Background Materials for
the Roundtable on

Designing New Planning Measures of Transportation System Performance

Joint Congress of
American Collegiate Schools of Planning
and
Association of European Schools of Planning

Organizer and Moderator
Barry Wellar, Emeritus Professor,
University of Ottawa
Distinguished Research Fellow
Transport 2000 Canada

Co-Organizer
Lalita Sen, Professor
Texas Southern University

Chicago, Illinois
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Designing New Planning Measures of Transportation System Performance

Joint Congress
ACSP-AESOP
Chicago, Illinois, July 6-12, 2008

One of the most challenging aspects of transportation planning research in North America and Europe is developing pertinent, accurate, reliable, verifiable, reproducible, and generally understandable measures to describe, analyze, and evaluate initiatives proposed, designed and implemented to improve transportation system performance.

Cases in point of transportation planning strategies include transportation demand and supply management, sustainable transport best practices, inter-modal integration, walkability standards, teleworking programs, connectivity hierarchies, and mobility-based land use planning and zoning. All of these ideas and approaches have great conceptual appeal.

However, and although these and numerous other ways to improve transportation planning have been known for decades in North America and Europe, a major problem remains. That is, only limited progress has been made in achieving robust measures of the effectiveness, efficiency, equity, or utility of these initiatives for planning purposes, and especially in the increasingly important and realms of ecosystem-based and sustainability-based planning.

This session provides a venue for presentations on designing, proposing, prescribing, or demonstrating new or different and more robust ways of measuring how, and how well transportation systems, sub-systems or components are performing. Of particular interest are discussions of how planning theories and principles affect the design of the measures, and discussions of experiences in introducing, championing, implementing, testing, and evaluating the new measures of transportation system performance.

To promote the broad exchange of information between North American and European planners on this critical transportation planning research and applications topic, the roundtable discussion is open to new measures of transportation system performance for any mode involving people, data, or freight, that is, walk, cycle, transit, private motor vehicle, teleworking, rail, water, air, and pipeline in rural, urban and regional planning contexts.

Barry Wellar
Roundtable Organizer and Moderator **wellarb@uottawa.ca.**

Terms of Reference for Participants in the Roundtable Discussion

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In the interests of optimizing the opportunity provided by ACSP-AESOP to exchange views on a vital topic, this brief terms of reference outlines how we are organizing the roundtable session in order to bring together individuals and organizations for a most informative discussion of New Planning Measures of Transportation System Performance.

First, a clear focus is required in order to have a productive session, and we are soliciting three kinds of contributions to this roundtable.
1. Presentations that inform participants about new or modified planning measures of transportation system performance that have recently been conceptualized, designed, tested, and /or implemented.
2. Critiques of existing planning measures of transportation system performance that provide guidance for research into new measures.
3. Summaries of literature searches and reviews of journals, proceedings, conference abstracts, professional advisories, dissertations, manuals, and other bodies of documentation that provide references as well as findings about context, ideas, methods, etc., to support research into evaluating existing measures, and/or developing new or modified planning measures of transportation system performance.

Second, to promote informed exchanges of views and discussion of presentations, roundtable panelists will provide one-page overviews of presentations, critiques, and summaries in advance of the ACSP-AESOP meeting in Chicago. The overviews will be circulated among Roundtable panelists, and will be available to conference attendees from Barry Wellar.

