INFRASTRUCTURE 2008

A Competitive Advantage

Urban Land Institute

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Quality In Everything We Do

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PAGES 20–21: Dubai's explosive growth has been matched by a steadfast commitment to infrastructure investment, undertaken by both private and public entities (Haider Yousuf/iStockphoto.com).

DESIGN AND COMPOSITION:
Marc Alain Meadows, Meadows Design Office, Inc.
www.mdomedia.com

AUTHOR/EDITOR

Jonathan D. Miller

ULI PRINCIPAL RESEARCHERS AND ADVISERS

Maureen McAvey
Executive Vice President
Infrastructure Initiatives

Robert Dunphy
Senior Fellow
Infrastructure and Transportation

Ellen McLean
Former Managing Director
Infrastructure Initiatives

Carl Koelbel
Research Associate

John Miller
Scholar in Residence

Daniel Glasson
Visiting Presidential Management Fellow

ERNST & YOUNG ADVISERS

Dale Anne Reiss
Global Director of Real Estate

Howard Roth
Americas Leader of Real Estate

Mike Lucki
Global Infrastructure Leader

Christopher Lawton
Partner, Infrastructure
Global Real Estate Center

Rick Sinkuler
Global Director of Markets
Global Real Estate Center

Jill Maguire
Marketing Manager
Global Real Estate Center

PRODUCTION STAFF

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At the Urban Land Institute (ULI), we recognize that today the need to invest in infrastructure is greater than ever. From highly visible roads, bridges, and public transit to water lines hidden under city streets, infrastructure plays a critical, but sometimes unrecognized role in our daily lives. Worldwide, in light of a surge in economic growth, developing countries like China, India, and Brazil are racing headlong to link burgeoning cities with roads and public transit—even as they add millions of new drivers to their roads. By contrast, in developed countries like the United States and those in western Europe, leaders face the challenge of reinvesting in venerable but aging 20th-century infrastructure at the same time as they launch new projects necessary to compete in the global economy.

Infrastructure investment is an acute need worldwide, but finding a way to fund projects is a major challenge. Facing weakness in the economy and escalating construction costs, the funding of new infrastructure projects may be met increasingly by public/private partnerships (PPPs) and other innovative financing agreements. Ranging from the Millau Viaduct in France—which graced the cover of last year's report—to Los Angeles's Alameda Rail Corridor, which speeds up the movement of freight from the city's critically important Long Beach port, some of the largest, most significant projects worldwide are being funded by PPPs.

Continuing the momentum begun by last year's global perspective, *Infrastructure 2008: A Competitive Advantage* closely examines international issues as well as domestic ones. To strengthen the analysis for the United States, ULI commissioned research that studies how well major urban areas are preparing to accommodate growth. The results underscore the challenges that many of these cities face if they hope to compete in a national and increasingly global market.

Leaders of all political stripes, many already galvanized by the tragic failure of the I-35 West bridge in Minneapolis, Minnesota, have their work cut out for them in the coming years if they are to help their cities stay competitive. And for political leaders and ULI members alike, their response to larger public policy debates—such as the one likely to surround the forthcoming Transportation Reauthorization Act—will also inevitably play a major role in shaping how communities develop and reinvent themselves over time.

This report, completed with the generous support of Ernst & Young, is based on wide-ranging research and interviews, and was informed by participants at ULI and Ernst & Young forums held in Paris, Hamburg, and Los Angeles. At these events, experts from diverse fields including finance, development, engineering, and the public sector examined current infrastructure challenges as well as future trends and opportunities.

The health and well-being of infrastructure are vitally important to the Urban Land Institute's mission to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. Infrastructure should be seen as an opportunity to advance this goal—at once a chance to maintain competitiveness, bolster economic growth, and provide the basis for building sustainable communities for the next century.

Richard M. Rosan, President
ULI Worldwide

Dale Anne Reiss, Global Director of Real Estate
Ernst & Young

Contents

Part One
Ante Up or Fall Behind

No matter how hard they may try, governments can't escape a basic fact: Infrastructure is absolutely necessary and very, very expensive. And in 2008, the stakes increase in many countries: "That fundamental need to invest in infrastructure is particularly great right now."

Confronted by social spending entitlements, defense priorities, and global warming concerns, many nations—and the United States in particular—are grappling with identifying and funding new infrastructure models suitable for 21st-century realities: significant demographic changes, high-stakes sustainability requirements, and increasingly competitive global markets. They must balance current fiscal realities against lessons that history has taught them—infrastructure fuels economies and enables prosperity. In fact, only countries that manage to invest heavily in infrastructure have attained and can sustain global leadership.

No coincidence, then, that during its ascendancy to superpower status from 1910 to 1970, the United States invested massively in its infrastructure: expanding ports, building extensive road systems, leading in airport design, erecting dams, laying down power grids, and constructing water treatment facilities. Japan moved to challenge the United States in world markets by stepping up infrastructure investment during the 1960s and 1970s, developing bullet trains, state-of-the-art highways, and signature airports and ports. Today, China spends about 9 percent of its gross domestic product (GDP) on infrastructure development, trying to compress what America achieved over the course of more than 50 years into just a couple of decades. India and Russia strive to follow suit in attempts to ramp up burgeoning industry. As population growth and urbanization in developing countries strain inadequate infrastructure, mature, industrialized economies—in western Europe, Canada, and Australia—try to retool and modernize aging systems and networks to remain competitive. The United States, meanwhile, suddenly must scramble to stay ahead.

Leaders often struggle with conceptualizing infrastructure plans—"These are long-term assets, which require long-term strategic thinking"*—and they resist projects with paybacks that take time to materialize, usually well after they leave office. They know people have difficulty connecting the dots that link multibillion-dollar freight rail corridors or high-speed rail lines to future economic gains, especially when those projects may bulldoze thousands of homes and take years to complete. Sometimes, road or tunnel projects register egregious overruns, raising public ire and distrust. Touted benefits expected for tomorrow somehow don't

* All quotes in this report are from interviews conducted with industry experts. The list of interviewees can be found on page 57.

count for much when the bills come due today. And elected officials reflexively retreat when constituents balk at higher taxes and near-term sacrifice.

Political will may emerge only when people face imminent reward or immediate risk—a bridge collapse or a burst levee, and maybe not even then. In more autocratic countries where citizens' views don't matter as much, governments have the luxury of pushing ahead with infrastructure initiatives, but only if they can pay for them. One way or another, people—taxpayers and/or users—ultimately bear the costs.

But the dilemma extends beyond the enormous funding gap—at least $170 billion annually in the United States alone. How do developed countries revamp suddenly obsolete land use and infrastructure models that produce too much congestion and pollution, and sap economic competitiveness? And how are growth patterns across all modes of transportation, especially in emerging economies, reconciled with political aspirations for climate change?

- The globalizing economy concentrates transport hubs at a shrinking number of international gateway centers where airports, ports, and road systems become overloaded bottlenecks.
- New global pathways simultaneously bypass secondary and tertiary regions, changing their relevance in transport schemes.
- India wants to build more highways and roads to energize its economy and support lifestyles for its mushrooming middle class, knowing its carbon footprint will grow by an unacceptably large degree. China already proceeds well down that road.
- America's fast-growing Sunbelt metropolitan areas—Atlanta, Dallas, Houston, and Phoenix, among others—choke in suburban car dependence and a history of disconnected regional development just as driving becomes increasingly expensive. These suburban agglomerations face a daunting challenge in expanding road capacity and retrofitting swaths of pedestrian-unfriendly subdivisions with mass transit.
- The housing downturn is also putting a dent in the U.S. state and local government budgets as slower home sales translate into lower permitting fees, real estate transfers, and taxes.

For now, short-term distress—the ongoing credit market crisis and U.S. economic travail—roils government centers and finance capitals, distracting from infrastructure imperatives. Governments ponder structuring more public/private partnerships to pay for needed projects and wonder how to deal with global warming. In the background, international money managers continue to raise billion-dollar funds to invest in infrastructure. As rising construction and material expenses give pause to budget hawks, bankers and money managers calculate strategies and investment gambits for maximal gains, concentrating on one-off projects and concessions, which can fit their risk/reward parameters. In America, many financial community stalwarts continue to argue against higher taxes, which they say would choke off entrepreneurial initiative and limit private investment returns, while some politicians want to jump-start the economy through public spending on infrastructure. China just powers ahead on its relentless path to urbanization and industrialization, hoping to show well during the Summer Olympics.

