is affected by the density, diversity, design, and location of land uses. Transportation systems affect land development patterns by providing physical access. Mobility and accessibility are fundamental benefits that planners try to achieve through transportation.

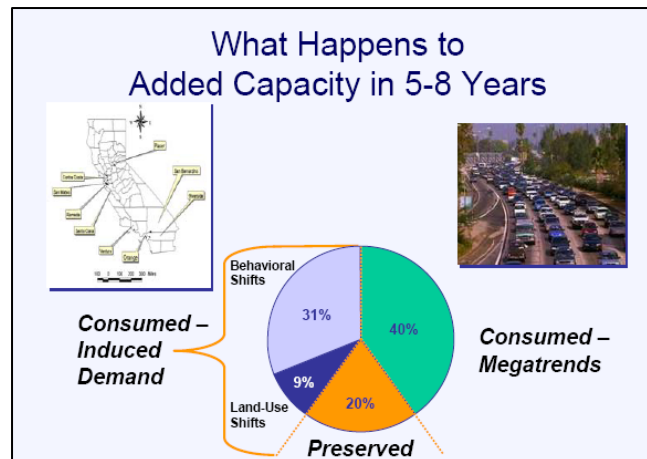
Mobility is defined as the ability to travel. Making travel faster, cheaper, and more convenient improves mobility.

Accessibility is defined as the ability to reach desired destinations or activities and is a combination of mobility and land use patterns. Accessibility can be improved through transportation investments that enhance mobility or through more compact land use patterns that locate origins and destinations closer together.

Accessibility is the link between land use and transportation. The transportation system or 'supply' provides access, which in turn affects how people choose to locate their homes or businesses. Land use patterns affect the 'demand' for transportation, including travel distance and mode.



Land use and transportation are interactive systems that influence each other greatly. Over the long-term, land use changes are one of the most important causes of induced demand for transportation. The graph below illustrates that 40% of road capacity increases were ultimately consumed due to induced demand including new trips, longer trips, and other changes in motorist behavior related to the road expansion. Only 20% of the new roadway capacity was actually preserved over the long-term.

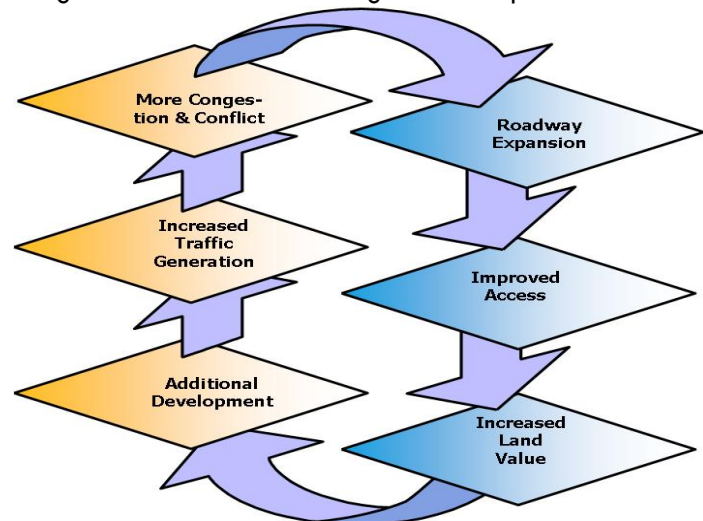


Why Connecting Land Use & Transportation Planning is Important

If you ask a commuter on a heavily traveled stretch of roadway what they would suggest to improve their journey, a common response would be to add more travel lanes. In the short term when travel lanes are added capacity expands, travel times are reduced, and commuters see an improvement.

In the long run, however, the additional capacity is utilized and the roadway often returns to a less than desirable level of service. The graphic below illustrates this cyclical pattern, which occurs for a number of reasons. As capacity improves, so does the perception of access, leading to an increase in land values. This in turn attracts additional development, causing an increase in traffic congestion and potential conflicts.

The cycle can be minimized by successfully integrating land use and transportation and by creating more sustainable developments with increased accessibility. Fully integrated land use and transportation planning recognizes that every project is multi-disciplinary and has many dimensions—political, economic, ecological, social, technical, aesthetic, and ideological. This document outlines these dimensions and proposes strategies to successfully address them.



Source: Rockingham Regional Planning Commission

Transportation Planning Process

Transportation planning has historically involved defining goals and objectives, identifying problems, generating alternatives, evaluating alternatives, and developing the plan. However, in the face of traffic congestion, air pollution, and other environmental challenges, planners are increasingly required to take a multi-disciplinary approach to transportation planning. As a result, the role of the transportation planner is expanding from strictly technical analysis to include promoting sustainability through integrated transportation and land use policies.

Historical Perspective

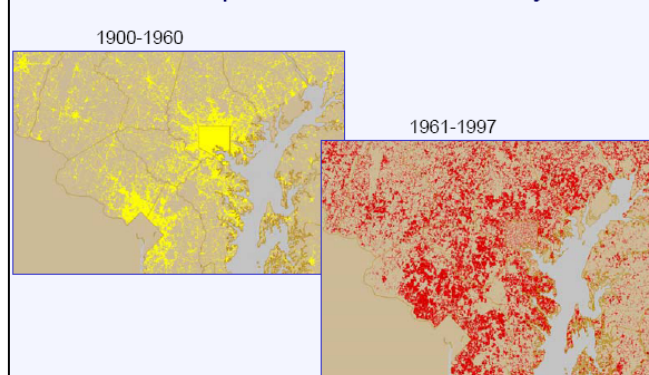
Prior to the mid-1800's, cities developed around the distance a person could comfortably walk—approximately $\frac{1}{2}$ mile or 10 minutes. Consequently, the various land uses associated with peoples' needs were concentrated within the $\frac{1}{2}$ mile where they worked and lived.

Streetcar suburbs developed in the late 1800's to early 1900's, which allowed people to walk half a mile to a streetcar and then be transported to a job or activity at a more distant location.

Streetcar Suburb (1890 – 1920) – Peabody Heights/Charles Village, MD



Urban Footprint of Southern Maryland



In the 1920's through 1940's the automobile became affordable to many Americans and it meant that people could live even further from where they worked, played, or conducted personal business. This also meant that land uses associated with peoples' needs spread further away from a centralized area. Freeways and the interstate highway system were developed during the second half of the 1900's, which resulted in congestion and ever more dispersed development patterns.

