6th International Symposium on Highway Capacity and Quality of Service

Stockholm, Sweden June 28 – July 1, 2011

Final Program
Welcome to the
6th International Symposium on
Highway Capacity and Quality of Service,
Stockholm, Sweden, June 28-July 1, 2011.

Dear friends,

We welcome our colleagues from around the world to this major international event. The Symposium, following the release of the HCM 2010, provides a unique opportunity for researchers, engineers, planners, and other professionals to present and discuss issues of importance for the sustainable design and operation of road transport facilities.

The Royal Institute of Technology (KTH), the leading technological university in Sweden, has the privilege to be the local organizers of the Symposium, on behalf of the Transportation Research Board, Committee AHB40 on Highway Capacity and Quality of Service. The Symposium attracted worldwide interest with over 140 abstracts submitted. Through a peer review process 78 papers and 9 country reports, covering all aspects of traffic operations and systems, are included in the program.

We invite all delegates to actively participate in the conference and enjoy the interactions with colleagues in the technical sessions and the social events.

Haris N. Koutsopoulos  Karl-Lennart Bång  Lily Elefteriadou

Photographer Human Spectra – Stockholm Visitors Board
Program

Monday, June 27

13:00 – 17:00  PRE-SYMPOSIUM WORKSHOP

Chairperson: Karl Bang, KTH

Place: Royal Institute of Technology (KTH), Division of Traffic and Logistics
Teknikringen 72, Stockholm. Room V22.

Topic: Tools for system analysis of motorways and adjacent interchanges

Program*:

- Opening of the workshop
  Karl Bang, KTH

- Presentation of the freeway facilities general approach in HCM 2010
  Nagui R ouphail and Bastian Schroeder, North Carolina State University,
  Raleigh, US

- Presentation and interpretation of the FREEVAL model inputs and outputs.
  Nagui R ouphail and Bastian Schroeder, North Carolina State University,
  Raleigh, USA

- FREEVAL hands on exercises and solutions

- Presentation of the CALMAR model (based on FREEVAL) applied on the
  Stockholm motorway system
  Per Strömgren, KTH/WSP

- Discussion

* ATTENTION: Participants are required to bring/share their own laptops
Tuesday, June 28

09:00 Opening of registration desk at Hotel Hilton Slussen

13:00 – 13:30 OPENING SESSION Room: Auditorium
Moderator: Haris Koutsopoulos, KTH

Opening address: Lily Elefteriadou, Chair TRB Committee AHB40
Welcome address: Ulla Hamilton, Vice Mayor, City of Stockholm
Keynote speech: Lena Erixon, Deputy Director General, Swedish Transport Administration

13:40 – 15:10 COUNTRY REPORTS 1 Room: Auditorium
Moderator: Hideki Nakamura

Lily Elefteriadou

Sweden: Swedish Country Report
Torsten Bergh, Karl Bang, and Fredrik Davidsson

Denmark: Highway Capacity Research and Applications in Denmark
Henning Sörensen

Germany: Challenges of the Future Traffic Growth in Germany
Josef Kunz and Kerstin Lemke

15:10 – 15:30 Coffee break

15:30 – 17.00 COUNTRY REPORTS 2 Room: Auditorium
Moderator: Karl Bang

Japan: Present State of Capacity and Quality of Service Research and Practice in Japan
Hideki Nakamura, Takashi Oguchi

China: Chinese Highway Capacity Research Studies and Applications
Jian Rong, Jeff Guo, and Ronggui Zhou

Malaysia: The Malaysian Highway Capacity Study

Brazil: Highway Capacity Research in Brazil
José Reynaldo Setti

Spain: Spanish Country Report
Manuel Romana
Tuesday, June 28 Evening

Welcome reception, Stockholm Town Hall

18:30- Departure by bus from Hilton Slussen Hotel (bring your invitation card)

19:00- Welcome reception at Stockholm City Hall hosted by the City of Stockholm

- Welcome address: Margaretha Björk, President of the Stockholm City Council
- Tour of the City Hall
- Buffet dinner
- Closing remarks: Lily Elefteriadou, Professor of Civil Engineering, University of Florida Chair of TRB Committee AHB40

City Hall

City Hall is one of the most famous silhouettes in Stockholm. It was designed by the architect Ragnar Östberg, and opened on Midsummer Eve in 1923. Architecturally, the City Hall is one of Sweden’s leading examples of national romanticism in architecture.