The status quo increasingly looks like a precarious option.

By all appearances, 2008 marks a critical juncture in a rapidly changing economic environment where new approaches to land use, infrastructure, and energy efficiency will likely determine and possibly reorder the next generation of winners and losers—countries, companies, investors, and people. The status quo increasingly looks like a precarious option—relying on existing networks and systems will only hamstring future growth and compromise sustainability.

The prosperity equation has not changed, just the urgency to take action: It's time to ante up or fall behind.

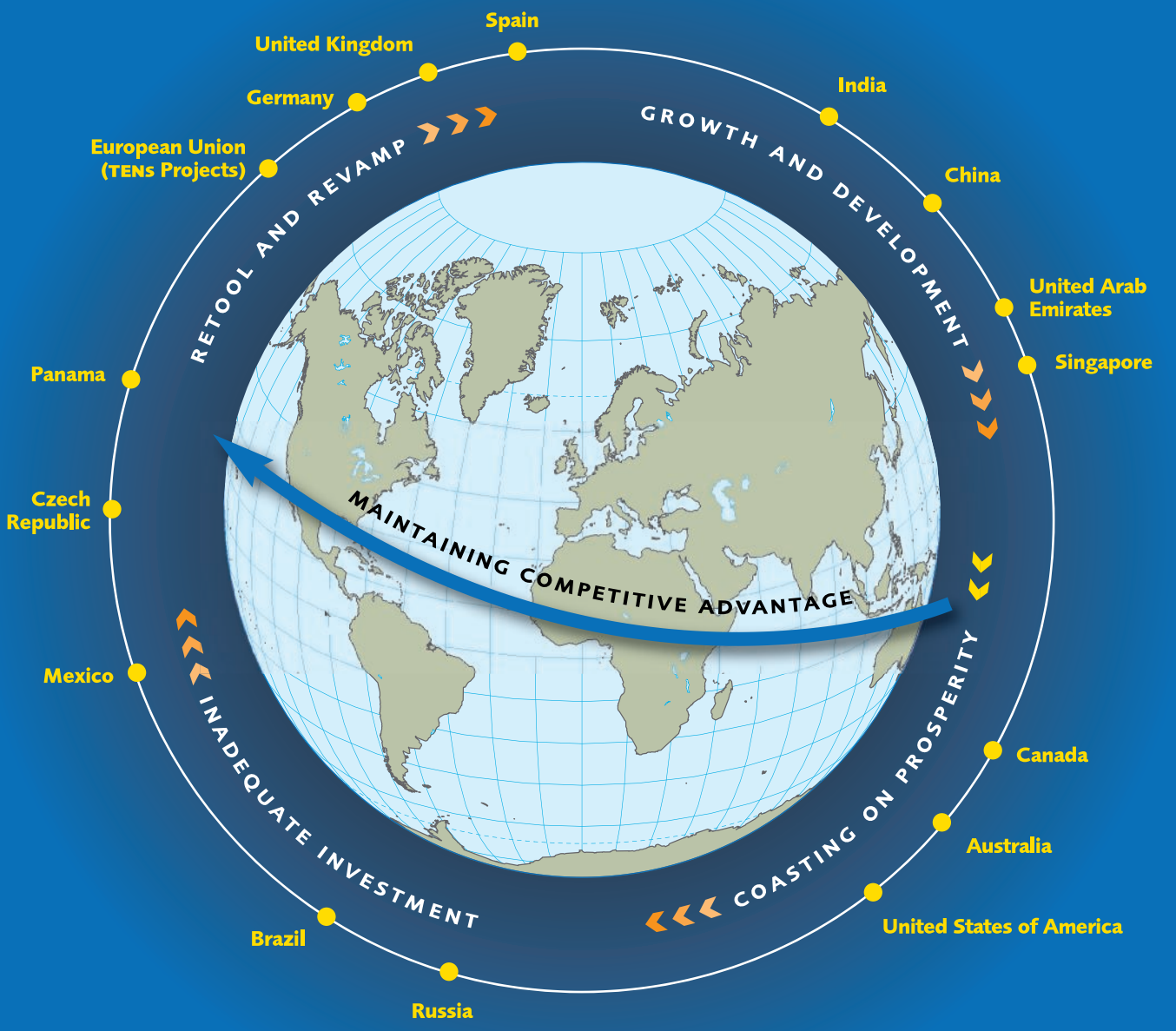
2008 MAJOR ISSUES AND TRENDS

Central Government Planning Provides an Edge

The realities of stiffening global economic competition steadily impel countries to adopt more nationally oriented infrastructure policies at the expense of local control over land use. For now, countries take varied top-down/bottom-up approaches, informed by political systems, tradition, and perceived urgency:

- China's national leaders dictate overall policy and actively review regional plans as the country transforms its urban landscapes into commercial and manufacturing centers.
- The European Union develops Trans-European Networks (TENs) to facilitate connections between member

FIGURE 1. Infrastructure life cycle: quality, condition, need.



Countries continuously need to invest in and retool infrastructure to remain economically competitive. Transport networks require constant maintenance—the average life span for road beds, bridges, and tunnels is about 50 years before they require extensive capital overhauls or even replacement. Increasing population, demographic shifts, changing technology, and new transport logistics force change. *Infrastructure 2008* identifies four stages of the infrastructure life cycle and positions where countries stand in terms of general infrastructure quality, condition, and level of investment.

Development and growth. A high percentage of GDP investment builds out innovative networks and systems to replace inadequate or nonexistent infrastructure, enhancing economic competitiveness.

Coasting on prosperity. In the post-development phase, government reduces relative infrastructure spending and reaps economic benefits from high-quality systems, focusing on maintenance over capital projects.

Inadequate investment. Insufficient funding for infrastructure maintenance and recapitalization leads to economic weakness from lowered productivity and efficiency. Costly breakdowns in systems occur and transport delays increase. Safety also may be compromised.

Reinvesting and revamping. Infrastructure spending increases to avoid or stem declines. New infrastructure is planned and built to sustain and improve economic competitiveness.

Europe is connecting its cities with a network of high-speed trains traveling at nearly 200 miles (322 km) per hour; above, trains from Germany (left) and France (right) at the Gare de l'Est station in Paris.

states' transportation routes—rails, roads, rivers, canals, and air service. The European Investment Bank reinforces cross-border and regional priorities through its underwriting and financing of projects.

- National governments in France and Spain impose strict oversight on transport plans and other infrastructure initiatives.

- Australia is more top-down than bottom-up. "People complain about it, but you can get more things done."

- U.K. ministers approve all major projects, "theoretically knitting together national infrastructure goals with local plans."

- India's states retain more control than the central government, impeding some national initiatives, but the Delhi government formulates a comprehensive plan for integrating airports, ports, and roads.

- The United States still leaves most infrastructure planning to state and local agencies, which interact through hundreds of metropolitan planning organizations. The process impedes concerted regional planning and disconnects local agendas from national priorities.

Although the U.S. Constitution puts land use under state and local control, American presidents have often spearheaded significant national infrastructure forays: Thomas Jefferson's canal and road building (1808), Teddy Roosevelt's power generation (1908), Franklin Roosevelt's New Deal (1930s), and Dwight Eisenhower's interstate highway system (1950s).

Since the advent of the interstates, the U.S. federal government has had "no real infrastructure agenda" beyond pushing off costs to the states. "While Asia is flying and Europe knows it needs to catch up," U.S. transportation policy "flounders." The country "behaves more like Eastern Bloc governments than a superpower." Congress wastes money on local "earmarks" for pet projects: "bridges to nowhere" and "one-off road extensions." Towns and counties compete with each other to subsidize Wal-Marts and sewer extensions. "Every Tom, Dick, and Harry town can have its own approach to land use—no wonder nothing fits." The pendulum for local control may have swung too far—NIMBY (not in my backyard) movements can too easily block solutions that benefit the majority. "Nobody wants to take [one] for the team anymore."