Local, Regional, & State Planning Process

Federal rules require that the regional Transportation Improvement Program (TIP) contain projects for a four-year period. The four-year regional TIP is incorporated into the New Hampshire Department of Transportation (NHDOT) Statewide Transportation Plan (STIP). The four-year TIP and STIP are also incorporated into the NHDOT Ten-Year Plan. Finally, the regional TIP and regional ten-year plan are incorporated into the NRPC Long-Range Transportation Plan (LRTP), which has a twenty-five year planning horizon.

Historically, the transportation planning process at the regional level includes working with the local communities to obtain their recommendations for transportation improvements. NRPC develops a prioritized list of transportation projects for the region that are incorporated into the regional TIP. Recommendations for projects can also come from more specific studies, such as a corridor study on a specific route, or a town-wide traffic study, as well as from an alternative mode study, such as the Regional Transit Plan. All transportation planning activities are governed by the Transportation Technical Advisory Committee (TTAC). Members of the TTAC are responsible for representing their community and its transportation needs. In recent years this process has been altered to accommodate the fiscal constraints facing the 10 Year Plan in New Hampshire. No new projects are being solicited and accepted into the 10 Year Plan. Instead the TTAC focused their efforts on reevaluating the prioritized project list and associated planning documents to meet fiscal constraints. For a greater level of detail please see the 2009 - 2012 Transportation Improvement Program (TIP).

Federal rules require Metropolitan Planning Organizations (MPOs) such as NRPC to develop, adopt, and implement formalized procedures for effective community participation to be used during the development or updating of a LRTP or TIP. NRPC also seeks public involvement and comment during the development of any corridor study, parking study, Safe Routes to School study, bicycle/pedestrian study, or any other transportation-related plan development. Public involvement may take the form of public meetings, internet or mail surveys, and other public forums. NRPC transportation staff also review local documents such as comprehensive or Master Plans when considering the public's transportation needs. The flowchart on the following page highlights the major milestones in the development of the NHDOT Ten-Year Plan.

TIP ~ Transportation Improvement Plan, regional, contains project on a 4-year timeframe

STIP ~ Statewide Transportation Plan, developed by the state for non-metropolitan areas, incorporates the TIP

LRTP ~ Long Range Transportation Plan, regional, 25-year timeframe

TTAC ~ Transportation Technical Advisory Committee, members represent each community

MPO ~ Metropolitan Planning Organization, responsible for developing transportation plans & programs for urbanized areas of the State; NRPC serves as the MPO for the region

CYCLE BEGINS

New Projects are Introduced

October of Even Years
(2002, 2004, 2006, etc.)

Regional Planning Commissions (RPCs) request proposals from constituent communities for candidate projects.

Projects are

Regionally Ranked

(November-December of Even Years)

The Transportation Advisory Committee (TAC) for each RPC rank projects submitted for consideration based on selection criteria established by each RPC.

Adoption of Statewide Plan

December – June of Even Years

The Governor reviews the Statewide Ten Year Plan and submits it to the Legislature for consideration and approval. Public Hearings are held and input considered.

IMPLEMENTATION

After adoption by the Legislature, Metropolitan Planning Organizations (MPOs) incorporate approved projects into their Transportation Improvement Program (TIP).

RPC Plan Submitted

May 1 of Odd Years

Each RPC submits its regional priorities and recommendations to NHDOT.

Ten Year Plan Drafted / Debated

January – April of Odd Years
(2003, 2005, 2007, etc.)

Early in the new year each RPCs TAC develops and approves a draft of the regional priorities and

recommendations for consideration – keeping in mind selection criteria and each project's relative scores – for submission to the New Hampshire Department of Transportation (NHDOT).

Draft Statewide Ten Year Plan Prepared

May – December of Odd Years

May 1 – July 1: NHDOT prepares the draft Statewide Ten Year Plan, using the information provided by each RPC for submission to the Governor's Advisory Commission on Intermodal Transportation (GACIT).

July 1 – December: GACIT amends the Ten Year Plan after a series of statewide public hearings and forwards it to the Governor.

CYCLE BEGINS AGAIN

Assessment Tools

Sound land use and transportation planning requires a thorough understanding of the area being considered. Knowledge of who, what, and where are crucial in understanding the interrelationships between people and places. The better the understanding, the more likely good decisions will be made in planning land uses, appropriate densities, connectivity of neighborhoods, and ease of mobility.

What is an Assessment?

Assessment tools help clearly identify and quantify where a community stands. Assessments typically guide the user through a number of topics in a question and answer format to help identify key issues and actions. The results of these assessments can then be used to develop a “road map,” which outlines community goals and the necessary steps to achieve these goals.

Why Conduct an Assessment?

The primary purpose of conducting an assessment is to understand the technical, social, economic, ecological, and aesthetic components of your community. The results of the assessments can then be used to set community goals and select techniques to achieve these goals. When assessing your community and its surroundings, it is important to take a local, regional, and statewide perspective. Assessments help to do this by addressing the following types of questions:

Local

- What regulatory mechanisms are in place that allow or hinder your ability to reach the desired objective?
- What is the state of your current infrastructure?
- What are the pros and cons of your transportation network?
- How do people travel between destinations?
- What are the current demographics?
- What are current land use and transportation patterns?
- Is there public support or opposition to existing or proposed development, roads, land uses, or restrictions?

Regional

- How and where do people commute?
- Are there state highways, water bodies, railroads, protected lands, or steep terrain, within or running through your region and do they help or hinder land use and transportation patterns?

- 
- Are there regional transit routes? Does the existing road network adequately meet the needs of existing development? Where and when is traffic congestion a problem?
 - Where do people shop? What does and does not work on these sites?

Statewide

- Are there large commerce centers, key destinations, or other places or events that cause continual, seasonal, or sporadic traffic congestion?
- When you travel regionally or out of state, where and why does traffic move smoothly or back up? Are there alternate routes available to make connections and lessen congestion?
- Is public transportation available and convenient? Do you use or have a need for statewide trail connectivity?

What Assessment should my community use?

There are a variety of options when choosing an assessment tool. The *Resources* section on page 35 of this document provides examples of common assessment tools. A good starting point is to contact state and regional planning offices or professional planners. Local colleges and cooperative extensions may also know of or provide resources.