Barry Wellar
Roundtable Organizer and Moderator **wellarb@uottawa.ca**

Roster of Roundtable Presenters

Designing New Planning Measures of Transportation System Performance

Joint Conference
American Collegiate Schools of Planning
Association of European Schools of Planning
Chicago, Illinois, July 6-12, 2008

Moderator

Barry Wellar, PhD, MCIP, Professor Emeritus
Department of Geography and Environmental Studies
University of Ottawa, Ottawa, CANADA wellarb@uottawa.ca

Contributors

Lalita Sen
Department of Urban Planning & Environmental Policy
Texas Southern University
Houston, Texas, U.S.A. Sen_LX@tsu.edu

Angela Hull, Professor of Spatial Planning
School of the Built Environment
Heriot-Watt University, Edinburgh SCOTLAND a.d.hull@hw.ac.uk

Clarence Woudsma, Director, School of Planning
University of Waterloo
Waterloo, CANADA cwoudsma@fes.uwaterloo.ca

Ed Barsotti, Executive Director
League of Illinois Bicyclists
Aurora, IL U.S.A. ed@bikelib.org

Qisheng Pan, Associate Professor
Department of Urban Planning and Environmental Policy
Texas Southern University
Houston, U.S.A. pan_qs@tsu.edu

Robert Schneider, AICP, Ph.D. Student
Department of City and Regional Planning
University of California Berkeley
Berkeley, CA U.S.A. rschneider@berkeley.edu

Designing New Planning Measures of Transportation System Performance

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Barry Wellar

Methodologies for Ranking Sustainable Transport Practices in Urban Regions: Reviewing the State of the Art/Science

Ed Barsotti

"Complete Streets" Road Project Audits for Bicycles and Pedestrians

Robert Schneider

Pedestrian and Bicycle Performance Measures in Practice: Lessons Learned from Communities that Are Measuring Human-Powered Transportation

Clarence Woudsma

Moving Goods Not People – Freight Data, Indicators, and Issues

Angela Hull

Where Are We Heading? Do We Want to Take Responsibility for Transport Externalities?

Qisheng Pan

Measuring Transportation System Performance for Large Metropolitan Areas

Lalita Sen

Systems' Performance Measures from the Local to the Global Level: A User's Perspective

Methodologies for Ranking Sustainable Transport Practices in Urban Regions: Reviewing the State of the Art/Science*

Barry Wellar
wellarb@uottawa.ca

In preparation for a presentation at the 2007 TravelWise conference in Belfast, I contacted a number of government agencies in Canada about their sustainable transport practices. As a result of the responses I contacted Mr. Larry Cannon, Minister of Transportation, Infrastructure, and Communities, Government of Canada, and suggested that "… we are long overdue to incorporate index-based reasoning in policy, plan, and program decisions involving all modes of urban transport. As a result, I would be pleased to meet with your officials to discuss a project to design an index for ranking sustainable urban transport practices".

After several meetings with officials, the project Methodologies for Ranking Sustainable Transport Practices in Urban Regions was approved. The summary statement of work for the initial phase of the project is to conduct a "Literature search and review of the state of the art/science of methodologies for ranking sustainable transport practices in urban regions".

The ACSP-AESOP Congress is the first opportunity to discuss the project in a public forum, and comment is sought from roundtable participants, Congress attendees, and other researchers on the following research design topics:

1. **Precedent inquiries (policy and systems analysis, plan reviews, etc.)**
2. **Pertinent literatures (government documents, journals, theses, etc.)**
3. **Potential methodologies, with emphasis on the structures, functions and operational strengths and limitations of indexes.**
4. **Procedures for rating methodologies.**
5. **Optimizing the keyword-based search and review procedure.**
6. **Consultations with experts about prioritizing criteria to use in ranking transport practices in regard to sustainability.**
7. **Selection of agencies for interviews on sustainable transport practices that have been identified, adopted, implemented.**

Over the course of the initial phase I will be in contact with academics, professionals, and practitioners in such fields as planning, engineering, transportation, economics, geography, regional science, telecommunications, and research methods. Of particular importance are researchers and officials with experience in achieving sustainable transport practices, with emphasis on the methodologies they used in deciding which of the identified practices to adopt, and then implement. I look forward to beginning the project by interacting with the planning expertise at the ACSP-AESOP Congress.

"Complete Streets" Road Project Audits for Bicycles and Pedestrians

Ed Barsotti
ed@bikelib.org

"Complete Streets" are designed to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders are able to safely move along and across a complete street. Across the country, road-building agencies are formally adopting complete streets policies, to provide safer conditions for those who bicycle or walk either by choice – or by economic (or other) *necessity*.