While some interviewees favor continued grass-roots control that harnesses local vision, the majority view argues for greater federal coordination and oversight to establish a transformative program linked to national competitiveness and sustainability. The federal government could establish critical transport corridors and coordinate state projects through funding carrot and sticks. Local governments would need to comply with regional plans tied to national priorities before receiving federal grants or taxing authority for their projects. Officials would need to target more high-value projects in gateways and major population centers, and resist spreading dollars geographically to areas off global pathways. Some outlier states may suffer funding cutbacks to shore up primary economic gateways, and certain communities may lose out, if they are in the path of new networks or cut off from them. But some out-of-the-way places

may benefit as new cargo and freight redistribution hubs.

"We can't employ a roughshod approach like China [has], but national systems like the interstates promoted movement of goods and people and changed the face of our economy. We need the next-generation plan."

Global Warming Convergence

Fears about climate change and the demand for green space help people around the world link sustainability concerns to land use decisions and needed funding for infrastructure improvements. "Carbon footprint issues galvanize attention, particularly about transportation, which is responsible for fully one-third of all emissions." People begin to understand how better-planned, higher-quality infrastructure helps the environment. Less congestion—from pricing schemes and new road systems—not only speeds travel, but also reduces pollutants from idling engines. Denser, pedestrian-friendly communities near mass transit and shopping amenities decrease car dependence. Rail and subway service produce lower carbon footprints than automobiles do. Public green space in urban and suburban environments becomes more coveted. "People begin to put two and two together."

Changing Urban Land Use/Infrastructure Models

Congestion, pollution, and global economic demands force planners to rethink accepted land use models that led to rampant suburban growth during the last half century. From Shanghai and Tokyo to London, Paris, and New York, expanding urban megacenters have concentrated population and commerce around desirable 24-hour cities with major gateway international airports, serving global business and government. But these urban cores and their more haphazardly developed suburbs can't handle the upsurge in traffic volumes. Growth trends also portend gridlock in suburban agglomerations located throughout the U.S. Sunbelt. Public parks and watersheds, meanwhile, have been sacrificed in many suburban expanses for backyards and lawns. Competition among cities for water resources strains supplies, particularly in rapidly developing regions (China, Turkey, and U.S. Southeast and Southwest). New concepts to address these issues include the following:

- China uses cluster development—integrating mass transit, rail, roads, and green space—in a multimodal transport "spiderweb" encompassing urban nodes around its major cities. (See sidebar on page 9.)

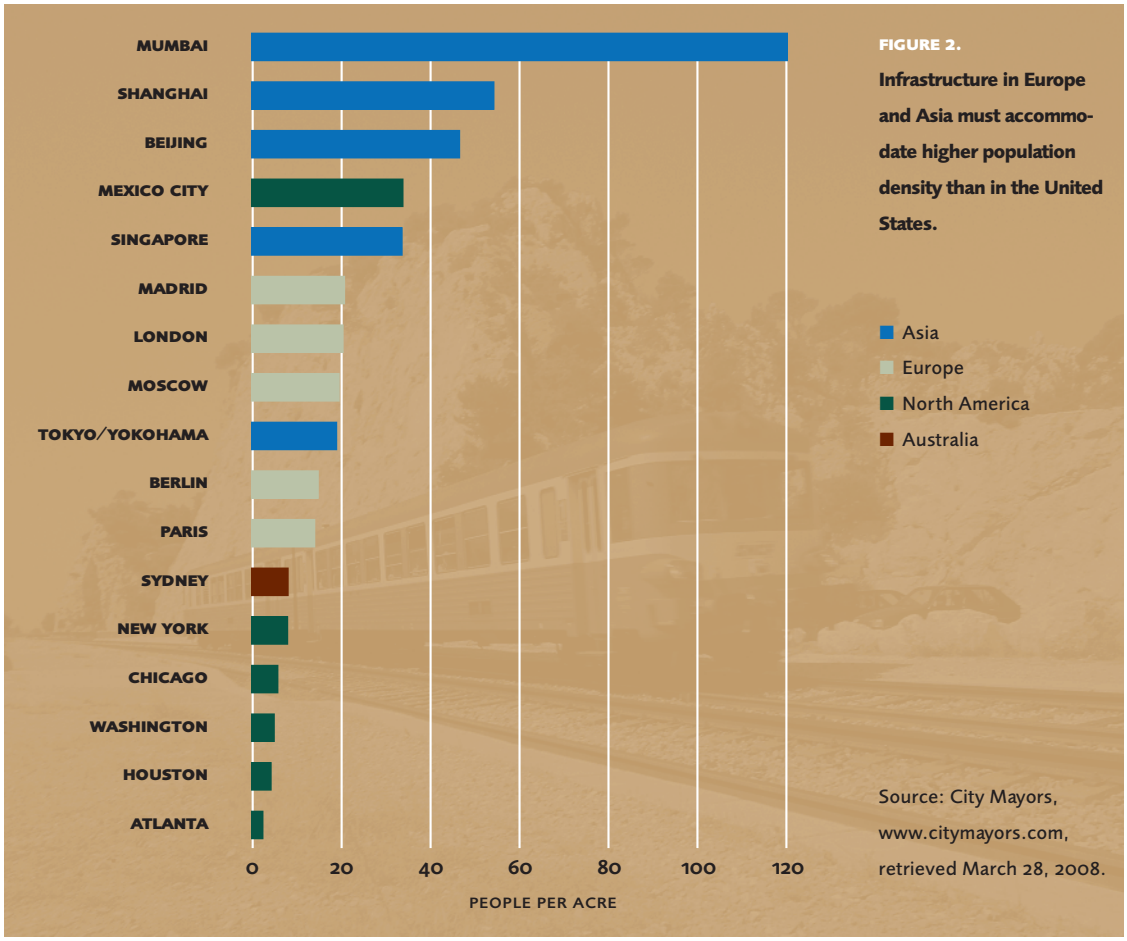


FIGURE 2.
Infrastructure in Europe and Asia must accommodate higher population density than in the United States.

Source: City Mayors, www.citymayors.com, retrieved March 28, 2008.

Lessons from China

Compared to the political hurdles that leaders in democracies face, China's authoritarian rulers have had an easier time shaping land use and infrastructure policy as the country builds out its cities and fashions an emerging economic powerhouse. This phenomenal transformation and the redistribution of hundreds of millions of people have whipsawed a nation used to peremptory dislocation, and the country's unprecedented urbanization has overcrowded cities, including districts in key global gateways like Shanghai and Beijing. Wrenching change has also led to severe pollution, power deficiencies, and water shortages throughout the country. But despite missteps and some harsh outcomes, China's stunning modernization also offers regional planning and infrastructure solutions for other countries to consider and possibly adapt.

Since the end of the Cultural Revolution in 1978, the number of people living in China's cities has tripled to more than 560 million, increasing by 60 million in just two years from 2003 to 2005. The rapid conversion from a rural to urban-based economy has tested regional planning constructs and infrastructure requirements, precipitating new approaches and models that appropriately integrate housing, transport networks, parks, and commercial districts. The recent Chinese experience incubates many new useful ideas for constructively integrating land use and infrastructure to meet future demands.

China's leaders pushed regional officials and local planners to find creative strategies for improving quality of life, moving people efficiently between work and home, bettering living standards, and providing amenities expected for "world-class" business centers. A disciplined process for devising 20-year plans conceives "spiderweb" networks of subways, light rail, highways, and roads to link satellite cities built around primary urban cores. The country concentrates on developing three main urban clusters—the Yangtze River Delta (Shanghai), the Pearl River Delta (Guangzhou and Shenzhen), and the Bohai Sea economic belt (Beijing and Tianjin)—and implements plans to build out eight other regional areas.