Planning Techniques

After completing an assessment, your community will begin to set goals and develop a strategy to achieve these goals. There are a variety of planning techniques available to help communities at this implementation stage. In some cases, communities may choose to jump directly to these techniques without conducting an assessment if they already have a sound understanding of what needs to be accomplished.

Each community is unique and therefore what is effective in one community may have a very different outcome in another. To address these differences, the following section introduces a variety of planning techniques designed to connect land use and transportation planning in both rural and urban areas. Each technique is defined, key components are identified, and project examples are provided, if applicable. Communities are encouraged to apply the appropriate techniques to the physical, social, and environmental needs of their specific project.

Corridor Planning

Description

Corridor planning is a long-range transportation planning process that evaluates the current and future operating conditions and deficiencies along a transportation corridor. Improvements are recommended to maintain or improve mobility along the corridor by minimizing or alleviating the identified deficiencies. These plans can have different focuses including overall mobility, access management, historical resources, and scenic byways. Ideally, corridor plans address multi-modal elements such as vehicles, bicyclists, pedestrians, mass transit, and where appropriate intelligent transportation systems (ITS) and local land use and environmental issues.

Key Components

Corridor planning evaluates a number of transportation networks including, but not limited to, state highways, major local streets and roads, local and regional transit service, and pedestrian and bicycle facilities. It considers traffic patterns, vehicle miles traveled, and access management, and ranks the corridor for safety and efficiency based on these current and future conditions. A full-scale plan may include the following:

- Existing travel conditions along the corridor
- Current land uses and potential future land uses based on existing zoning districts
- Existing and future traffic conditions along the corridor and at key intersections
- Prioritization of improvement projects and responsible parties
- Historic, cultural, and scenic resources associated with scenic byway planning

Examples

NH 101A Corridor Master Plan and Improvements Program ~ <http://www.nashuarpc.org/101a>



References

<http://www.dot.ca.gov/dist3/departments/planning/corridorplanning.html>

Transit Oriented Development

Description

Transit Oriented Development creates mixed-use, dense, walkable communities that encourage citizens to live, work, and shop near transit, decreasing their dependence on cars. Communities within the Nashua Region vary in their access to public transportation opportunities. Even if your community does not have an established public transportation system you can still incorporate several of the Transit Oriented Development design components to create a vibrant, pedestrian friendly community.

Key Components

- Walkable layout with pedestrians as the highest priority
- Inclusive design for non-motorized transportation (ex. bikes, scooters, rollerblades)
- Public transit station as prominent feature of town center
- Collector support transit systems, including trolley, streetcars, light rail, buses
- Reduced and managed parking within close proximity to town center

Benefits/Applications

- Reduced need for driving and burning of fossil fuels
- Higher quality of life; better places to live, work, and play
- Greater mobility and increased transportation options
- Reduced traffic congestion
- Improved public health by promoting walking, better air quality
- Increased economic vitality, higher property values

Example

Maine Street Station, in Brunswick, ME is a transit oriented development project that combines smart growth principles with brownfields redevelopment. The “preferred master plan,” which was approved by the Town Council, would include 122 units of housing, offices, retail space, a hotel, and movie theater, in addition to a train station and parking garages for commuters.



Rendering: MACTEC

Reference

Brunswick Maine Street Station: Redevelopment Analysis and Master Development Plan
<http://www.brunswickme.org/ecdev/MSS.pdf>

District / Neighborhood Planning

Description

District/neighborhood planning is typically a component of a master plan that gives a more focused picture of what will happen in a particular part of town. It provides the opportunity to develop zoning ordinances, design guidelines, and site/subdivision regulations that are more applicable to specific areas rather than the entire community.

Key Components

- Housing Quality – considers housing stock, design methods, approaches to improving housing options, low-income/elderly housing opportunities.
- Historic Preservation and Neighborhood Conservation – allows for policies that retain and enhance the important features of an area, such as historic architecture, parks, landmarks, or views. It can be achieved through overlay zones that regulate height limitations, setbacks, adequate parking, and landscaping.
- Traffic and Circulation – concerned not only with the amount and type of traffic in a neighborhood but also with the aesthetics. Considers traffic patterns, sidewalks, on-street uses, street landscaping, bike and pedestrian facilities.
- Parks, Recreation, and Environmental Protection – intended to compliment the city/town's parks and open space plans as well as priority natural resource areas. This can include everything from pocket parks and limitations on hillside development to protected viewsheds and preserving open space for habitat protection.
- Urban/Rural Design – emphasizes appearance. Can provide design strategies for residential, commercial, and office areas as well as gateways into the neighborhood. Uses tools such as recommended landscaping, redevelopment of vacant buildings/lots, incompatible land uses, buffer zones, and specific architectural styles to maintain desired character.

Benefits/Applications

This is a great tool for areas that deserve special attention because of their environmental, historical, or cultural resources. A town-wide Master Plan is important for looking at the big picture, but district/neighborhood plans highlight the unique qualities of a neighborhood and provide the level of physical, social, and economic detail necessary to accommodate growth and change.

References

<http://www.ci.concord.nh.us/PLANNING/NEIGHBORHOODPLANNING/concordv2.asp?siteindx=L0a,14>

Nodal Development

Description

Nodal Development involves concentrating development in existing or new centers at a higher density than the surrounding area.

Key Components

Nodal development is generally found in more suburban/urban locations and provides a mix of residential, commercial, and service opportunities in a compact walkable area. Nodes are often located at existing intersections or community centers. The land between the nodes remains relatively rural with limited commercial sites and access points.

Benefits/Applications

One of the key benefits of nodal development is reduced automobile trips by providing bicycle and pedestrian amenities such as sidewalks, visible crosswalks, streetscape improvements, and street furniture. Nodal development can enhance community character and sense of place by minimizing the spread of generic sprawl. Safety is also improved by concentrating access points within the nodes and limiting them along major corridors to minimize potential conflict points.

Example

The Maplewood Development in Nashua is an excellent example of Nodal Development, providing residents with the opportunity to walk or bike to a variety of uses, including a preschool, dry cleaner, and restaurants.



Village Plan Alternative

Description

The Village Plan Alternative (VPA) is a planning tool that promotes compact development scaled to a rural setting with a mix of land uses, including residential, small-scale commercial, recreation, and conservation.

