Why a CNU Transportation Summit on Sustainable Transportation Networks?

The Problem

The emergence of suburban sprawl - aided by the affordability of mass produced automobiles - as the predominant development pattern after WWII, has led to a built environment in which housing, employment, shopping, and civic uses got increasingly separated from one another and were eventually built entirely based on the assumption that people will travel by car to any destination. As a consequence the overall transportation system was optimized for the convenience and efficiency of only a single mode – the automobile, with little consideration for facility and comfort needs related to bicycle and pedestrian travel, and to a degree little consideration for transit.

However, the physical and social costs associated with this pattern of spread-out, segregated, and auto-dependent land uses have become a much debated subject, and it is widely viewed as a major contributor to today's high levels of vehicle-miles-traveled (VMT). This assessment is supported by findings in the most recent Mobility Report published by the Texas Transportation Institute, which states that "Traffic congestion continues to worsen in American cities of all sizes, creating a $78 billion annual drain on the U.S. economy in the form of 4.2 billion lost hours and 2.9 billion gallons of wasted fuel" [1]. Since 1980, the growth of miles driven by Americans has outpaced U.S. population growth by a factor of one to three, and is nearly twice as high as the growth in vehicle registrations. A further challenge to the status quo in transportation network planning is the significant share (33%) of total U.S. greenhouse gas emissions that stems from transportation. Increases in fuel consumption and emissions due to travel delays and the rise in VMT clearly contribute to this impact. Hidden within this transportation impact is the impact of the dispersed land use patterns that dominate the U.S. urban environment.

In addition, recent research into the relationship between transportation and housing costs has revealed that households located at the fringes of metropolitan areas tend to be burdened by the highest percentage of the combined cost for housing and transportation as compared with those living in inner suburbs and center cities. For residents of these households the low affordability of ownership housing often goes along with the loss of disposable time due to long commutes and the loss of disposable income due to the high combined cost for transportation and housing [2].

With the apparent transportation and climate crisis, the opportunities for reductions in the VMT through effectively linking transportation (networks) and land use moved more squarely into focus for transportation planners, urban designers, land use planners, economists, and other professionals that CNU counts among its members. In order to take advantage of these opportunities we need to thoroughly define in which way in which transportation networks are planned in coordination with land use planning. This requires that we first establish a clear definition of what we mean when we say that we want to create "sustainable transportation networks."

Establishing a CNU "Platform" on Sustainable Transportation Networks

The Congress for the New Urbanism has long recognized the importance of transportation as a key determinant of quality of urban form and community life. Transportation networks do not only accommodate a region's access and mobility needs but also have significant relationship with the location, type, and form of land development.

There are numerous references in CNU Charter Principles to transportation, elements of the transportation system, including streets and corridors as well as transportation modes, including, bicycling, walking, and transit. Particularly principle Eight, which broadly acknowledges the importance of transportation alternatives as a framework for the physical organization of a region.

Principle Eight

The physical organization of the region should be supported by a framework of transportation alternatives. Transit, pedestrian, and bicycle systems should maximize access and mobility throughout the while reducing dependence on the automobile.

Recently CNU published the Canons of Sustainable Architecture and Urbanism – adopted as a Supplement to the Charter and intended to provide "a set of operating principles" needed to "provide action-oriented tools for addressing the urgent need for change in the planning, design and building of communities." [3]

The preamble to the Canons aptly states that CNU's success in creating more sustainable neighborhoods and regions, and humane and engaging places that can serve as models has been achieved by *simultaneously* engaging urbanism, infrastructure, architecture, construction practice and conservation. There is a commitment to a comprehensive point of view and understanding that the "transportation and building sectors account for the majority of energy and non-renewable resource usage" and therefore make it essential to tackle the "design and planning of the totality of the built environment." [3]

The fact that transportation networks are a fundamental part of this totality makes it important for CNU to specifically define and detail the characteristics of transportation networks across all scales to advance the creation of sustainable neighborhoods, cities, towns, and regions. Taking a significant step toward this goal is the principal purpose of the Charlotte Summit and the Sustainable Transportation Initiative (STNI).

At the Charlotte Summit we invite you to participate in an engaging discussion and exchange of ideas about the topic of transportation networks, their role in CNU's transportation platform, and how to advance sustainability through a better and more integrated approach to transportation network and land use planning.