The City Hall is built from eight million bricks, and the 106m tall tower has at its apex the three crowns, the Swedish national coat of arms. Every year since 1930, the great Nobel banquet is held in the City Hall. After dinner in Blå hallen, the Blue Hall, Nobel Prize recipients, royalty and guests, dance in Gyllene salen, the Golden Hall, with its 18 million gold mosaic tiles.
## Wednesday, June 29

### 08:30 – 12:00 TECHNICAL SESSIONS TS1 – TS5
(presenting speaker underlined)

<table>
<thead>
<tr>
<th>Time</th>
<th>TS 1: Motorways 1</th>
<th>TS 2: Highways 1</th>
<th>TS 3: Signalized intersections 1</th>
<th>TS 4: Priority intersections 1</th>
<th>TS 5: Ramps – weaving sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30 – 12:00</td>
<td>Chair: A. Nissan</td>
<td>Chair: J.R. Setti</td>
<td>Chair: H. Nakamura</td>
<td>Chair: Z. Tian</td>
<td>Chair: N. Rouphail</td>
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### Wednesday, June 29

**TS 1: Motorways 1**
- **Platooning on Two-Lane Two-Way Highways:** An Empirical Investigation by Ahmed Al-Kaisy, Casey Durbin
- **Modelling blockage probability and capacity of shared lanes at signalized intersections:** Ning Wu
- **The determination of conflicting flow rates for the calculation of capacities of minor traffic streams on priority intersections:** Thoralf Knote
- **A new model for Level of Service of freeway merge, diverge, and weaving segments:** Ning Wu, Kerstin Lemke

**TS 2: Highways 1**
- **Empirical examination of passing lane operational benefits on rural two-lane highways:** Ahmed Al-Kaisy, Zachary Freedman
- **Saturation flow rate analysis for shared left-turn lane at signalized intersections in Japan:** Peng Chen, Hideki Nakamura, Miho Asano
- **Empirical behavioral models to support alternative tools for the analysis of mixed-priority pedestrian-vehicle interaction in a hwy capacity context:** Bastian Schroeder, Nagui Rouphail
- **Modelling factors influencing the capacity of motorway merge sections controlled by ramp metering:** Saad Yuusuf, Jalal Al-Obaedi

**TS 3: Signalized intersections 1**
- **Delay analysis of free right-turn channelized intersections:** Gregory S. Macfarlane, Mitsuru Saito, Grant G. Schultz
- **Modeling stochastic left-turn gap acceptance behavior:** Hesham Rakha
- **Traffic micro-simulation study to evaluate freeway exit ramps capacity:** Alfredo Garcia, M. Pilar Martinez, Ana T. Moreno

**TS 4: Priority intersections 1**
- **Impact of transit signal priority on level of service at signalized intersections:** Alexander Skabardonis, Eleni Christofa, Grant G. Schultz
- **Capacity of unsignalized intersections under mixed traffic conditions:** Jeewono Prasetijo, Mehdi Hossein Pour, Seyed M. R. Ghadiri
- **Empirical behavioral models to support alternative tools for the analysis of mixed-priority pedestrian-vehicle interaction in a hwy capacity context:** Bastian Schroeder, Nagui Rouphail

**TS 5: Ramps – weaving sections**
- **A preliminary assessment of the 2010 HCM weaving methodology:** Loren Bloomberg
- **Modelling motorway merge: The current practice in the UK and towards establishing general principles:** Ronghui Liu, Geoff Hyman

### Coffe break 10:00-10:30

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<td>Derivation of capacity standards for intercity roads carrying heterogeneous traffic using computer simulation</td>
<td>Vehicle composition and lane distribution in multilane highways in Indonesian cities</td>
<td>Impact of transit signal priority on level of service at signalized intersections</td>
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- **Estimating free-flow speed from posted speed limit signs:** Joseph Fazio, Brady N. Wiesner
- **Evaluation of low cost technique “Indirect Right Turn” to reduce congestion at urbanized signalized intersection in developing countries:** Kamran A. Bilal Khan
- **Roundabout metering signals: capacity, performance and timing:** Rahmi Akgelir
- **Modelling motorway merge: The current practice in the UK and towards establishing general principles:** Ronghui Liu, Geoff Hyman

**TS 2: Highways 1**
- **Proposition of an alternative model for speed-flow relationship in two-lane highways:** Manuel G. Romana, Miguel Núñez
- **Modification of saturation flow formula by width of road approach:** Budi H. Susilo, Yanto Solihin
- **Traffic operations at an entrance ramp of an urban freeway:** Gérard Louah, Dimitri Daucher, Patricia Condé-Cespedes, Frederic Bosc, Jean-Paul Lhuillier

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Wednesday, June 29 (continued)