Key Components

VPA is designed to implement the specific provisions of RSA 674:21.VI (a) by allowing for the creation of new villages with mixed-used development that is scaled to the smaller populations and lower density of New Hampshire towns.

There are two key requirements per RSA 674:21:

1. The entire density permitted by existing land use regulations must be located within 20 percent or less of the total parcel available for development.
2. The village plan alternative must comply with existing subdivision regulations relating to emergency access, fire prevention, and public health and safety. However, lot size, setbacks, dimensional requirements for frontage and setbacks, and density regulations shall not apply.

Benefits/Applications

The VPA is most appropriate as an alternative to cluster or open space developments in undeveloped areas. For example, the VPA can be used when a new village or an extension of an existing village would result from the development. Towns can use the VPA as a tool to support open space goals in the Master Plan or to achieve larger-scale objectives such as the conservation of a multi-town network of contiguous open space or the protection of a sensitive regional resource.

Example

I'on Village, SC—I'On Village, located in Mount Pleasant, SC, is a modern development rooted in the architecture and design of the area's historic cities. Much like Charleston, Savannah, and Beaufort, I'On Village features a grid layout and mixed-use development. It has received several awards, including the 2001 Platinum award for Best Smart Growth Community in the Nation from the National Association of Homebuilders.



Visualization/Simulation

Description

Techniques such as visual preference surveys and computer-based design simulation can be used to help citizens understand how different transportation and development alternatives will look. These techniques have been applied both in land use planning and in the design of transportation facilities.

Benefits/Applications

Visual examples of developments and road networks can help decision-makers approach land use and transportation planning from a more realistic viewpoint by allowing them to “see” what their ideas could look like. Visualization can help answer the following types of questions:

- Where should houses, apartments, and commercial buildings go?
- What roads, schools, water, and infrastructure will be needed in the future?
- What will traffic be like and can it be reduced?

Example

In NRPC's Milford iTRaC project, Urban Sim was used to create a simulation of what a proposed development could look like under current regulations and with design standards.



Resources

The UrbanSim Homepage: <http://cuspa.washington.edu/>

Access Management

Description

Access management is the practice of coordinating the location, number, spacing, and design of access points to maximize the traffic capacity of a roadway while minimizing potential conflict points. Uncoordinated growth along some of the region's major travel corridors has resulted in strip development and a proliferation of access points. In most instances, each individual development along the corridor has its own access driveway. Numerous access points along the corridor create conflicts between turning and through traffic, which cause delays and accidents.

Key Components

Minimizing potential conflict points is the key focus of access management. This can be accomplished through a variety of basic techniques, including limiting access points to one per site, providing internal connections between sites, encouraging shared driveways, and providing designated turn lanes.

Benefits/Applications

- Improved overall roadway safety
- Reduced total number of vehicle trips
- Decreased interruptions in traffic flow
- Minimized traffic delays and congestion
- Maintenance of roadway capacity
- Avoidance of costly highway projects
- Improved air quality
- Facilitation of compact development patterns
- Improved access to adjacent land uses

Example

Throat length is a term for the long driveway entrances into parking lots. Landscaped barriers or other devices are used to block turns along the throat length. These structures funnel traffic into and out of the parking lot safely by preventing turns from unexpected vehicles or pedestrians entering the throat.



Infill & Revitalization

Description

Infill is the development of existing vacant parcels. Revitalization is the rehabilitation of existing buildings and sites to create more attractive or more usable spaces.

Key Elements

Both of these techniques produce usable spaces with minimal impacts to the existing transportation network. It is important to maintain or enhance the existing sense of place and character of the area where infill or revitalization occurs. For instance, it would be out of character to build a three-story, multi-family structure in an existing neighborhood with single story ranches.

Benefits/Applications

The Jackson Falls Condominiums in downtown Nashua are a prime example of both infill and revitalization. The condos have been built along the Nashua River on a constrained site that is narrow and long. This is an ideal infill development that simultaneously revitalized the neighborhood by improving an underutilized area. To address limited surface area, the building is four stories high and parking has been accommodated beneath the living space.



Context Sensitive Solutions

Description

Context Sensitive Solutions (CSS) is a process in which communities take a central role in shaping transportation projects. The New Hampshire Department of Transportation's official definition of CSS is "a collaborative interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility." The Project for Public Spaces (PPS) defines CSS in this way: "the central tenet of CSS is that communities should not be molded to the requirements of motor vehicle traffic alone--transportation should preserve the scenic, historic, and environmental resources of the places it serves."

Key Elements

Using the CSS process, community stakeholders help to define problems, create vision statements, and provide input into the ultimate solution for their community.

Benefits/Applications

The Project for Public Spaces (PPS) and Tom Warne & Associates are assisting the State of New Hampshire Department of Transportation in implementing this new planning technique. NRPC has utilized CSS in the Town of Pelham to identify problems and solutions associated with two key intersections in the town center.

Example

The NH DOT presented a rendering of two roundabout alternatives (below) for the Pelham Town Center Project to help citizens visualize the final outcome.



Reference

NH DOT, Pelham Town Center Project <http://www.nh.gov/dot/projects/pelham14491/index.htm>

Interchange Area Planning

Description

There are specific design standards for freeway and interchange construction, including federal and state specifications and guidelines. Local and regional planners have also implemented land use regulations and zoning overlay ordinances to further guide land development around freeway interchanges. Local planners work with the state to determine where ramps will be located and where and how they will connect to local and regional road networks.

Application/Benefits

Without coordinating and projecting impacts into the future, unplanned development and unanticipated access issues can lead to a degradation of traffic conditions in and around an interchange, affecting capacity and safety. The development and implementation of model codes and regulations for interchange areas at the state level is complemented by local and regional interchange area plans that address access, traffic circulation, land use, site design guidelines, and landscape design.

Example

Below are two examples of interchanges on the Everett Turnpike within the Nashua region. Both are quite different, but provide good connectivity beyond the interchange to state and local roads and numerous adjacent businesses. They are Exit 2, Sagamore Bridge, DW Highway interchange, which is expansive, and Exit 11 in Merrimack, which is very compact. Interchange area plans are an excellent example of integrating land use and transportation, as access, connectivity, capacity, and safety are common concerns for both land and transportation planners.