In 1999, Shanghai introduced its 20-year "1-9-6-6" plan, outlining a comprehensive scheme for redeveloping the entire metropolitan region, which currently serves 21 million residents and temporary workers. Nine million people live in the center city alone. The plan calls for the core city to be surrounded by nine satellite cities (400,000 to 1 million residents each), 60 towns (50,000 to 100,000 people each), and 600 villages (approximately 2,000 each). Planners' objectives include:

- Separating industries into rings around the city—service businesses in the core, high tech in first ring, and heavy manufacturing outside.
- Building extensive interconnected transport networks comprising:
  - Expressways with ten axes and three ring roads;
  - 17 subway lines (11 scheduled for completion by 2010);
  - Six light-rail lines and four high-speed rail lines;
  - A new deepwater port, the world's largest;
  - A new high-speed intercity rail line to Beijing; and
  - Expansion of the Maglev high-speed rail line from Pudong International Airport.
- Positioning all towns within 15 minutes of expressways.
- Enabling maximum 30-minute commutes between the core and satellite cities.
- Ensuring that travel times do not exceed an hour between any two points within the municipality.
- Providing parks and green areas within 1,640 feet (500 m) of all residences, and covering 30 percent of the city with green space.

Shanghai's plan exemplifies approaches taken in China's cities, which attempt to augment quality of life for residents while supercharging industrial growth. As incomes rise and the Chinese gravitate to car ownership, regional planners balance road construction with significant investments in mass transit to connect points within the vast urban clusters. Seven cities now have subways, and more than 3,125 miles (5,000 km) of mass transit lines are planned throughout the country. For comparison's sake, New York's subway system is 246 miles (395 km) and London's comprises 255 miles (408 km).

Nevertheless, the extreme velocity of China's urban expansion and growing affinity for cars increase road congestion and carbon emissions. Shanghai discourages car ownership by auctioning off expensive licenses ($5,500 each). Beijing recently completed its sixth ring road. Manufacturing plants pushed to the edge of clusters, meanwhile, spew particulates and other pollution, clouding some cities in smog reminiscent of 19th-century London or Pittsburgh at the height of its steel production. The fast pace of designing and building vast road and transit systems also raises questions about the integrity and construction quality of projects. From all appearances, infrastructure quality rates as state of the art, but record snows prior to the 2008 Chinese New Year buckled some factory buildings and short-circuited train service throughout the country, triggering concerns. A collapse of a bridge under construction killed 28 workers in August 2007. Other problems persist. Per-capita water resources stand at less than one-quarter the world average—660 cities in China are short of water, and the country's massive population keeps increasing.

Planning may currently exceed execution, but planning is strong and execution and expertise could catch up quickly.

- Large seaports near global gateways (Los Angeles, San Francisco, Seattle, New York/New Jersey) will require expanded rail and truck corridors dedicated to moving freight and avoiding interference with local traffic. Some existing communities will need to make room for rights-of-way. New distribution centers, including cargo airports and rail depots, will be built outside megacities to facilitate transport to final destinations. Rails take an increasing share of freight volume away from trucks, especially on long-haul routes.
- Infill suburbs will urbanize, featuring more vertical commercial nodes served by mass transit. Planners will zone more mixed-use retail/apartment complexes around transit stations and look to reclaim land for public parks and recreation space.

- Congestion pricing—used in London, Stockholm, Oslo, and Singapore and recently introduced in Milan—will be adopted in more cities to help regulate and reduce traffic flows in urban cores.
- American cities eventually will follow the lead of European and Asian countries, building intercity high-speed rail networks that also link international airports.
- Many high-growth cities—particularly in arid regions—will need to impose water restrictions, limiting suburban expansion and ratcheting up development costs.

Direct User Fees Gain Traction

"The current driving model does not reflect the true cost of actual use and insulates people from understanding the costs of travel choices," a user fee proponent contends.

A movement builds behind a solution for funding new roads and transit, easing road congestion and reducing car emissions. The initiative depends on new technologies and should influence behavior change. It's called user fees. But these aren't your old-fashioned tolls, imposed at a uniform rate and limited to a few major roads. Twenty-first-century user fees can entail the use of transponder technologies to track driving by satellite and charge not only by the mile, but also by how, when, and where you drive. The idea is you pay more for traveling on congested roads during rush hour; driving heavier vehicles, which cause more road wear and tear; owning less fuel-efficient, higher-emissions cars; and going longer distances.

Congestion pricing is one form of user fee. London not only charges cars for entering the center city during business hours, but also now assesses an extra levy on high-polluting trucks that enter the zone. The commonwealth of Virginia plans Capital Beltway high-occupancy toll (HOT) lanes, which charge drivers for using special lanes to avoid traffic backups. The state of California also institutes HOT lane fees on some roads and some New York bridges and tunnels have imposed rush-hour surcharges. Germany institutes user fees on a new truck corridor, and Texas plans to follow suit with a truck-only toll road.

Available transponder technologies built into cars could take user fees to an entirely different level—factoring in the expense of building and maintaining roads as well as pollution-related costs. "People will be able to make informed decisions and adjust behaviors accordingly." Driving would become more expensive for people who do not plan trips or who buy less fuel-efficient larger cars. "The current driving model does not reflect the true cost of actual use and insulates people from understanding the costs of travel choices," a user fee proponent contends. "The user fee model leads to smarter, more judicious use, more travel at off-peak times, and over the long term changes how and where people choose to work and live, creating greater efficiencies."

The alternatives to imposing modern user fees are not appealing:

- Suffering "the drag on economic activity and living standards" by letting infrastructure conditions continue to deteriorate;
- Saddling future generations with huge debt service liabilities in financing new systems through bond issues, probably leading to future imposition of even higher user fees or sales/income taxes; or
- Raising gas taxes substantially—by as much as $1 a gallon in the United States.

The U.S. Congress must address raising gas taxes and/or implementing user fees by 2009, the year when the Federal Highway Trust Fund sunsets and faces impending insolvency. Lawmakers have been loath to raise gas taxes and user fees may be a difficult sell to constituents, who abhor any measures that increase driving costs and who feel pinched by rising pump prices. Under any circumstances, a test of political courage looms.

User fee opponents decry "Big Brother" technology, which could track movements and invade privacy. Others call user fees regressive, putting poor people at a disadvantage—unable to pay for the fastest route, they'll suffer in traffic. Advocates argue that the technology can be devised to reduce intrusiveness and suggest lower-income people may gain economic benefits from using HOT lanes. "The gardener may be able to reach more customers, and the working mom may get home faster and be able to reduce daycare expenses." Arguably, car dependence itself is regressive—if people can walk and use mass transit to get around, they avoid a myriad of car-related costs, which certainly favors the poor.

The auto and oil industries will likely oppose user fees—which could diminish buyer appetites for higher-margin large vehicles and slacken growth in gasoline sales from improved fuel efficiencies and reduced car travel. Truckers also will rebel—they have had a free ride on interstates for years despite their rigs' outsized contribution to roadbed deterioration.

Expect Congress to lift restrictions on states from tolling interstates and to set the framework for funding and establishing more high-tech user fee systems. In the meantime, the legislature will probably vote to raise the federal gas tax for the first time since 1993. A national commission has recommended raising the federal gas tax by 40 cents a gallon over five years, up from the current tax of only 18 cents. A combination of gas tax increases and new user fees would go a long way toward filling the growing U.S. transport infrastructure funding gap.