13:30 – 17:00 TECHNICAL SESSIONS TS6 - TS10

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<tr>
<td>Chair: W. Brilon</td>
<td>Chair: M. Romana</td>
<td>Chair: K. Courage</td>
<td>Chair: T. Bergh</td>
<td>Chair: F. Hall</td>
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<tr>
<td>Capacity effects of variable speed limits on German freeways</td>
<td>Speed and capacity for urban roads, Indonesian experience</td>
<td>Study on the saturation flow rate and its influence factors at signalized intersections in China</td>
<td>Analytical traffic models for roundabouts with unsignalized crossings</td>
<td>Evaluation of the IQA delay estimation method</td>
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<tr>
<td>Justin Geistefeld</td>
<td>Ahmad Munawar</td>
<td>Chang-Qiao Shao, Jian Rong, Xiao-ming Liu</td>
<td>Astrid Bergman, Johan Olstam, Andreas Allstrom</td>
<td>Mitsuru Saito, Yaye M. Keita</td>
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<td>Proactive ramp metering based on breakdown probabilities</td>
<td>Implementing two-lane highway simulation modeling into CORSIM</td>
<td>The development of microscopic traffic analysis software “Road Canal”</td>
<td>Critical gap analysis of dual lane roundabouts</td>
<td>Estimation of the peak-hour demand in the German Highway Capacity Manual</td>
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<tr>
<td>Lily Elefteriadou, Alexandra Kondyi, Scott Washburn, Werner Brilon, Jan Lohoff, Les Jacobson, Fred Hall, Bhagwant Persaud</td>
<td>Jing Li, Scott Washburn</td>
<td>Leksmono S. Putranto Reza Sunggiardi</td>
<td>Andyka Kusuma, Hans N. Koutsopoulos</td>
<td>Kerstin Lemke</td>
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<td>Measuring the quality of service for High Occupancy Toll (HOT) lanes operations</td>
<td>Derivation of ATS and PTSF functions for two-lane rural highways in Brazil</td>
<td>Effects of bi-directional pedestrian flow characteristics upon the capacity of signalized crosswalks</td>
<td>Density models and safety analysis for rural unsignalized restricted crossing U-turn intersections</td>
<td>An overview of guidelines for applying traffic simulation for level-of-service analysis</td>
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<td>Xianyou Liu, Guohui Zhang, Yao-Jan Wu, Yinhai Wang</td>
<td>Jose Reynaldo Setti and Jose E. Bessa Jr</td>
<td>W. K. M. Alhayaseen, Hideki Nakamura Miho Asano</td>
<td>Rafael Olarte, Joe G. Bared, Larry Sutherland, Anand Asokan</td>
<td>Andreas Tapani, Johan Olstam</td>
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<td>Development of HCM methodologies to access active traffic management strategies that influence traffic demand</td>
<td>Analysis on rural highways design using traffic micro-simulation in cold regions</td>
<td>Assessing performance potential of signalized intersections and arterials</td>
<td>Signal control of roundabouts</td>
<td>Estimation of the network capacity for multimodal urban systems</td>
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<td>Impact of a dedicated lane on the capacity and the level of service of an urban motorway</td>
<td>Description, validation and use of a model to estimate speed profile of heavy vehicles in grades</td>
<td>An exploratory hazard-based analysis of the first discharge headway</td>
<td>Capacity of TWSC intersection with multilane approaches</td>
<td>A utility-based evaluation method on the perceived quality of traffic service</td>
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<td>Simon Cohen, Judith Princeton</td>
<td>Vilhelm Bornes, Arvid Aakre</td>
<td>Ming-Jun Liu, Bao-Hua Mao, Li-Ping Gao, Shao-Kuan Chen Quan-Xin Sun</td>
<td>Haiyuan Li, Zong Tian, Wei Deng</td>
<td>Hideyuki Kita, Akira Kouchi</td>
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<td>Countermeasure strategies against traffic congestion on motorways in Japan</td>
<td>A new procedure to determine a user-oriented level of service of traffic light controlled crossroads</td>
<td>The Correction value of Passenger-Car Equivalents for motorcycle and its impact to road performance in developing countries</td>
<td>Sasana Putra</td>
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<tr>
<td>Yoshiyasu Murashige</td>
<td>Thorsten Becher</td>
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### Thursday, June 30

**08:30 – 12:00 TECHNICAL SESSIONS TS10 – TS15**

<table>
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<tr>
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| 08:30 – 12:00 | **TS11:** Road networks  
Chair: S. Washburn  
Room: Platon  
Time-dependent connection quality in road networks  
Jochen Lohmiller, Anna Bennecke, Bernhard Friedrich Markus Friedrich  
**TS12:** Work zones  
Chair: B. SchroederT  
Room: Aristoteles  
Simulation-based workzone capacity estimation. Application in the Korinth-Patras motorway.  
Constantinos Antoniou, Basil Psarianos, Guénoël Foll  
**TS13:** Urban arterials  
Chair: T. Luttinen  
Room: Sokrates  
The effect on improving traffic capacity by operational lane change test  
Masahiko Mitsuhashi, Yoichi Moriyama, Shinichi Hirai, Takashi Oguchi  
**TS14:** Signalized intersections 3  
Chair: R. Akcelik  
Room: Sofokles  
Investigating initialization times, repetitions, and MOE variability in simulation of saturated traffic signals  
Saravanan Gurupackiam, Steven L. Jones  
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### Coffe break 10:00-10:30
Thursday, June 30, (continued)