Exit 2, Everett Turnpike, Nashua



Exit 11, Everett Turnpike, Merrimack

Resource

Source - <http://www.fhwa.dot.gov/planning/landuse/tools.cfm#activities>

Low Impact Development

Description

Low Impact Development (LID) is a technique for suburban stormwater management that originated in Maryland's Prince George's County Department of Environmental Resources in the mid 1990's. LID looks at project specific methods of stormwater management that improve upon traditional methods and benefit the community, developer, and landowner while protecting the environment. LID utilizes both technology and natural processes to ensure post-development hydrology mimics or maintains pre-development rates and impacts.

Key Components

LID reduces the land area impacted by development; preserves natural processes and resources; and utilizes, connects, and expands "green" infrastructure. LID techniques include bio-retention areas, rain gardens, green roofs, porous pavement, bio-filters, roof leader wells, and infiltrating catch basins.

Benefits/Applications

Developers
• Reduces land clearing and grading costs • Reduces infrastructure costs (streets, curbs, gutters, sidewalk) • Reduces storm water management costs • Increases lot yields and reduces impact fees • Increases lot and community marketability
Municipalities
• Protects regional flora and fauna • Balances growth needs with environmental protection • Reduces municipal infrastructure and utility maintenance costs (streets, curbs, gutters, sidewalks, storm sewers) • Fosters public/private partnerships
Home Buyer
• Protects site and regional water quality by reducing sediment, nutrient, and toxic loads to waterbodies • Preserves and protects amenities that can translate into more salable homes and communities • Provides shading for homes and properly orients homes to help decrease monthly utility bills
Environment
• Preserves integrity of ecological and biological systems • Protects site and regional water quality by reducing sediment, nutrient, and toxic loads to waterbodies • Reduces impacts to local terrestrial and aquatic plants and animals • Preserves trees and natural vegetation

Resources

"The Practice of Low Impact Development," HUD Office of Policy Development and Research, July 2003.
http://www.lowimpactdevelopment.org/lid%20articles/practLowImpctDevel_jul03.pdf

University of New Hampshire Stormwater Center in Durham. <http://www.erg.unh.edu/stormwater/index.asp>

LEED

Description

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is a service of the US Green Building Council. LEED is a third-party certification program and nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

Key Elements

LEED rating systems are currently available for homes, commercial interiors, cores and shells, new construction, schools, healthcare, retail, and neighborhood developments (pilot). In recent years LEED has become a common term to many architects, realtors, engineers, designers, lenders, developers, and government officials.

Specific criteria in each rating system fall under the following categories:

- Sustainable site development
- Water efficiency
- Energy & atmosphere
- Materials & resources
- Indoor environmental quality
- Innovation & design process

Example

The new 2nd Nature Academy facility in Nashua boasts a healthy, high performance “green” school. The building meets strict criteria for site selection and sustainable building practices and employs highly efficient plumbing systems, solar voltaic electricity, and geothermal heating. It also utilizes recycled and local materials, certified wood, and natural lighting and is void of products containing toxins. 2nd Nature Academy is working closely with a team of green architects, planners, environmental scientists, and local contractors to become the first LEED certified school in New Hampshire.



Photo: Deborah Gleeson

Traffic Modeling

Description

NRPC maintains a travel demand model to forecast traffic conditions based on changes in the street network, land use patterns, and population.

Key Components

The traffic model uses census and employment data as well as a road network coded with attributes such as speed, length, and capacity as inputs. It then assigns trips using the traditional 4-step modeling process:

1. Trip generation (the number of trips to be made)
2. Trip distribution (where those trips go)
3. Trip assignment (predicting the route trips will take)
4. Mode choice (not employed in the NRPC model because of the extremely low percentage of trips using transit)

Applications/Benefits

NRPC has one of the most intensive and site-specific traffic models in the northeast for a small MPO. This allows the agency to assist communities with small-scale land use and transportation scenarios and to forecast traffic on a regional scale. Traffic forecasting outputs are also used to establish air quality budgets for the State transportation planning process and to analyze the air quality impacts of potential road projects.

Examples

NRPC has used its traffic model to analyze local projects such as:

- Changes in traffic patterns due to a proposed cut-through road in a residential development in Merrimack.
- Future town-wide traffic conditions based on several large-scale commercial developments in Merrimack and the share of traffic at key intersection that could be attributed to each individual site.
- Traffic patterns under various scenarios in Pelham's town center area.
- Traffic patterns due to converting certain one-way streets in downtown Nashua into two-way facilities.
- Changes to intersection level of service along the Route 13 corridor in Brookline and Mont Vernon due to various build-out land use scenarios.

In addition, NRPC has used the model in support of several larger regional projects, including the Broad Street Parkway, the Circumferential Highway, the widening of the Everett Turnpike, and the proposed extension and widening of the Route 101 Bypass.

Resources

http://www.nashuarpc.org/transportation/transproj_model.htm

Transfer of Development Rights

Description

Transfer of Development Rights (TDR) grew out of the nation's first zoning ordinance in New York City in 1916, when height and setback requirements were put in place. Developers were permitted to sell unused setback and air rights to adjacent properties. Eventually, the City changed the rules to permit the transfer of these rights to properties several blocks away. In New Hampshire, TDR goes by the name Density Transfer Credits (DTC) and is authorized under RSA 674:21, I(d), Transfer of density and development rights.

Key Components

TDR or Density Transfer Credits, is a process by which landowners can transfer development rights (the right to subdivide and build) from one parcel of land to another. Development is shifted from sensitive land (the “sending” area) to a suitable alternative location (the “receiving” area) for fair market compensation. The value comes from current market conditions and the development potential of the parcels in the sending area. Most density transfer credits are transacted between private landowners and developers. Municipalities approve transactions and monitor easements. Some local governments create “TDR /DTC banks” that purchase development rights (credits) with public funds and then sell them to developers or other interested parties. Conservation commissions will sometimes buy development credits for sensitive lands.

While many communities around the country have implemented TDR programs, their success has been limited. These programs are complex and can be difficult to administer. In addition, “takings” (taking land or rights away without fair compensation), can become a legal issue, especially in poorly conceived programs. Steady growth rates, a well designed plan, willing landowners and developers, and strong political will are keys to a successful program.