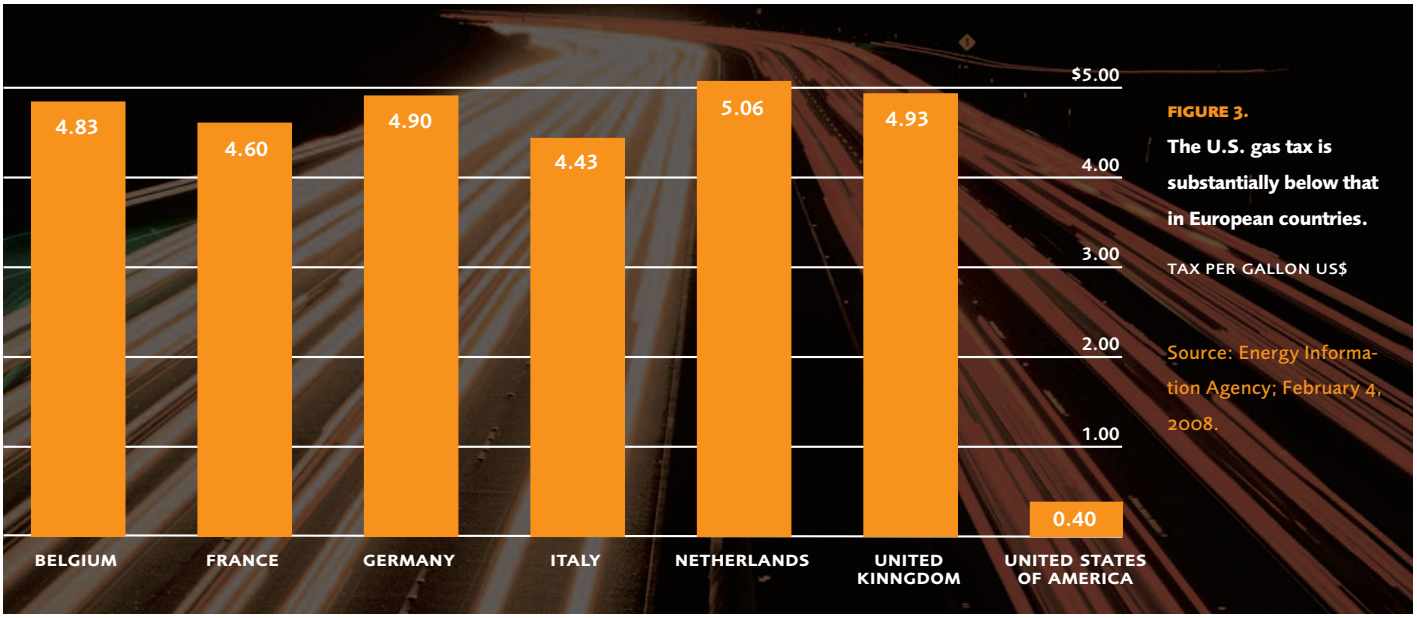


FIGURE 3.
The U.S. gas tax is substantially below that in European countries.

TAX PER GALLON US$

Source: Energy Information Agency; February 4, 2008.

America Heads Toward Decline

"America needs to wake up" about the relatively dire state of its infrastructure. Given all its resources, "the United States is scarily behind where an industrialized nation should be and loses further ground to competitors." While China builds "state-of-the-art" systems and the European Union strives for greater "connectivity," interviewees say that "America has been resting on its laurels." Since the 1970s, the country has "coasted, not planning or investing nearly enough." Government infrastructure spending has declined from about 3 percent of GDP in 1960 to about 2.4 percent today. For most of the 1980s and 1990s, budget levels were even lower, hovering under 2.35 percent of GDP. The federal government, meanwhile, has dramatically reduced its share of spending, pushing more of the burden on cash-strapped states and local governments, and taking less of a role in orienting long-term policy. "America heads for a crisis in the next ten years if nothing is done." Despite alarming infrastructure failures in Minneapolis and New Orleans, government action is fleeting and people quickly lose interest. Besides critical safety concerns—the U.S. Army Corps of Engineers has identified 122 high-risk levees in danger of failure, including the system that protects California's water supply—insidious "congestion grows worse, slowly grinding down the economy."

- Since 1980, vehicle miles traveled in the United States have increased 95 percent, but road capacity has increased only 4 percent. Backups and slowdowns on highways have skyrocketed, precipitating excruciating average annual delays for drivers in metropolitan areas: Los Angeles, 72 hours in 2005/45 hours in 1982; Atlanta, 60/26; San Francisco, 60/24; Washington, D.C., 60/16; Dallas, 58/10; Houston, 56/30; Phoenix, 48/35; Miami, 50/16; Chicago, 46/15; and New York, 46/12. Approximately 75 percent of trips are not related to work commutes—in many regions, people depend on cars to get around to do almost everything. Traffic congestion costs motorists $78 billion a year in wasted fuel and lost time, according to studies.

- About 24 percent of the country's major roads are in poor to mediocre condition, and 25.4 percent of bridges are structurally deficient or obsolete. About 14,000 fatalities each year are blamed on road conditions. A national commission recommends boosting annual funding on transport infrastructure from about $86 billion currently to $241 billion by 2020 in order to address unmet maintenance and capital needs.

- Flight delays cost at least $15 billion annually in lost productivity, according to the U.S. Department of Transportation. At the nation's two busiest airports in 2007, passengers respectively lost the equivalent of 3,500 days on late flights (Atlanta Hartsfield) and nearly 5,000 days (Chicago O'Hare). Passengers using New York's three airports suffered through 3.9 million more hours of takeoff delays in 2007 than they did a decade earlier. Flights often back up at primary business gateways, snarling the entire national system, and air traffic controllers must rely on decades-old radar technologies to space planes, limiting capacity in flight corridors. The country needs three to four new airports—passenger demand could increase by more than 35 percent from 2005 to 2015.

- Swelling container traffic from China and other Pacific Rim manufacturers crams seaports located in dense coastal

FIGURE 4.

The state and local share of infrastructure has increased while overall spending as a percentage of GDP has decreased.

INFRASTRUCTURE SPENDING AS PERCENTAGE OF GDP, 1960–2004

Source: Congressional Budget Office, *Trends in Public Spending on Transportation and Water Infrastructure 1956–2004*, August 2007.

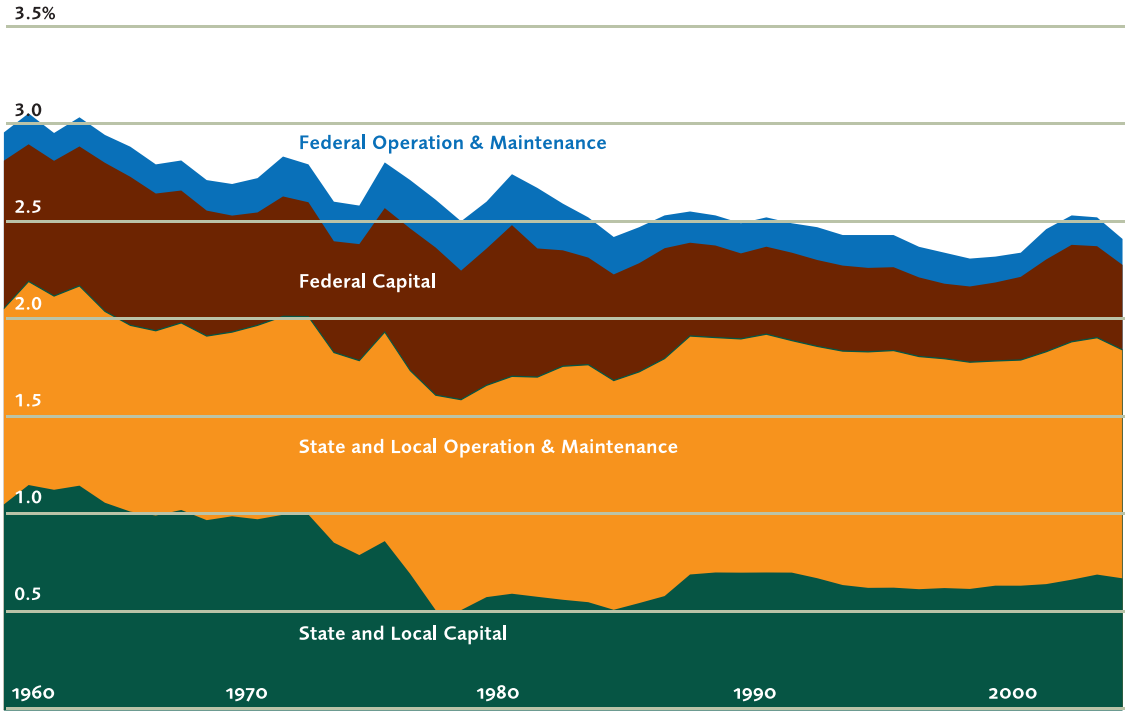


FIGURE 5.

The world's ten largest ports.