The League of Illinois Bicyclists (LIB), a statewide non-profit bicycle advocacy organization, has started a Complete Streets Audit program of road-building agencies. LIB has developed a scoring methodology rating a road design on how well it accommodates bicyclists and pedestrians – taking into account what is needed for that road's particular context. A quiet farm roadway or residential cul-de-sac may not need anything extra for bikes or peds, but a major suburban arterial would. A high score indicates that non-motorized users have been appropriately accommodated for whatever the specific situation may be.

Overall accommodation and design details are rated for: pedestrian travel *along* the road, bicycle travel *along* the road, crossings of the road, and other context-sensitive factors. The methodology uses tools such as the Federal Highway Administration's sidewalk installation recommendations, Bicycle Level of Service, and LIB's Sidepath Suitability Score to provide design guidance on topics ranging from bike accommodation type to right-in-right-out entrances.

The League is conducting Complete Street Audits of roadway projects in the state's urban areas, where both federal and state policies recognize there being the most existing and latent need. The goals are to:

- **Introduce the scoring methodology as a planning tool that can be used by agencies in a project's early stages and in the selection of accommodation type**
- **Work cooperatively with agencies on design details that make a big difference**
- **Give credit to agencies that build safer roads for pedestrians and bicyclists**
- **Urge other agencies to adopt Complete Streets policies and to view bike/ped accommodation as a necessary part of a project, not as an optional amenity**

Pedestrian and Bicycle Performance Measures in Practice: Lessons Learned from Communities that Are Measuring Human-Powered Transportation

Robert Schneider
rschneider@berkeley.edu

Walking and bicycling are essential elements of multimodal transportation systems. In recent years, several local and state governments have adopted pedestrian and bicycle performance measures. These agencies include the City of Seattle, WA, District of Columbia, City of Alexandria, VA, Greensboro (NC) Metropolitan Planning Organization, and states such as Vermont, Florida, Maryland, New Jersey, New York, Oregon, Tennessee, and Wisconsin.

Most transportation agencies still do not use pedestrian and bicycle performance measures. Therefore, it is important to analyze existing performance measures for walking and bicycling and understand the qualities that make human-powered transportation performance measures effective. This information will be useful for communities that seek to revise or establish new pedestrian and bicycle performance measures.

Several practical lessons can be learned from communities that have established pedestrian and bicycle performance measures:

1) Existing pedestrian and bicycle performance measures address many aspects of human-powered transportation, including safety, usage, facilities, education/enforcement, user satisfaction, land use, training/assistance, economic benefits, and institutionalization of non-motorized transportation issues within agencies.
2) The level of detail in pedestrian and bicycle performance measures varies. Some agencies measure only increases or decreases in non-motorized usage and/or crashes. Others have established specific targets to be achieved by certain dates.
3) Some performance measures are process oriented (measure the direct implementation of policies and actions of the agency) and others are outcome oriented (measure the end results of policies and actions in relation to goals, such as pedestrian and bicycle use, safety, health, economic benefits, etc.).
4) Data collection is critical for measuring pedestrian and bicycle characteristics over time. This aspect of pedestrian and bicycle performance measurement is often a barrier for transportation agencies.
5) Good pedestrian and bicycle performance measures are related to the policies and goals of the agency pedestrian and bicycle plan; can be measured and/or graphed over time; use data that are readily available and can be collected cost- and labor-effectively; and can be reported at regular intervals, such as in an annual or biannual performance measures report.