Benefits/Application

- Provides a mechanism for preserving valuable land from development while providing fair compensation for the development rights.
- Directs development to locations that are zoned for and can support higher density development.
- Used to preserve agricultural land and unique or sensitive parcels.

Resources

Transfer of Development Rights Programs—Using the Market for Compensation and Preservation, Jason Hanly-Forde, George Homsy, Katherine Lieverknecht, Remington Stone <http://government.cce.cornell.edu/doc/html/Transfer%20of%20Development%20Rights%20Programs.htm>

Innovative Land Use Planning Techniques: A Handbook for Sustainable Development, 2008; NHDES, NHOEP, NHARPC, and NHLGC. The document provides a chapter on Density Transfer Credit and includes a model ordinance. http://des.nh.gov/organization/divisions/water/wmb/repp/innovative_land_use.htm.

Changing Our Behavior

Dependency on single occupancy vehicles and the subsequent costs to society have taken several generations to develop. The causes of this dependency result in part from the way land use and transportation policies accommodate each other. Reducing dependency on single occupancy vehicles will require behavioral change in our society. Therefore, facilitating behavioral change is a critical component of transportation and land use planning.

Strategies for Facilitating Behavior Change

- Know Your Audience—survey users and potential users of alternative modes of transportation to determine preferences, knowledge, barriers, and opportunities for changing travel behavior.
- Target Individuals—provide individualized information and incentives that help inform and encourage people to use alternative modes.
- Establish Partnerships—build programs with local employers, officials, and businesses to help encourage alternate mode trips.
- Promote the Benefits—highlight the many positive aspects of alternative transportation.
- Build a Toolbox—provide a guide for users on the types of alternative transportation available to them.
- Follow the Money—assess the costs, both financial and personal, of all modes of travel and work to make alternative transportation a lower-cost choice.
- Connect to the Regional System—use marketing and incentives to connect local pedestrian and cycling trips to the regional transportation system, creating linkages between all modes.
- Provide Facilities—offer the infrastructure needed for alternative modes such as sidewalks and bike lanes.

Public Outreach Materials & Methods

When communicating with the general public, it is important to remember that every community is different and outreach strategies that work in one town may not be appropriate for another town. Furthermore, within a given community not every resident will prefer to receive information in the same manner. Therefore, a variety of outreach methods will need to be employed. Take time to learn about the community and consult with local officials and opinion leaders before conducting a public outreach campaign to ensure that the most effective strategy is developed.

Board/Elected Officials Outreach Materials & Methods

- Online forums
- Guidebooks
- Board trainings
- Fact sheets
- Brochures

General Outreach Materials & Methods

- Press releases
- Direct mail
- Fliers
- Posters
- Informational brochures
- Display boards
- Partnerships with elementary schools
- Cable access public service announcements
- Local online discussion groups
- Municipal websites
- Civic group presentations
- Email meeting reminders
- Police department mobile electronic signs



RESOURCE CARD #9: Stormwater Management

During a rainfall event or snowmelt some precipitation . . .

What is Stormwater?

infiltrates the soil, is taken up by plants, or evaporates into the atmosphere. But some remains, running off land & impervious surfaces. **This is stormwater.**

Stormwater Fact Sheet Highlights:

- Stormwater 101 ~ definitions, pollution problems, management goals
- Planning tips ~ requirements, objectives
- Open vs. closed drainage ~ descriptions of each system, cost/benefit comparisons, what to use where

Get your fact sheet today at www.nashuarpc.org/itrac

To Learn More...

Fact sheets, training summaries, publications, frequently asked questions, and more are available at:

www.nashuarpc.org/itrac/

or by contacting Camille Pattison, Integrated Planning Program Manager, at 883-0366 x14 or camillep@nashuarpc.org

Evaluating Land Use and Transportation Policies

Regulations and Ordinances

Description

New Hampshire RSA 672:1, Declaration of Purpose states: “Planning, zoning and related regulations have been and should continue to be the responsibility of municipal government.” Planning and zoning regulations help municipal governments to address the demands of growth, enhance public health and safety, and encourage appropriate land use. Regulations also protect forests, open space, and agriculture and promote energy conservation and efficiency.

Title LXIV: Planning and Zoning of the NH statute (chapters 672 through 678) grants the necessary authority and lays out the procedures for land use boards to carry out their duties.

- [CHAPTER 672: GENERAL PROVISIONS](#)
- [CHAPTER 673: LOCAL LAND USE BOARDS](#)
- [CHAPTER 674: LOCAL LAND USE PLANNING AND REGULATORY POWERS](#)
- [CHAPTER 675: ENACTMENT AND ADOPTION PROCEDURES](#)
- [CHAPTER 676: ADMINISTRATIVE AND ENFORCEMENT PROCEDURES](#)
- [CHAPTER 677: REHEARING AND APPEAL PROCEDURES](#)
- [CHAPTER 678: COMMUNITY SERVICES AND CARE PLANNING BOARDS](#)

Key Components

Ordinances are local laws adopted and amended by the board of selectmen, city council, or planning board. They require a public hearing and a secret ballot majority vote in the affirmative by the legislative body (residents of the municipality) at traditional or SB2 town meetings. While ordinances may not be waived, provisions for conditional uses under innovative zoning and special exceptions may be made. Relief may also be granted by the Zoning Board of Adjustments or the courts. The local building code is adopted in the same manner. Local amendments may be more strict than the State Building Code (RSA 155-A), but not less.

Regulations are standards adopted to supplement and support local ordinances. Regulations only require a public hearing and are adopted by the planning board; they do not require approval of the legislative body and may be adopted any time during the year. Regulations may be waived under certain circumstances by the planning board. Appeals related to regulations are made to the planning board and the courts.

Ordinances and regulations should promote the goals set forth in a municipality’s Master Plan (i.e. Comprehensive Plan) and the purpose statement in the State statutes.

Applications/Benefits

Regulations and ordinances are critical in providing the mechanism for integrating land use and transportation. Location, density, and mixture of land uses affect development patterns, which in turn affect transportation. Low density development and segregated land uses increase sprawl and the need to drive. Zoning can reverse this trend by increasing development density, reducing frontage and setback requirements, allowing for mixed uses, and providing for bike and pedestrian travel. The use of gateways with zoning specific to the roadway can help eliminate the common “franchise style” design of commercial corridors. Narrower, pedestrian-friendly roads are equally important. Zoning and regulations requiring sidewalks, bikeways, and adequate maintenance will encourage walking and biking. There is also a need for businesses to locate closer to the street so pedestrians can walk to them easily.

