Society and the Built Environment
What Lies Ahead?

G. Wayne Clough
President, Georgia Institute of Technology

Vecellio Distinguished Lecture
Virginia Polytechnic Institute & State University
October 12, 2001
Today’s challenges require civil engineering and construction talent.
U.S. Construction Industry

656,450 firms
5.7 million employees
$860 billion in 2001
Virginia Construction Industry

19,537 firms
180,000 employees
$23.2 billion a year
The Growing Challenges

More…
• People
• Senior citizens
• Vehicles
• Air traffic
• Mass transit demand
• Aging infrastructure

Less…
• Water supply
• Irrigated acreage
• Security
• Public confidence
Can We Absorb 4 Billion More?

World Population

In billions

1810 1840 1870 1900 1930 1960 1990 2020 2050
American Centenarians*

*Persons who are at least 100 years old.
The Rivers Are Running Dry
“The world has to significantly increase water production while at the same time restoring the world’s rivers if we are to have any hope of meeting the water needs of 8 billion people while protecting the environment.”

Ismail Serageldin
World Commission on Water for the 21st Century
Infrastructure Fails to Keep Up
One million Americans become sick every year from tainted drinking water, attributed in part to the role of decaying infrastructure in encouraging the growth of bacteria.

Centers for Disease Control
Transportation Demands Speed Up
Boston’s new Central Artery will tunnel underneath the city, then rise up to cross the Charles River on two bridges with a total of 14 lanes.
Commercial Air Travel Takes Off
As highways and airports become more congested, the demand for mass transit is growing.
“There’s a new risk involved, not only the risk of terrorism directly, but the psychological risk among people who would use tall buildings.”

Henry Petroski
Civil Engineering Professor
Duke University
“More than any other time in history, mankind faces a crossroads: One path leads to despair and utter hopelessness. The other to total extinction. Let us pray we have the wisdom to choose correctly.”

Woody Allen
Side Effects
Armed with the right talent and technology, we can build the safe harbor humankind needs in the face of our growing challenges.
Technological Answers
Looking For Construction Solutions
• Genetically engineered micro-organisms will be used in the manufacture of high-strength building materials.

• Biotechnology disposal will eliminate plumbing pipes for waste.

Randall Vosbeck
Architectural Record, Dec 1999
Advanced Communications:
Do We Get IT?
Today’s Structures:
Intelligent as well as Good-Looking
Intelligent Transportation:

Digital cameras survey highways, sending a constant flow of images to a computer that manages an intelligent transportation system.
Today: Virtual reality with headgear and tactile gloves
Tomorrow: Virtual reality with neural implants
Nanotechnology and New Materials
Lighter, stronger bridge decking
Lacing Materials with Optical Sensors
“Smart” bridges represent a new era in highway safety as well as construction.
New Management Strategies
Streamlining the Construction Process
Design-build brings all parties together around a consensus vision for the project.
Taking Business Online
“We set up websites for our projects that include change orders, schedules – which are so important in retail construction – and shop drawings, so we can get many sets of eyes on them.”

Bill Pratt, Director of Business Operations
Walbridge Aldinger, Tampa
System on a Chip
Sustainability
“The construction industry worldwide is the largest exploiter of natural resources of any sector of the global economy, and a major generator of waste and pollution. Building accounts for one-third of the world’s wood harvest, two-fifths of its material and energy usage, and one-sixth of its fresh water withdrawals.”

Mike Kelly
Building Design Expert
Edinburgh, Scotland
“It isn’t easy being green.”

Kermit the Frog
Educating a New Construction Manager for a New Millennium
“There isn’t an engineering school out there that isn’t looking at its curriculum.”
Eleanor Baum, Dean
Cooper Union School of Engineering
Lifelong Learning Online
The point is to actually build something.
Teaching the Practice of Engineering
“I look forward to an America… which will protect the beauty of our natural environment, which will preserve the great old American houses and squares and parks of our national past, and which will build handsome and balanced cities for our future.”

John F. Kennedy
The first step toward achievement is to acknowledge the challenge.