Moving Goods Not People:
Freight Data, Indicators, and Issues

Clarence Woudsma
cwoudsma@fesmail.uwaterloo.ca

The majority of literature that deals with freight movement, especially in the context of urban areas, begins with a phrase roughly captured as "... it's important, under- researched, and poorly understood". This includes literature from the 1960's to the present, and although there is a good deal of freight work out there, the statement would ring as true in 2008. For this Roundtable, the focus is on issues and prospects affecting the design of new measures connecting freight, planning, and transportation system performance. 1. Identity and engagement – what is it and who's doing work in it? – freight, logistics, city logistics, supply chain management, commercial movement, urban goods. 2. Data consistency and regularity – think "average commuting time" in the context of freight (see discussion in Ambrosini and Routhier 2004, Woudsma, 2001). 3. Vital in the context of energy and sustainability – we really mean it this time! 4. Moving from physical trip (counting trucks) to decision making focus (household vs. firm activity – discrete choice (Hensher and Puckett, 2005)). 5. Focus on broader network metrics (Scott et al. 2006) and incorporating "sustainability indices" in traditional integrated (T/LU) modeling efforts (Maoh and Kanaroglou, 2008).

Ambrosini, C, Routhier, J-L (2004) "Objectives, methods and results of surveys carried out in the field of urban freight transport: An international comparison" Transport Reviews 24: 57-77.

Hensher, D.A., Puckett, S.M. (2005) Refocusing the modeling of freight distribution: Development of an economic-based framework to evaluate supply chain behavior in response to congestion charging, Transportation (2005) 32: 573–602.

Maoh, H., Kanaroglou, P.S. (2008) Patterns of Land Use Development and Sustainable Transportation: A Simulation Approach, in Proceedings of the 43rd, Annual Conference of the Canadian Transportation Research Forum, pp.433-448, Saskatoon, SK.

Ogden, KW (1992) Urban Goods Movement: A Guide to Policy and Planning, Ashgate, Aldershot, UK.

Scott D.M., Novak D.C., Aultman-Hall L., Guo F. (2006) Network Robustness Index: A new method for identifying critical links and evaluating the performance of transportation networks, Journal of Transport Geography, Vol. 14, (3), May 2006, pp 215-227.

Woudsma, C.G., (2001), Understanding the Movement of Goods Not People: Issues, Evidence and Potential, Urban Studies, Vol. 38. No. 13 pp 547-570.

Where are we heading? Do we want to take responsibility for transport externalities?

Angela Hull
a.d.hull@hw.ac.uk

First we need to agree the direction in which we should be traveling. A European vision of sustainable transport (ECMT, 2000) is one that:

- **Allows the basic access needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health;**
- **Is affordable, operates efficiently, offers choice of transport mode; and**
- **Limits emissions and waste within the planet's ability to absorb them, and resources at or below their rates of generation, and minimizes the use of land and the generation of noise.**

Second, what governance tools can we use to achieve a step-change?

- **Direct development of the transport system, or provision of parts;**
- **City regions need financial tools as 'push' and 'pull' levers towards sustainability, which could include incentives and penalties linked to carbon emissions, and /or market–based tools that internalize the external costs of our behavior;**
- **Regulatory powers to ensure the cooperation of private sector transport operators and other stakeholders backed by consistently applied national legal requirements;**
- **Community awareness raising of the effects of over consumption of natural and man-made resources on global climate change, and city-region transport strategies integrated with land use, education, health etc strategies.**

Third, if we have agreement on the structure above, we can move on to designing performance measures to show progress towards sustainability. First order priorities should be to:

- **Minimize the dependence on fossil fuels**
- **Cut the consumption of natural and man-made resources**
- **Reduce emissions of greenhouse gases**
- **Cut pollution to groundwater and seas**
- **Reduce the impact on habitats and soil erosion**

We should be able to continue our present levels of accessibility by consuming less natural resources using Factor 4 and Factor 10 principles which underlie the concept of exergy. Other priorities:

- **Contribute to other social objectives such as improving health, reducing accidents and providing a better quality of life**
- **Ensure that social capacity to make low energy decisions is enhanced through community engagement.**