Regulations and design guidelines that address building orientation, buffering, landscaping, and a pedestrian friendly environment give a sense of “place” to neighborhoods and communities. Design guidelines may include street trees and vegetation, street furniture, transit stop design, bike racks, and bridge and stormwater structure.

When developing regulations and ordinance, look at land use and transportation planning as one discipline to foster integration and reinforce how inseparable they are.

Environmental Considerations

Land Use and transportation changes to the landscape can significantly impact environmental integrity. The following section will discuss some of the environmental factors that should be considered when making land use and transportation decisions. While this is not an all inclusive list, it is a good starting point for boards.

Light Pollution

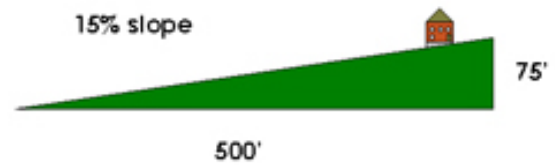
The rural areas of NH are accustomed to having dark, star-filled night skies. As development continues to expand, however, this is occurring less frequently throughout the state. The continuation of dark skies is important for economic, quality of life, and habitat reasons. Light pollution can be detrimental to humans, birds, insects, and nocturnal animals. It is often caused by outdoor lighting that is projected upwards and can be minimized with downcast and cutoff lighting. Fortunately towns can address this issue with the following simple techniques:

- Implement an outdoor lighting ordinance - see Innovative Land Use Techniques for examples.
- Require new developments to include pedestrian-scaled light fixtures that are appropriate to the building and location.
- Limit upward illumination and minimize illumination using ISNEA standards.
- Require lighting plans for new development.



Steep Slopes

Steep slopes are legally defined as hillsides having a 15 foot or greater vertical rise over 100 feet of horizontal run, or a 15% slope. They are often undesirable areas for development due to the difficulty of building on steep grades. While the use of vegetation, berms, and retaining walls can help to stabilize hillsides, developing steep slopes can lead to erosion, expensive infrastructure, and the need for additional roadways.



On the other hand, these slopes can provide wildlife habitat, recreational opportunities, and scenic views, preserving the unique and culturally valuable environmental qualities that people treasure in New Hampshire. Communities can elect to minimize potential impacts of development on steep slopes. The State of NH has created enabling legislation authorizing communities to regulate slope development under RSA 674:16 Grant of Power, RSA 674:21 Innovative Land Use Controls, and RSA 674:21.(j) Environmental Characteristics Zoning.

The following techniques can also be used:

- Slope/Density Ratio—bases the allowable density of development on the steepness of the grade, effectively reducing the intensity of development as the slope increases. The cap is generally 25%, when slopes become too steep for safe and cost-effective development.
- Soil Overlay—this method uses soil maps provided by the Natural Resource Conservation Service to determine which slopes can safely support development based on the stability, depth, and type of soils found in a given location. For more info visit: soils.usda.gov.
- Overlay Districts—a hillside overlay district, similar to the more familiar wetlands overlay district, can provide a set of guiding principles for all future hillside development within a jurisdiction. These regulations are often flexible and can be tailored to specific projects and slopes.

Site Design

The details of a project's layout and design can have a significant impact on pervious surfaces and salt usage. If possible, the roadway layout should consider the effect of the winter sun on snow melt. A well

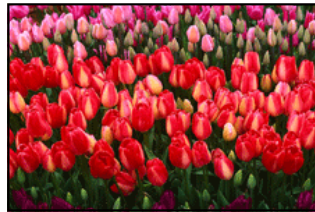


Photo: NH DOT

shaded road will require additional salt and sand, while the sun's melting power will limit salt usage. On certain roads it may also be possible to have a reduced shoulder width, thus minimizing site impact and impervious pavement. Porous pavements should be considered on a site by site basis to reduce runoff and increase groundwater recharge. Aesthetic features also add significant value to specific sites and the entire community. Special attention to visual cues, architecture, viewsheds, and landscaping all add to a site's overall success.

Stormwater

When a rainfall event occurs, several things can happen to the precipitation. Some of it infiltrates the soil, some is taken up by plants, and some is evaporated into the atmosphere. Stormwater is the remaining precipitation that runs off land surfaces and impervious areas. Stormwater runoff can carry chemicals, nutrients, sediments, and other forms of nonpoint source (NPS) pollution across impervious surfaces such as roofs and parking lots, over lawns, and into local waterways either directly or through storm sewers. Stormwater runoff is the most common way that NPS pollution reaches local rivers, streams, and lakes. The major goal of stormwater management is to reduce impervious surfaces and increase the absorption of rainwater by soils and vegetation. This is usually accomplished by reducing the speed of flow or by retaining the water in basins or decentralized areas. Increasing absorption by soil has the added benefits of reduced flooding and maintenance of ground water supplies in our aquifers, which are the source of drinking water for many communities in the Nashua Region. The NH Dept. of Environmental Services website, des.nh.gov/, provides the latest information on rain runoff and drainage regulations.



During a rainfall event or snow melt some precipitation infiltrates the soil, is taken up by plants, or evaporates into the atmosphere. But some remains, running off land and impervious surfaces. This is stormwater.

Closed vs. Open Drainage

Most local regulations require stormwater to be “directed to enter the nearest open stream channel.” This allows both open and closed drainage systems to be integrated into local stormwater management, but can still result in environmental impacts such as flooding, aquifer depletion, stream channel erosion, and habitat destruction. What are the differences between open and closed systems? An open drainage system uses swales and open channels to convey stormwater and is often integrated with Low Impact Development techniques. Closed drainage systems use pipes, culverts, and manholes to convey stormwater to detention basins or other centralized infiltration areas. The choice of system will vary by location. Stormwater management systems should be designed for the particular characteristics of the site in order to avoid environmental impacts and to be the most cost-effective for monitoring and maintenance after the project is complete. Water will follow a natural path, so designing a system that respects the characteristics of the site and planning for a monitoring and maintenance schedule will go a long way towards successful stormwater management.