In order to begin our discussions in Charlotte at a higher level than at our session about networks at the CNU Congress in Austin earlier this year, members of the STNI have prepared four discussion papers for your perusal prior to the Summit. For practical purpose, we have divided the intensely interconnected subject of networks into four subjects:

1. Network – Defining and Measuring Sustainable Transportation Networks
2. Network and Places
3. Network and Modes
4. Network – Implementation Policies and Barriers

We realize that for a subject whose every aspect seems to be interconnected with others, separating out disparate discussion topics can be treacherous. In fact, during the work on their papers, all STNI subgroups became painfully aware of how interrelated all four subjects are and that work in different

locations around the country was making it hard to always be on the same page (or within the same network). However, for practical reason, we believe it makes sense to keep up the subgroup discussion format through parts of the Summit. This will be counter balanced by the scheduled report-outs and large group discussions and a synopsis of results after the Summit.

Again, we ask that you consider the following papers as discussion starters for a discourse in breakout groups at the Summit about how best to define CNU's "platform" for sustainable transportation networks.

Network – Defining and Measuring Sustainable Transportation Networks

What do we mean by network? What are its principles? What are the key characteristics of a sustainable – as compared to a conventional – network? What are the best ways for us to measure the performance of sustainable transportation networks across all modes and in terms of traditional and alternative measures? What contributions can a sustainable transportation network make to the issue of climate change and the energy crisis? What are the expectations, metrics, and possible research that are desired?

Network and Places

What are the desired characteristics of transportation networks and the places that they serve that together lead to an urban form consistent with New Urbanist goals and principles? How can we plan networks and places to achieve these characteristics?

Network and Modes

What are the desired characteristics of transportation networks that produce an urban form consistent with New Urbanist goals and principles – relationship to context, both public realm and buildings?

Network – Implementation Policies and Barriers

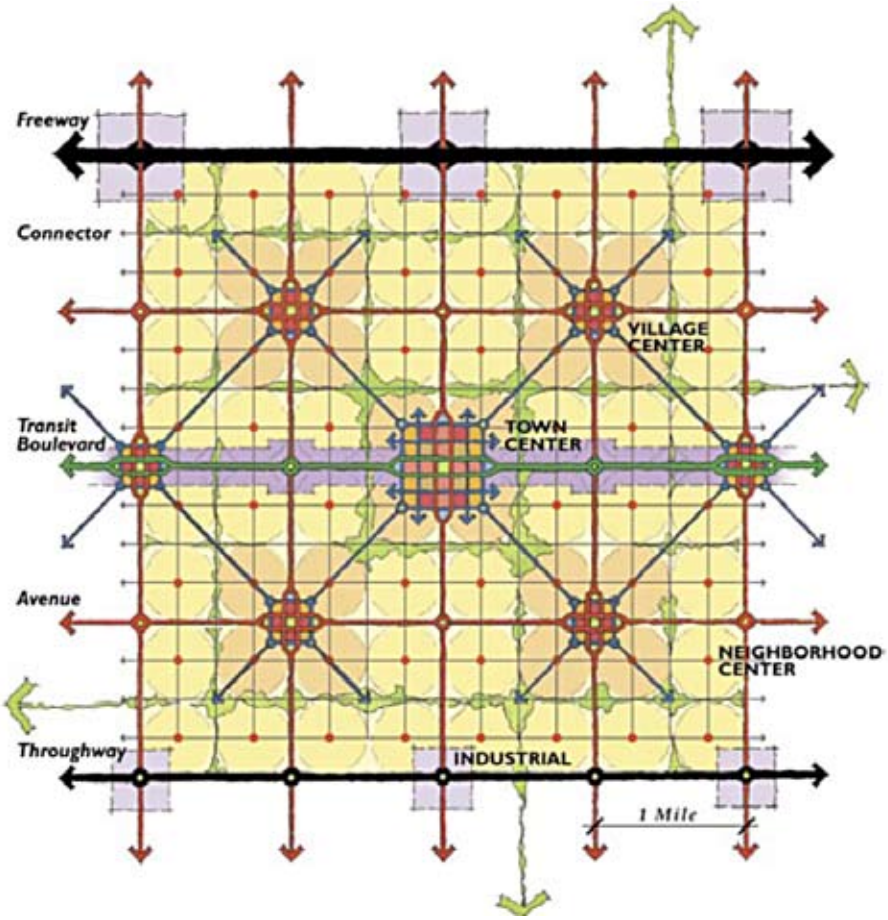
What are the critical barriers to implementation of a sustainable network (including regional transportation modeling; roadway funding; regional vs. local network planning; subdivision codes; system vs. facility planning) and how can they be overcome?