TWENTY-FOOT EQUIVALENT UNITS (TEUS) (MILLIONS)

- China
- Europe
- Middle East
- Pacific Rim
- United States of America

Source: Containerization International.

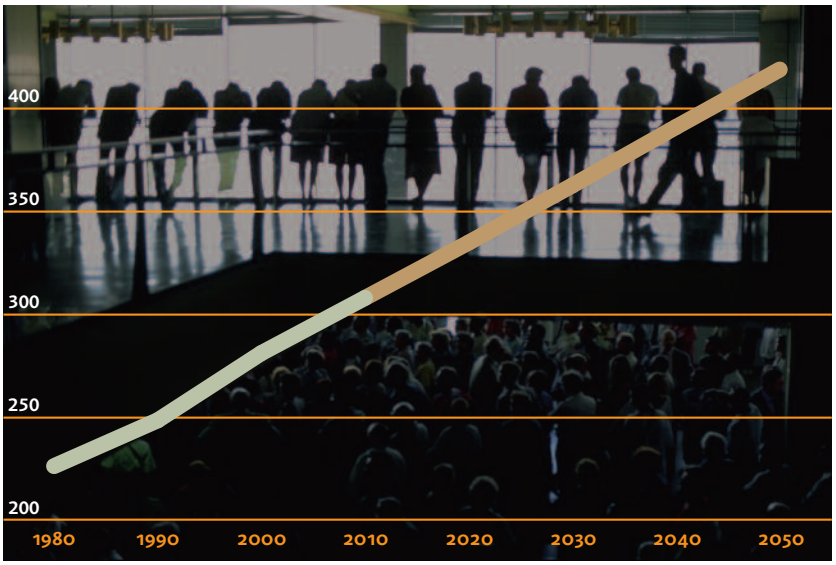


FIGURE 6.

Expected U.S. population growth through 2050.

MILLIONS OF PEOPLE

Actual

Projected

Source: U.S. Census Bureau.

population centers. "Our freight transport system serves the old export-based manufacturing economy, when we have morphed into an import-based consumer economy." In fact, the import share of GDP has tripled since 1970, while export share has only doubled. Import volumes from China could double again by 2015. Trucks and freight trains clog highways and rails leaving West Coast and East Coast hubs, as shipments begin to outstrip transportation capacity.

▸ Without a dedicated rail corridor, the country's only "high-speed" passenger trains must operate well below maximum speeds on their D.C.-to-Boston routes. Other intercity, high-speed rail initiatives find no support in Congress—they're viewed as too expensive.

By 2040, forecasters add 100 million to the U.S. population, concentrated in and around already crowded coastal gateways and Sunbelt metropolitan areas. "We must make investments today to accommodate this growth and set the stage for the rest of the century," says a leading planning consultant. "It's suffering some heartburn today versus needing life-saving resuscitation later."

Notably, infrastructure gets some lip service in the 2008 presidential campaign. But no candidate has leveled about the trillion-dollar budget-shattering realities of repair and regeneration, especially with the Iraq War, health care costs, and Social Security viability more prominent in voters' minds. So far, the talk centers on using relatively modest infrastructure spending to stimulate the shaky economy. More concerted action takes place at the state and local levels, where California Governor Arnold Schwarzenegger, Pennsylvania Governor Ed Rendell, and New York City Mayor Michael Bloomberg together lobby for increased federal spending to help relieve gridlock and avert calamities. They focus on increasing user fees, implementing congestion pricing, expanding mass transit, and sourcing private funding.

Some interviewees contend that America must suffer "more infrastructure failures," "funding cutoffs," and congestion snafus before the public forces action and willingly accepts the cost. "Not enough Americans go overseas" (only about 20 percent have passports) to realize "how medieval" their airports, rails, and roads look compared with those in countries in Europe and Asia. "They assume they have the best, but that's no longer true."

Overcoming Sticker Shock

User fees and public/private partnership structures may have limits when it comes to funding extremely expensive "game-changing" projects like the $15 billion Chunnel or Boston's "Big Dig." These large-scale infrastructure initiatives can have significant-enough economic impact to justify "a general taxpayer burden," relieving the initial users of bearing full costs. "But they don't fit typical investment expectations for returns, and returns don't necessarily register from the infrastructure itself." (See sidebar, page 47.)

A veritable political piñata, the Big Dig just completed construction after a nearly 20-year tunnel excavation and redevelopment, marked by delays, shortfalls, and engineering lapses. At least for now, the $15 billion project's reputation as a red-ink sump mars emerging benefits. Trip times to Logan Airport and in and around Boston's financial district have been reduced substantially and green space opens onto the harbor, replacing concrete overpasses. The project offers the potential for substantially increasing the value and viability of the city's North End and Wharf District, and has helped spur construction of a new convention center.

With heavy I-93 traffic routed underground, Boston's costly "Big Dig"—pictured in 1991 (left) and 2007 (right)—is reconnecting the city's downtown to the waterfront and opening land on the "lid" for development.

America may need to front-load and subsidize funding for a range of necessary big-ticket multibillion-dollar projects including intercity high-speed rail, new airports, transit systems, and rail/truck freight corridors from key seaports. "Overall public objectives need to be kept primary," says an interviewee, "especially in the case of mass transit, where it is highly appropriate to fund and subsidize as a general burden, while roads and highways can be linked to more specific users."

Shifting the Cost of Living Equation

Over four decades, the combination of cheap driving and inexpensive land accelerated sprawl development in the United States. Buyers could get better value for suburban homes in outlying districts, and relatively inexpensive gasoline fueled mobility to work, shopping, and recreation over sometimes long distances. But pricey gasoline and new user fees make driving more expensive and may tip the value equation in favor of infill locations and less driving. Working families spend an average of 60 percent of their incomes on housing and transportation. In high-cost cities like San Francisco and New York, they spend more on housing. But those cities also have excellent mass transit. Families don't need as many cars, so they have fewer auto-related expenses—loan servicing, maintenance, and insurance average about $10,000 per vehicle annually. Now, rising prices at the pump increase transportation expenses at a faster rate than housing costs, just as increasing congestion results in productivity declines and lower fuel efficiency. Heating and air-conditioning bills for larger suburban homes increase, too. In addition, many suburban roads—originally subsidized by state and federal grants—have been turned over to local governments, which must raise taxes to maintain them. Suddenly, more expensive infill homes or apartments closer to subways, light rail, and bus lines may look like better values.

Railroad Renaissance: All Aboard

The 20th century marked a transport revolution: two inventions—the automobile and the airplane—became dominant travel modes, thoroughly eclipsing railroads, especially in America. Trucks account for more than 80 percent of market share for hauling freight today, making direct door-to-door deliveries. Passenger trains disappear except for Boston-to-Washington express service; a handful of far-flung Amtrak national routes; and commuter lines serving

FIGURE 7.
Working families* spend a high percentage of their income on housing in high-transit cities; they spend more on transportation in low-transit cities.

New York, Philadelphia, and Chicago as well as limited service in a handful of other cities.

Now, freight train haulers begin a comeback in the United States, tapping into the demand to move across the country skyrocketing volumes of container shipments from China and other Asian exporters. Railroads change strategy to meet the times: serving importers by moving finished goods to consumers rather than delivering raw materials to heartland factories and then moving manufactured products toward the coasts. They undercut trucks on pricing—higher gasoline costs hurt truckers—and speed deliveries by enhancing their networks for the first time in decades. Since 2000, railroads have spent $10 billion to upgrade tracks, facilities, and equipment, and have budgeted another $12 billion for additional expansions and improvements. New, centrally located Midwest distribution depots for unloading and reloading goods open or are planned for Kansas City, Columbus, and central Illinois.

But recent private investment represents a small share of the estimated $175 billion required to accommodate anticipated increases in total freight carried over the next 20 years. Some states—Virginia and Texas—help fund rail strategies and California attracted federal dollars to build the Alameda rail corridor (see sidebar on page 16). Still, no coordinated federal program exists to formulate a national approach to freight hauling, integrating rail and truck routes from seaports and airports, and working with private industry and local governments to augment solutions. Such initiatives might not only help relieve highway congestion, especially in metropolitan areas, but also lower carbon footprints since trains are more fuel efficient than trucks. Truckers, meanwhile, have not had to pay a fair share for roads they neither build nor maintain. Higher gas taxes and/or truck user fees might help level the playing field for railroads.

