TRANSPORTATION @ MIT

Cynthia Barnhart

Transportation @ MIT Seminar Series Launch

September 15, 2009
Background

• Dean Subra Suresh launched a strategic planning effort for the School of Engineering, and charged a Transportation Strategy Committee (2008) to investigate opportunities in Transportation

• Committee membership- representation from the School of Engineering, the Sloan School of Management, and the School of Architecture and Urban Planning:
  – Ian Waitz (Chair)
  – Cynthia Barnhart
  – John Hansman
  – Patrick Jaillet
  – Yossi Sheffi
  – John Sterman
  – Ryan Tam
  – Chris Zegras

• Launched Transportation @ MIT Initiative in March 2009, a partnership of
  • School of Engineering
  • Sloan School of Management
  • School of Architecture and Planning
If the projected world population of 9 billion people in 2050 lived the way Americans do today….

- There would be **7.6 Billion** motor vehicles on the roads
- Transportation alone would consume **440 million** barrels of oil per day
  - *Total* world oil production today is **82 million** barrels/day
- CO₂ emissions from transportation alone would be **62 billion** metric tons/year
  - *Total* world emissions from fossil fuels today ≈ **28 billion** tons CO₂/year

- The current Western model of development and transportation cannot scale to a world of 9 billion who live the way we do
  - Efficiency improvements are necessary but not sufficient
  - New technologies are necessary but not sufficient
  - **We must behave differently and think about the problem differently**

Thanks to John Sterman for this analysis
Grand Challenge

• The greatest wave of mass mobility is yet to come
  – Represents a potential economic, health, and ecological disaster on a global scale

A goal of Transportation @ MIT is to do something about it....
Transportation @ MIT

- Transportation @ MIT - a partnership of the Schools of Engineering, Management and Architecture and Planning
  - Recognizing the multi-faceted challenges associated with transportation
    - Mobility (moving people and goods), Energy, Environment, Safety, Technology, Information, Infrastructure, Economics, Settlement Patterns, Urbanization, Social Structure, Globalization, Personal and Political Behavior
  - Recognizing the need for a multi-disciplinary approach
- Transportation @ MIT connects with and builds upon
  - MIT Energy Initiative
  - MIT Environmental Research Council
  - MIT’s rich tradition of promoting multi-disciplinary scholarship and education
Transportation @ MIT: Focus

• To address the grand challenge of Sustainable Accessibility
  – Providing access to goods, services and opportunities necessary to enable human development while preserving and restoring the environment
  – Going beyond moving people and goods from point A to B, includes
    • Deploying advanced technologies and processes to reduce the time, energy, and environmental impact associated with travel, AND
    • Changing the demand for travel by reconfiguring or moving A and B, by employing information technologies to enable people to not travel, etc.
Some Goals of Transportation @ MIT

- Build a vibrant intellectual community
  - Engage MIT researchers and the local community
  - transportation.mit.edu
  - Knit together the wide-ranging research already under way at the Institute to create new opportunities for innovation in education and research
Our Current Network: Over 220 people
Over 300 ties among researchers. 5 Schools. 42 Departments, Labs, Centers, Initiatives, etc.
Leadership/ Governance

- Cynthia Barnhart, Director
- Rebecca Fearing, Assistant Director
  - fearing@mit.edu
- Ian Waitz, Chair Advisory Council
  - 4 schools, 8 departments
- Student involvement
- Opportunities for others to be involved...

- Advisory Council
  - Robert Armstrong - Energy Initiative, Chemical Engineering
  - Hari Balakrishnan – EECS, CSAIL
  - Moshe Ben-Akiva – CEE
  - Dara Entekhabi – Environmental Council, CEE
  - Steve Graves – Sloan School
  - John Hansman – AerøAstro
  - John Heywood – ME
  - Patrick Jaillet – CEE, EECS, LIDS
  - Yossi Sheffi – ESD
  - John Sterman – Sloan School
  - Lawrence Susskind – DUSP
  - Ian Waitz, AerøAstro
  - Chris Zegras – DUSP
Some Goals of Transportation @ MIT

- Build a vibrant intellectual community
  - Knit together the wide-ranging research already under way at the Institute to create new opportunities for innovation in education and research
  - Engage the local community
- Position MIT transportation research and education in the context of the sustainable accessibility challenge
  - Pursue large-scale research projects in US and elsewhere
    - Establish living labs (near and far, developed and developing world) to apply and test new processes, technologies and policies
FUTURE URBAN MOBILITY

The MIT Team
29 faculty and senior research staff
drawn from CEE, EECS, A/A,
Architecture, DUSP, the Sloan School,
the ORC, CSAIL, LIDS, Sustainable
Cities Lab, and CTL
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- Position MIT transportation research and education in the context of the accessibility challenge
  - Pursue large-scale research projects in US and elsewhere
    - Two living labs (near and far, developed and developing world) to apply and test new processes, technologies and policies
  - Develop coherent undergraduate/graduate educational offerings across existing Departments/Divisions/Centers
    - Over 100 "transportation" subjects currently
MIT’s Transportation Subjects

• Over 100 transportation-related subjects
  – Propulsion
  – Vehicles
  – Sources of Transportation Energy
  – Logistics and Supply Chain Management
  – Urban Transportation
  – Airlines
  – Transportation Autonomy
  – Transportation Networks
  – Transportation System Control
  – Traveler Behavior/ Transportation Economics
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- Position MIT transportation research and education in the context of the accessibility challenge
  - Pursue large-scale research projects in US and elsewhere
    - Two living labs (near and far, developed and developing world) to apply and test new processes, technologies and policies
  - Develop coherent undergraduate/graduate educational strategy and offerings across existing Departments/Divisions/Centers
    - Over 100 transportation subjects currently
    - Identify needs for educational offerings with sustainable transportation as a focus
    - Develop strategy for transportation education at undergraduate and graduate levels
- Educate change agents who
  - Leave MIT and populate government, industry and academia
  - **Advance knowledge for the development and implementation of a sustainable accessibility system for the betterment of humankind and the Earth’s ecosystems**
Fall 2009 Seminar Series

Tuesdays from 4:00-5:00 in 5-217

• 9/22: John Heywood, Mechanical Engineering. ”Opportunities for Reducing U.S. Transportation’s Petroleum Usage and GHG Emissions”.

• 9/29: Nigel Wilson, Civil and Environmental Engineering. ”The Role of Information Technology in Improving Transit Systems.”


• 10/20: Bill Mitchell, Media Lab. ”Mobility on Demand: Future of Transportation in Cities.”

• 10/27: Edgar Blanco, Center for Transportation and Logistics. ”Carbon and Energy Efficient Supply Chains.”

• 11/3: Li-Shiuan Peh, Electrical Engineering and Computer Science. ”Network-Driven Transportation.”

• 11/10: Carlo Ratti, Urban Studies and Planning. “SENSEable Cities.”

• 11/17: Marta Gonzalez, Civil and Environmental Engineering. ”Mobility Networks.”

• 12/1: Andreas Schulz, Sloan School of Management. ”Algorithmic Game Theory and Transportation: A Survey.”

• 12/8: Emilio Frazzoli, Aeronautics and Astronautics. ”Autonomous Vehicles and Urban Mobility.”