A Short History of CNU Transportation Network Efforts

The Charlotte Transportation Summit is not the first occasion on which CNU members have taken on the subject of transportation networks. The following gives a brief history of CNU efforts around transportation networks.

The Urban Network

In 2002, Peter Calthorpe published *The Urban Network: A New Framework for Growth* [4]. According to Calthorpe the concept is intended to ensure that walkable neighborhoods fit into a regional grid and to transform an arterial network that carries high volumes of traffic vital to retail into a pedestrian-



The diagram of the Urban Network shows transit boulevards and local arterials with one-way couplets going through town centers (Diagram by Calthorpe Associates)

friendly environment.

At the center of the concept are local arterials that split into a pair of parallel one-way roads (set a block apart) when they enter a village center. Under the Urban Network approach these "one-way couplets" are narrower than a conventional suburban arterial and easier for pedestrians to cross, therefore making it possible to create a grid of pedestrian-scale streets in the commercial center. Other key features of the Urban Network include (from *New Urban News*, July/August 2002):

Transit Boulevards, run mass transit within the boulevard right-of-way. Calthorpe says the common practice of running rail transit on a route not shared with auto and pedestrian circulation is a mistake. "Put pedestrians, vehicles, and transit all together," Calthorpe advises. "It makes better urbanism."

Throughways, which carry truck traffic and serve industrial areas and "nonwalkable uses."

Roundabouts, on roads bearing heavy traffic. In a roundabout, traffic is delayed as little as half the time that traffic has to stop for a typical signalized intersection, according to Calthorpe. Roundabouts give rise to "half the number of accidents" of regular intersections, he adds.

Diagonal Connector Streets, which angle outward from the village centers into the surrounding residential neighborhoods, providing convenient access for cars, bicyclists, and pedestrians.

The proposal of the Urban Network created a lively discussion among CNU members about the benefits and potential issues associated with the concept and its main feature – the one-way couplets and transit boulevards, as well as the diagrams reliance on the mile grid.

2003 Nashville Transportation Summit – Modern Network Design

In 2003, in the midst of work by CNU members on developing guidance for context sensitive design of major streets—the design of thoroughfares that serve all users (modes) and are compatible with surroundings through which they pass, interest also developed around defining a new approach to network planning and design. This interest was generated in part by frustrations over the limitations imposed by the conventional functional classification system (Arterial, Collector, Local) on the network-wide application of the more fine-grained range of thoroughfare types that had been developed by CNU members. This expanded pallet of thoroughfare types ranged from freeways to alleys and went along with the idea that capacity calculations for a transportation network that included the full range of thoroughfare types would take into account local streets, which is not the case with current regional network capacity calculations that typically form the basis for all regional transportation planning.

The main outcome of this effort was a white paper that included a table (see next page) that juxtaposed the characteristics of a conventional transportation network with one that fulfills New Urbanist / Smart Growth goals (termed in the white paper the Modern Network Design or MND).

The Modern Network Design described by the characteristics in the following table stands in stark contrast to the conventional suburban thoroughfare network, which derived from the same paradigm that produced single-use, auto-dependent sprawl. The authors of the white paper described the approach as supporting better land development and providing greater compatibility with its surroundings and more support for alternative modes of travel, including private vehicles, busses, truck traffic, commuter and light rail, bicycles, and pedestrians.

The following are short descriptions of the most critical components of the Modern Network Design:

Connectivity – There should be connectivity generally between all adjacent urban areas, including:

- Within and between neighborhoods and from neighborhoods to neighborhood centers
- From one neighborhood center to another and from neighborhood centers to town centers
- From one town center to another and from town centers to urban centers
- From one urban center to another and from urban centers to regional transportation facilities

Continuity – There should be opportunities for continuous movement:

- Within neighborhoods (residential only or part of a mixed use development)
- Between the various centers (neighborhood centers, town centers, and urban centers)
- Between major facilities (inter regional)

Circulation patterns – Circulation should be ubiquitous and multimodal providing:

- Connections should be as direct as possible to prevent circuitous travel within neighborhoods

and centers
- Block lengths should be fairly short (preferably less than 600 feet)
- The transportation system should be focused on the various centers
- The transportation system should be designed as an integrated multimodal system

Street Density – Street density should be function of activity intensity and street types. Higher activity intensity results in high traffic demand, which requires more street capacity. Each street type has a maximum recommended number of lanes. In high intensity areas the spacing between higher classes of streets should be less to maintain the required capacity and stay within the maximum lane requirements.