Measuring Transportation System Performance for Large Metropolitan Areas

Qisheng Pan
pan_qs@tsu.edu

Transportation in large metropolitan areas is a complex system, including both passenger trips and freight flows for different trip purposes and using a variety of modes. The performance of the transportation system is usually assessed in terms different criteria, such as the reduction of congestion and pollution, the improvement of mobility and accessibility, the assurance of equity, and the development of a safer system, etc. Because some of the issues are inter-related, it is costly and inappropriate to examine the components separately. It would be beneficial to develop and implement an integrated model that is capable of measuring the performance of the transportation system under a variety of circumstances and with different criteria. The model should have enhanced and innovative functions. Based on my experience and observation, I list some of these functions as follows,

- **A combination of passenger and freight flows in travel demand simulation and forecasting**
- **A feedback loop between transportation performance and the spatial location of regional activities.**
- **A two-way link to the land use model**
- **An integration of accessibility and mobility measures**
- **Socio-economic and environment impact analysis**
- **A scalable structure that accounts for the availability of data and the needs of functions at different levels.**

An example is the Southern California Planning Model (SCPM) that I have collaborated on with the colleagues at USC for many years. SCPM is a metropolitan input-output model linked to a spatial allocation model in the Garin-Lowry tradition that is very spatially disaggregated and to which a highway network is added with endogenously determined loadings of both passenger and freight flows. It includes a freight module that exploits secondary data sources to estimate detailed freight flows for a large metropolitan area in a low-cost way. It enables the estimation of geographically located outputs and job impacts in response to a variety of exogenous shocks, including policies, projects and plans. It has extensive applications with a scalable model structure, including the examination of economic impacts and transportation performance changes for hypothetical terrorist attacks and the forecast of the impacts of various transportation corridor improvement projects on population, employment, passenger traffic and freight flows. The experience gained from making SCPM operational suggests that similar models can be built for other large metro areas.

Systems' Performance Measures from the Local to the Global Level: A User's Perspective

Lalita Sen
Sen_LX@tsu.edu

Users' view point on systems' performance measures include *critical factors* such as:

Affordability; Accessibility; Flexibility; Security; Comfort; Journey time

These above factors are viewed in terms of mode choice/ preference or availability varying with each mode. The modes from a global perspective can be as follows:

Walking; Cycle; Rickshaws; Carts/ Tongas/ Horse carriages; Minibus/ Thukthuks; Private cars; Taxis; Large Buses' Tram/ Light rails (surface); Subways; Suburban trains; Long distance rail transport; Commuter planes; Long distance airlines

An inductive model for system measures is proposed using field data collected on evaluation of travel factors by mode.

Modes	**Evaluating travel characteristics by mode**					
	Comfort (A)	Affordability (B)	Flexibility (C)	Security (D)	Accessibility (E)	Time/ Distance (F)
Walking						
Cycle / Rickshaw						
Buses / Mini buses						
Taxis / shuttles						
Private cars						
Trams/ light rails						
Suburban trains/ long distance trains						
Airplanes						

For each trip segment, each aspect of travel (factor) can be rated using five point Likert scale ranging from 1- Very bad through 5-Very good.

In addition to trip segments in a trip chain, transfer points have become very important from a user's perspective. Factors such as accessibility, security, comfort, and waiting time become critical at transfer points such as pick up and drop off points, and transfer points between modes etc.

Following is an example:

	Accessibility	Security	Comfort	Waiting time
Curb by residence/ destination				
Bus stop/ terminals				
Rail stations				
Airports				
Ferry / dock				

Use of such a model:

1. **Such a method can measure the average system's performance and allow comparison between regions, countries, and within regions both small and large.**

2. **This approach can measure accessibility , security, comfort, and waiting time / travel time for modes, transfers between modes and for an entire trip chain**

3. **These measures can also measure for responses from locals, visitors, and foreign tourists**

4. **This method focuses on the user's perspective which effectively can help policy makers to determine priorities in terms of budgetary allocation of scarce public resources.**