High-speed intercity rail service could also help reduce car congestion and speed travel in certain regions with closely bunched urban centers—in Florida, Texas, and the Northeast and along the West Coast. Many congressmen and senators will need to swallow hard to support funding that leaves their states out, but helps the nation's economic gateways.

Construction Costs and Credit Crisis

The credit crunch and skyrocketing construction costs compromise infrastructure budgets and delay implementation of new initiatives. Project financing becomes more expensive and difficult to transact while concrete, steel, and other

Bottlenecked Ports

America's freight transport infrastructure supports a manufacturing/agribusiness-centered economy, shipping an array of products and crops from heartland factories and farms. The country's vast network of rails and roads radiates outward to cities and towns and eventually to coastal ports, primed to facilitate exports to offshore markets. But this successful 20th-century model no longer accommodates the country's emerging 21st-century realities and needs. The United States has become a net importer and midwestern regions slowly suffer inexorable declines. Today goods reverse course, transported from overseas factories to U.S. ocean ports and then near and far across the country into population centers along interstates and rail lines. "We have outsourced agriculture and manufacturing, and the funnel for moving freight has inverted."

The consequences of this true paradigm shift could soon overwhelm major coastal metropolitan areas already coping with insufferable road congestion and inadequate infrastructure to meet growing populations. Based on import projections, goods moving through already constricted ports are forecast to double or even triple by 2025. U.S. harbor destinations have transformed into crowded bottlenecks for ships, trucks, and trains, creating more traffic jams, stressing already deteriorating highway and rail systems, and escalating levels of pollution.

The nation's largest port (and the world's fifth largest)—Los Angeles/Long Beach—faces substantial challenges, straining under the onslaught of vessels entering its expansive deepwater harbor from the Pacific Rim. Not only is this southern California gateway most proximate for ships tracking from Far East manufacturing juggernauts China, Korea, and Singapore, but L.A./Long Beach also spills into one of America's most prodigious and attractive regional consumer markets. Port traffic has almost quintupled since the early 1980s. Today, the port handles 60 percent of all Asian imports and more than 40 percent of all container ships entering the United States. About 23 percent of the nation's exports, meanwhile, leave through L.A./Long Beach, but that number only represents 16 percent of its total trade volume. The ratio of 3.5-to-1 imports to exports also requires vast swaths of land to store empty containers, waiting for shipment back home.

Completion in 2005 of the highly touted 22-mile (35-km), tolled Alameda rail corridor facilitates off-loading of containers from ships directly onto trains, reducing the need to truck containers to intermediary rail heads that worsened congestion on Los Angeles's infamously jammed local streets and highways. An enlightened engineering feat, Alameda also helps speed trains with triple-decked containers in and out of the L.A. area without impeding road traffic at grade crossings. But in hindsight, Alameda may be more of a $2.4 billion bandage than a solution. Approximately 16,000 trucks still enter and leave the port weekly, a staggering number that will only grow as anticipated cargo shipments multiply over the next 20 years. As soon as possible, new centralized rail terminals need to be constructed to help increase rail capacity and eliminate inefficient trans-loading and local truck trips. New truck-only corridors must be built to speed long haulers out of the region and keep them off local streets.

But land for new terminals and freight corridors is scarce—sprawling suburban growth surrounds the port and gnaws into industrial sites. Established communities understandably balk at contemplated rail and highway projects that would threaten homes and businesses, while other neighborhoods along main truck routes complain about deleterious air quality and reports of higher cancer rates connected to increased volumes of truck exhaust. In southern California, port activities and noisome truckers contribute 45 percent of the region's sulphur oxides and 12 percent of diesel particulates.

Inevitably, some people face dislocation and lowered property values as the port and distribution infrastructure build out to accommodate anticipated needs. The nation's economy will depend on it. Any retooling will cost billions of dollars, requiring some combination of expensive new bond issues, increases in user fees, and higher import taxes on goods that eventually will be passed on to consumers. While state and local politicians and various government agencies wring their hands and try to hash out compromises, L.A./Long Beach port officials make a small start, barring all pre-2007 model, high-polluting trucks by 2013.

Ultimately, other U.S. ports will need to help relieve the congestion at L.A./Long Beach. But geographic and environmental constraints may present difficult hurdles. Only a part of New York Harbor on the East Coast and Seattle/Tacoma on the West Coast can handle larger-draft Panamax ships (more than 55 feet/16.7 m). It's a close fit at Oakland, which can accommodate up to 48 feet (14.63 m), enough depth for larger boats not traveling at maximum draft. The harbors of Houston, Savannah, and Charleston are too shallow for bigger ships. Norfolk, meanwhile, has potential once its harbor is dredged. But most of these cities confront the same slew of problems strangling southern California. Without revamped truck and rail lines into and out of these ports, quality of life will suffer and the movement of goods will be hampered, raising shipping costs and lowering productivity.

Transport engineers and logistics pros talk about constructing ports in Mexico and using rail links to new distribution hubs in less densely populated places in the Southwest or even the Midwest. Built-up residential areas in northern New Jersey and around Seattle face similar Hobson's-choice conundrums confronting cities in southern California. Savannah and Charleston want to increase their market share, "but should be careful what they hope for." Port expansions may help delay national freight capacity constraints, but fundamental problems still persist. According to one interviewee, "The sink is overflowing, but we really need to redesign the entire kitchen."

materials ratchet up in price. China's building boom continues to increase demand for construction supplies, driving up costs worldwide. Overall, construction material costs jumped 8 percent in 2007. In the United States, a weakening dollar has less purchasing power with offshore suppliers, exacerbating further potential budget gaps. Denver's light-rail expansion suddenly pencils out at $6.2 billion, up from earlier $4.7 billion forecasts. In addition, the troubled American economy has engendered reduced tax flows into state and local coffers, leading to funding cutbacks. Governors and mayors start to slash budgets, tabling projects in the short term.

Some politicians talk about infrastructure investment as a way to ward off recessionary impacts. If the unemployment rate escalates and private industry stalls out, infrastructure spending could provide some economic stimulus

and a plentiful source of jobs, especially in the construction trades. About 47,500 jobs are generated for each $1 billion spent on highway construction in the United States. If the country invested the full $1.6 trillion required over five years to meet current infrastructure needs, about 5 million jobs would be created.

Evolution of Public/Private Partnerships

The momentum behind public/private partnerships hits some speed bumps in the United States as state governments wrestle with figuring out proper structures, covenants, and procurement practices. States seem reluctant to follow the Chicago Skyway/Indiana Tollway model—giving up toll concessions for large upfront lump sum payments and long-term leases. They look for more profit-sharing arrangements and controls over private operators. States want private partners to take on high-risk development projects, while the private funds prefer to cherry-pick existing toll roads, tunnels, and bridges with proven cash flows. In Europe, the United Kingdom remains the leader in public/private partnerships, while other countries develop regulatory platforms to tap into private funding sources more efficiently. China creates a hybrid financing model—the national and regional governments join private companies and investors as shareholders in entities building and operating infrastructure projects (see Part 4).

Infrastructure Funds Attract More Investors

Investment banks and institutional managers continue to raise large sums in infrastructure funds, upwards of $100 billion to $150 billion, which when leveraged can assume $400 billion to $500 billion in buying power. These funds invest in the gamut of infrastructure-related assets—toll roads, water treatment facilities, telecom, airports, pipelines, power plants, and government buildings. Investment managers look for both income-oriented investment returns on existing cash-flowing assets and for opportunistic returns on riskier greenfield development projects. Since stocks and fixed-income investments stagger in credit-crunched markets, pension funds see infrastructure as a new alternative

FIGURE 8.
Highway construction costs have outpaced costs of all other finished goods.