Accessibility versus Mobility – High capacity streets such as freeways and expressways should be designed and used for high levels of mobility, whereas connectors and local streets should be designed to provide access and local mobility. The remaining street types (major thoroughfares) should be designed to provide the balance between accessibility and mobility.

Street Types – The functional classification of streets for new urbanism/smart growth comprises the full range of thoroughfares required to support smart growth and new urban development, including streets, roads, parkways, avenues, boulevards, alleys, and supplemental off-road facilities like multiuse paths, and other non-vehicular connections.

Land Use Compatibility – Street types should be compatible with and supportive of the intended

Modern Network Design	Conventional Roadway Networks
Highly Connected	Partially Connected
Multimodal	Auto-dependent
Accessible Destinations	Indirect Routes
More Public Streets	Fewer Public Streets
Detailed Streetscape	Few Streetscape Elements
Welcoming for Pedestrians	Dangerous and Unpleasant for Pedestrians
More Route Choices / Redundant	Fewer Route Choices / Prone to Break Down
Smaller/Narrower Streets	Wider Streets
Finer Grained	Coarser Grained
Lower Speeds but Faster Trips	Higher Seeds but Longer Trips
Focus on Quality of Place	Focus on Flow of Vehicles
Less Delay at Intersections	More Delay at Intersections
Simpler Turns	More Complicated Turns
Supports Activity on Sidewalks Adjacent to Streets	Sidewalk and Adjacent Activity Subservient to Traffic Flow

activities and environment associated with the adjacent area types and land uses (this concept was ultimately fleshed out in the Institute of Transportation Engineers (ITE) Draft Recommended Practice *Context Sensitive Solutions for Designing Major Urban Thoroughfares for Walkable Communities*[1]).

ITE/ CNU - Context Sensitive Solutions for Designing Major Urban Thoroughfares for Walkable Communities

At the local and sub-regional scale, the Context Sensitive Solutions (CSS) process has already proven to be an approach that allows the successful integration of multiple planning disciplines and community interest within a single process. In light of the need for a similar integration of potentially diverging interests at the regional scale or even state level (where a lot of transportation network related decisions are being made), it is conceivable that the extension of context sensitive solutions to a system-based approach could produce the desired results.

The following are excerpts from the ITE Draft Recommended Practice *Context Sensitive Solutions for Designing Major Urban Thoroughfares for Walkable Communities* that specifically address the importance of transportation network planning in relation to Context Sensitive Solution:

"Oftentimes the challenges encountered on an individual thoroughfare can be resolved at the scale of the network or the corridor. Network planning establishes a framework for the transportation system and distinguishes the functions, modal emphasis and operational features of individual segments. Alignment, spacing, functional classification, access control, determination of number of lanes and designation for major freight and transit routes are among the familiar characteristics addressed.

Ideally, network planning takes place at the early stages of regional development and is integrated into a comprehensive planning process that concurrently addresses land use, transportation and environmental resource management. In practice, especially in areas with multiple jurisdictions, network planning is often conducted in a piecemeal manner by multiple agencies with different geographic jurisdictions, missions and powers. For the practitioner planning or designing a thoroughfare segment, considering network design and function can lead to solutions that balance between demands for vehicle throughput and support for adjacent development.

The design process [for individual thoroughfares] needs to recognize the role of the thoroughfare as part of a large-scale, multimodal network. The designer, as well as stakeholders involved in the project development process, will need to weigh the regional, sub-regional and neighborhood functions of the thoroughfare in relation to urban form and character. The design of the individual thoroughfare, therefore, is linked to the performance of the network. This is the relationship between the network and the thoroughfare, and why network design is an important aspect of CSS.

Network characteristics have a very meaningful impact on urban development patterns. For example, compact, mixed-use areas are dependent on a pattern of highly connected local and major thoroughfares. The high level of connectivity results in short blocks that provide many choices of routes to destinations, support a fine grained urban lot pattern and provide direct access to many properties.

1 *This ongoing project is a joint effort by the CNU and ITE and is co-sponsored by funds from the Federal Highway Administration and the Environmental Protection Agency.*

Walkable suburban areas are similarly supported by a high level of street or path connectivity. One fundamental tension that is commonly encountered in the application of CSS principles is between the desire of local residents to emphasize character in thoroughfare design, and the desire of stakeholders from a range of broader interests to emphasize vehicle capacity or the ability to accommodate projected regional travel demand. The tension between these objectives is best addressed through consideration of the broader network and corridor in conjunction with the individual thoroughfare. Network characteristics are factors in providing opportunity for CSS. Connectivity, parallel routes and corridor capacity contribute to a transportation system that can accommodate projected demand by dispersing traffic, transit, freight and bicyclists across a system of parallel roadways.