12:00 Lunch at Hilton Slussen (included in symposium fee)

13:00 – 17:00 TECHNICAL VISITS

13:00 Bus transport from Hilton Slussen to each visit site
13:30–16:30 Technical visits

**TV-1 Stockholm Congestion Tax System (STCS)**
*(Bus guide: Karl Bang, KTH)*

Visit to Swedish Transport Administration (TRV), Regional office in Stockholm  
*Host: Lars-Olov Lissell*

- The Stockholm Congestion Tax System (STCS)
  - Film presentation
  - Congestion taxing impacts and environmental sustainability  
    Gunnar Söderholm (*City of Stockholm*) and Karl Bang (*KTH*)

- Congestion Tax Systems in Sweden
  - Concepts, legislation, functions, technology.  
    Lars-Olov Lissel (*TRV*)
  - Information systems & handling. Eva Söderberg (*STA*)

- Discussion regarding future international development.  
  *Moderator: Karl Bang (KTH)*

**TV-2 Stockholm Traffic Management Center**
*(Bus guide: Per Strömgren, KTH)*

Visit to the Traffic Management Center  
"Traffic Stockholm" (TS) operated in cooperation between the Swedish Transport Administration and the City of Stockholm.  
*Host: Mats Kjellman*

- System functions and operation
  
  *Mats Kjellman (TS) and Henrik Sundqvist (TRV)*

- The STRESS system for motorway traffic data collection & analysis  
  *Joakim Barkman (TRV), Jerk Brorson (Balanz), and Per Ström gren (KTH)*

Field trip on instrumented parts of the urban motorway system

**TV-3 Stockholm Bypass and Northern Link Tunnel Complex**
*(Bus guide: Torsten Bergh, Swedish Transport Administration-TRV)*

Visit to TRV project office in Kräftriket

- Planning process for Stockholm bypass to be built west of the city  
  *(Anders Wengelin, TRV)*

- Northern Link design concepts, construction techniques and planned traffic control system  
  *(Michael Lundborg, TRV)*

Bus tour of the North Link tunnel construction site
Thursday, June 30, (continued)

19:00 – 22:00 SYMPOSIUM DINNER at Solliden, Skansen

18:30 Bus departure from Hotel Hilton Slussen

19:00 Symposium dinner

**Attire:** Smart casual
Bring your symposium badge and dinner ticket. Additional tickets can be purchased at the registration desk.

**Skansen** is the first open air museum and zoo in Sweden and is located on the island Djurgården in Stockholm. It was founded in 1891 by Artur Hazelius (1833-1901) to show the way of life in the different parts of Sweden before the industrial era.
Friday, 1 July

Post-Symposium Workshops  Room: Aristoteles

08:00 – 12:00  Two-lane highways
13:00 – 15:00  Performance measures
15:00 – 17:00  SHRP L08 project: Reliability in the HCM

International Roundabout Design and Capacity Seminar  Room: Platon (organized by the Swedish Transport Administration and KTH, free of charge)

09:00 – 15:30  Experts from 10 countries present an overview of:
• typical roundabout designs in urban and rural environments and treatments of bicycles and pedestrians
• analytical and simulation capacity and level-of-service methods
• recent research on capacity and level-of-service.

Program:
09.00 - 10.00  UK, US
10.00 - 10.15  Coffee break
10.15 - 12.15  Norway, Denmark, Finland, Sweden
12.15 - 13.00  Lunch
13.00 -15.00  Netherlands, Spain, Germany, Australia/New Zeland
15.00 - 15.15  Coffee break
15.15 - 15.45  Discussion

Questions:
Torsten Bergh Swedish Transport Administration
torsten.bergh@trafikverket.se  mobile +46705875266
Saturday, 2 July

Meetings and workshops

08:00 – 09:30  Uninterrupted and interrupted flow group meeting
               Two parallel sessions. Rooms: Platon + Aristoteles

09:30 – 11:00  Research subcommittee workshop *
               Room: Platon

11:00 – 12:00  HCQS Committee meeting (AHB40) *
               Room: Aristoteles

* The subcommittee and committee meetings are open to all attendees.
These are working sessions devoted to discussions of capacity and quality of service
research and support of users of the HCM.
Conference Rooms
Local Organizers
   Haris N. Koutsopoulos, KTH
   Karl L. Bang, KTH

International Technical and Planning Committee
   Zong Tian, University of Nevada, USA, chair
   Werner Brilon, Ruhr-University Bochum, GERMANY
   Richard Dowling, Dowling Associates, USA
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