Landscaping

Landscaping is more than simply using objects or plants to fill space or create transitions. In commercial and residential developments it often involves a creative and thoughtful design process. An emerging trend is to utilize native plants and trees in landscapes. This eliminates proliferation of invasive species, protects soils, minimizes energy and water usage, provides habitat, and supports the local economy. Looking to nature for guidance is at the heart of integrated landscaping, which is a holistic approach that incorporates multilayered plant systems. Capturing and treating stormwater is another component of good design. Properly placed vegetation can reduce the velocity of runoff and filter sediment and pollutants before they reach surface water bodies. Trees, greenery, & parks absorb air and water pollutants while providing shade and a cooling effect on public spaces and buildings.



Native plants provide habitat for a variety of animals and keep invasive species at bay. They are also well adapted to local conditions and require little maintenance once established, reducing the need for fertilizers, pesticides, and water.



Parks and green spaces help to make urban areas more inviting for pedestrians. These parks don't need to be large to have an impact. Milford's World War II Memorial Park at the edge of Union Street is a good example.



Landscaping elements are possible even in areas without large open spaces. This planter is constructed in the side of a building along Main Street in Nashua.

Habitat

Wildlife habitat provides public benefits and performs a variety of important ecological functions, including stream buffering, flood retention, carbon sequestration, and contaminant filtering. Preserving wildlife habitat also protects endangered species and biodiversity, which in turn support the health and vitality of natural processes, allowing them to perform important ecological services in our communities and region. Wildlife and habitat help maintain the rural character of New Hampshire. Scenic views and access to protected natural areas are long-standing icons of the state, drawing tourists and residents alike.

What your municipality can do to protect habitat:

- Maintain unfragmented habitat blocks to protect existing wildlife and create a network of viable habitats.
- Adopt statements of purpose in the master plan to guide the creation of ordinances and regulations that protect wildlife. These statements often suggest conducting a Natural Resources Inventory, Open Space Plan, or Wildlife Habitat Protection Plan.

- Utilize innovative zoning techniques found in RSA 674:21, including the Village Plan Alternative and Environmental Characteristic Zoning, to provide a basis for growth while preserving wildlife habitat through more efficient and cost-effective land use.
- Participate in a regional open space team or coordinate with a land trust. Important local decisions can be reprioritized when they are part of a larger vision
- Create design guidelines for all new development that provide specific criteria for protecting wildlife habitat and visual amenities for the town. Design guidelines must be approved by the Planning Board. Develop performance standards within the subdivision or site plan ordinances to assure that the town's habitat and natural resource priorities are not jeopardized as growth occurs.

Energy Efficiency

Communities are increasingly incorporating energy efficient design into the planning process. Site design techniques that take advantage of sun exposure, impervious surfaces, and landscaping reduce a development's energy consumption and environmental impacts. These planning techniques can be used to design housing and non-residential developments, set density levels, integrate different land uses, and design transportation and circulation systems. Energy efficient planning principles can be implemented and upheld through subdivision and site plan review regulations, zoning ordinance, and building codes.

For communities just beginning to explore energy efficiency a good first step is to adopt language into development regulations (such as subdivision or site plan review regulations) that requires optimization of passive solar heating and cooling opportunities. Communities can then adopt additional building codes that exceed the state energy codes for residential and non-residential construction. This requires an established building inspector and code enforcement system. Finally, the most comprehensive method is to adopt a performance zoning ordinance encouraging the voluntary implementation of energy efficient practices for new construction in exchange for a set of incentives or bonuses.

Providing a set of incentives for energy efficient design may draw interest among builders and developers. Incentives can help lessen the initial cost burden by providing a subsidy through tax deferments, deductions, credits, or abatements. Other incentives include expediting the site/subdivision approval time, awarding developments a special certification status, and providing density bonuses.

The State of NH has put the following regulations in place to facilitate energy efficient design:

- RSA 674:44 II (i) - when supported by the Master Plan, communities may also include energy efficiency language in their site plan review regulations as allowed as an innovative land use control.
- RSA 72:61-72 - allows municipalities to adopt property tax exemptions for property owners who have installed solar, wind-powered, or central wood heating energy systems on their property.



Assessment Tool Resources

A variety of assessment tools are available to communities. These tools can be used independently, however, it may be necessary to use multiple assessment tools to best understand your specific situation. The list below is by no means complete; new tools are developed every year.

[Comprehensive Smart Growth Audit Checklist For NH Communities](#)

This tool was created in conjunction with a report titled *Achieving Smart Growth in New Hampshire*, which is available through the New Hampshire Office of Energy and Planning (NHOEP). It is intended to help community planners and citizens utilize Smart Growth principals and prevent sprawl by allowing growth that maintains community identity and character while requiring less resources.

[Smart Growth Audit Toolkit](#)

The Smart Growth Leadership Institute provides a *Smart Growth Implementation Toolkit*, which includes a group of tools that can be used to help communities grow in a way that is smarter and more sustainable. The tools examine community policies, local codes, and regulations.

[Smart Growth Scorecards | Smart Growth | US EPA](#)

The US Environmental Protection Agency (USEPA) has developed the *Smart Growth Scorecards* website that provides links to a number of municipal and project specific assessment tools and resources.

[ICLEI Density-VMT-Calculator](#)

By looking at developments of varying densities, this tool compares the land area needed for development, the added vehicle miles traveled, and the infrastructure required by the proposed development.

[Project for Public Spaces \(PPS\)](#)

PPS is a non-profit organization dedicated to helping communities create and sustain public spaces. Through “placemaking,” PPS works with communities define issues and opportunities, develop a vision, implement the plan, and sustain the public space.

[UNH Extension Community Needs Assessment Tool](#)

This multifaceted tool includes a focus group interview, public issues forum, secondary data analysis, community survey questionnaire, interviews, and asset mapping. The process is intended to identify the needs and desires of a community, target outreach, and motivate grassroots action to address needs.

[CTAP Community Assessment Tool](#)

This tool includes a series of detailed questions that determine the extent to which a community is achieving Smart Growth and provides suggestions for future steps.

[Energy Consumption - EPA's Portfolio Manager](#)

Portfolio Manager allows users to track and assess energy and water consumption across their entire portfolio of buildings in a secure online environment. The tool can help communities determine investment priorities, identify under-performing buildings, verify efficiency improvements, and receive EPA recognition for superior energy performance.



Helping communities face the challenges and impacts of growth while maintaining their character and sense of place.



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