[This manual] addresses all major urban thoroughfares except limited access facilities and local streets. However, when considering network design, properly located express thoroughfares—freeways/tollways, expressways and parkways—supplement the urban arterial thoroughfare network by providing major increments of capacity for longer trips. High vehicular capacity facilities permit other major thoroughfares to balance the movement of traffic with other local objectives. If well connected to the larger thoroughfare network, local streets can also provide parallel capacity in the network to accommodate local, shorter trips. [5]

2006 Boulder Transportation Summit & Sustainable Transportation Network Initiative

Interest in following up on the Nashville effort surfaced at the Boulder Transportation Summit in 2006 and eventually led to the formation of what is now called the Sustainable Transportation Network Initiative (STNI). This group includes CNU members from a range of professional backgrounds who have an interest in finally advancing the discussion of transportation networks to the larger CNU membership and in setting forth a set of operating principles and action-oriented tools (perhaps similar to the Canons) that can provide more detailed concepts and guidance on the subject.

A first step toward this goal was taken at this year's Congress in Austin, where initiative members led a fruitful working session that generated initial discussions on what aspects of network planning and design required further detailed research and thought. The results of the session served as a basis for continuing work in the four subgroups that with this document present their thought process and ideas to the attendees of the Charlotte Transportation Summit.

Canons of Sustainable Architecture and Urbanism

The adoption of the *Canons of Sustainable Architecture and Urbanism* [6] has underlined CNU's firm intent to contribute to the "convenient solution" to the "inconvenient truth" of climate change through the development of detailed objectives and action-oriented tools. The following are key objectives from the Canons that are directly applicable to a discussion of sustainable transportation networks:

The Street, Block, and Network

1. The design of streets and the entire right-of-way shall be directed at the positive shaping of the public realm in order to encourage shared pedestrian, bicycle and vehicular use.

2. The pattern of blocks and streets shall be compact and designed in a well-connected network for easy, safe and secure walkability. This will reduce overall vehicular usage by decreasing travel time and trip length. Design shall strive to minimize material and utility infrastructure.

4. The design of the streets, blocks, platting, landscape and building typologies shall all be configured for both reduced overall energy usage and an enhanced quality of life in the public realm.

The Neighborhood, Town and City

1. The balance of jobs, shopping, schools, recreation, civic uses, institutions, housing, areas of food production and natural places shall occur at the neighborhood scale, with these uses being within easy walking distances or easy access to transit.

4. Neighborhoods, towns and cities shall be as compact as possible, with a range of densities that are compatible with existing places and cultures and that hew tightly to projected growth rates and urban growth boundaries while promoting lively mixed urban places.

8. Natural places of all kinds shall be within easy walking distance or accessible by transit. Public parklands and reserves shall be protected and the creation of new ones promoted.

Region

3. The physical organization of the region shall promote transit, pedestrian and bicycle systems to maximize access and mobility while reducing dependence on automobiles and trucks.

4. The spatial balance of jobs and housing is enabled at the regional scale by extensive transit systems. Development shall be primarily organized around transit lines and hubs.

Conclusion

The discussion above demonstrates that the CNU has long recognized transportation networks for their significant influence on the location, type, and form of land development and made significant progress in conceptualizing the key characteristics of transportation networks that make our urban environments more livable. What remains is the need for a cohesive definition of a new urbanist approach to sustainable transportation networks. An approach that affords the level of detail necessary to provide guidance to transportation planners, urban designer, land use planners and other professionals on how to implement sustainable networks in practice and across all scales – from the street and block to the neighborhood, to cities, and regions. It will be equally important to address implementation barriers to sustainable transportation networks as these will span across administrative and jurisdictional boundaries as well as challenge today's infrastructure funding regimes. In summary, the Charlotte Transportation Summit represents an important step along the way to reforming the current, flawed approach to transportation network planning.

References

[1] Texas Transportation Institute, Schrank, Lomax, "2007 Urban Mobility Report", 2007
[2] Center for Housing Policy, A Heavy Load – The Combined Housing and Transportation Burdens of Working Families, 2006
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[4] The Urban Network: A New Framework for Growth, Peter Calthorpe, 2002
[5] ITE - Context Sensitive Solutions in Designing Major Urban Thoroughfares in Walkable Communities" – ITE Draft Recommended Practice, 2006
[6] Canons of Sustainable Architecture and Urbanism – A Companion to the Charter of the New Urbanism, CNU