INDEXED IN JANUARY 1998

Source: Bureau of Labor Statistics *Producer Price Index for Highway and Street Construction and All Finished Goods.*

investment safe haven and a good hedge against inflation. So-called core-plus funds market 10 to 12 percent annualized returns while the opportunity funds target about 19 percent. "The volatility in credit and equity markets has lowered pricing worldwide, but investors can't leverage up returns as much." Overall, fund managers see a silver lining—they can acquire good assets at better prices and anticipate refinancing when the economy improves and spreads narrow. Recent American skittishness pushes managers back into Europe and toward Asia, hunting for deals. India and other emerging markets beckon, but investors move tentatively in the face of concerns about transparency, bureaucratic dysfunction, and corruption.

MOVING AHEAD / BEST PRACTICES

The following list of initiatives and best practices derives from interviews and ULI forums:

The Priorities

Focus on deferred maintenance. Politicians like ribbon cuttings for new projects, but "we can save money by making sure existing infrastructure doesn't fall apart and keeps working." Fix and rebuild existing systems to avoid more failing levees (Katrina), Minneapolis-style bridge tragedies, and New York steam pipe explosions. When existing infrastructure fails, the costs can be huge.

In the United States, the tragic collapse of the bridge on Interstate 35 West in Minneapolis, Minnesota, has been a call to arms to replace aging infrastructure.

Develop national and regional infrastructure plans. Create frameworks for integrated multimodal transport infrastructure, giving state and local governments incentives to participate. Identify national transport corridors and land use policy that jibes with efficient movement of people and goods, and reduces carbon emissions. Provide federal funding only for state and local projects that fit national priorities, and limit municipal bond financing on projects that don't conform. Stop funding nonconforming earmark projects.

Target transport funding on primary economic gateways. Connections to global pathways will be key in future national economic growth. Planners need to ensure that people and goods move efficiently through these centers, while connecting to secondary and tertiary locations. If global gateways turn into bottlenecks, national economies suffer. Roads to Timbuktu may help a local legislator get reelected, but provide no bang for the buck.

Change Government's Approach

Reconfigure government infrastructure management. The federal government should consolidate management and oversight of federal funding for infrastructure programs. The feds must formulate a national policy and develop an integrated framework for 21st-century transport systems and economic support networks—roads, transit, rails, electric grids, water resources, and housing. Currently, 100 different federal programs divvy up funding from the Highway Trust Fund alone. If necessary, the President and Congress should consider realigning federal agencies to help execute a cohesive national strategy, working closely with states and local governments.

Finance projects through an infrastructure bank. Establish an infrastructure bank to finance projects at favorable rates, underwriting initiatives that meet national infrastructure goals. The European Investment Bank, for instance, has been instrumental in helping European Union (EU) countries revamp infrastructure and providing support for long-term projects that don't pay back immediate returns.

Restructure state and local agencies. End a balkanized government approach to land use and transportation management. Rail, road, transit, seaport, and airport planning must tie together, linking modes to serve commercial centers and residential neighborhoods. Land use and transportation planning must be coordinated at the state and regional levels—planning councils, highway departments, and transit authorities need to operate with common purpose.

Scrap or streamline MPOs. Regional planning doesn't work in a global economy, when neighboring planning en-

tities don't interact with each other and then formulate disconnected plans designed to obtain federal funding for local projects. But that's essentially how regional planning works in the United States. More than 400 separate metropolitan planning organizations (MPOs) coordinate local transport and infrastructure planning in a system designed by Congress nearly 50 years ago. The country needs to consider revising its approach—redrawing regional boundaries to reflect changes in local economies and population dispersion, and encouraging regional plans to align with national priorities (see Part 3).

New Funding Strategies

Fund road/transit infrastructure through more direct user fees. Encourage people to find the most efficient and cost-effective lifestyle behaviors through placing an economic cost on using various transport modes. Incentivize behaviors that can reduce congestion and carbon footprints, while raising money to pay for maintaining and improving systems.

Toll interstates. Congress needs to enact legislation allowing states to toll interstate highways, employing new user fee strategies that raise funds to support national infrastructure goals. Freeways cannot be free anymore.

Tie community development to goals for lowered VMTs. Monies should fund projects and redevelopment that enable people to reduce their car dependence and/or distance traveled in cars (vehicle miles traveled [VMTs]). Subsidies need to encourage infill housing and commercial development, served by mass transit in pedestrian-friendly communities.

Stop subsidizing sprawl. States must stop funding or subsidizing road and water projects that reward developers at suburban fringes and focus instead on improving and maintaining existing systems, which can more efficiently and economically serve people and businesses in more densely populated infill locations. Owning homes at the suburban edge would be less affordable if buyers had to pay fully loaded costs for infrastructure (new roads and water/sewage systems).

Stop tapping user fee revenues as cash cows. Some governors and mayors view toll concessions as mother lodes for solving fiscal distress, but the user fee model should not be distorted to make up for other governing shortfalls. The United States finds itself "in its current mess" because of chronically depriving budgets for infrastructure maintenance and capital improvements.

The Private Sector's Role

Use more private operators. They can bring discipline and expertise to maintaining and managing infrastructure, not readily practiced or available in the public sector. Properly incentivized operators look to maximize revenues by improving efficiencies and service, often employing the latest technologies and best practices. Some public authorities tend to be mired in the status quo. Many European and Asian airports and seaports appear to thrive under private management.

Set consistent procurement standards. State and local governments need to reach consistency in procurement standards for infrastructure concession projects, creating more certainty and transparency in the bidding process. The federal government could help set uniform guidelines, which states would need to follow to receive federal grants. Private funders and operators can't reasonably bid without knowing parameters. Some states try to set parameters after receiving bids, frustrating potential private partners who spend millions on fruitless proposals.

Encourage development around transit hubs. Provide development and tax incentives to builders for master-planned projects around rail and transit hubs, ensuring pedestrian-friendly environments with nearby housing and retail. Plan for green space—parks and recreation areas—and incorporate more bike lanes into roadways.

Compared with those in urban areas, homes in suburban areas may be cheaper to build, but their per-capita infrastructure maintenance costs are significantly higher.

Part Two
Global Update

Countries in all regions take up the challenge to pursue infrastructure policy that will buttress their world standing, some with greater purpose, resources, and success than others. They note history's lesson—prosperity and competitiveness derive from infrastructure advancements. For some governments, infrastructure not only enables economic possibilities, but also boosts national pride. Armies, fighter jets, and air force carriers may signal raw power, but super-fast railways, sleek tunnels, and new airports can represent modernity, inventiveness, industry, and efficiency. In many established countries, infrastructure "shows off their best." People may "complain about higher taxes" and government's heavy hand, but they accept infrastructure spending "for the greater good." In developing nations, infrastructure bears not only on improving living standards—providing reliable power sources and basic transport systems, but also protecting health and welfare—supplying potable water and sewage treatment.

Once in place, infrastructure requires attention and care—expanding populations can stress or overwhelm capacity. Time and use inevitably wear down systems. Yesterday's "best in class" may morph into today's "less than adequate." Governments discover they cannot grow complacent, especially as international markets rapidly transform. In the new world order, it appears that deepwater ports and international airports connected to population centers by multimodal transport corridors give regions an advantage in the globalizing economy—business looks to move people and goods as quickly as possible between points of commerce over long distances. At the same time, once-primary cities at key highway intersections or rail hubs may lose their status if passed over by emerging global pathways. Connectivity becomes more important than ever.

A broad survey of recent infrastructure highlights and trends across the world follows.

EUROPE

The European Union "theoretically links infrastructure and land use," establishing goals and guidelines for member states and local governments to follow. The continent's "big new" push encompasses "trans-connectivity" (or "TENs" for Trans-European Networks), where member countries tie together transport, telecommunications, and energy networks to promote mobility and economic synergy. More than $900 billion in transport projects have been identified, $515 billion targeted as high priority. Planners concentrate on creating various north–south, east–west road and rail corridors, connecting to seaports, airports, and major cities. Planners look to reduce congestion, eliminate bottlenecks, and "fill

in missing links." Until the European Union formed, little impetus existed to promote connectivity between member countries—some motorways stopped at borders and train systems operated on incompatible tracks with different technical standards.

A lack of connectivity puts the EU at a disadvantage compared to the United States, whose interstate highways and rail lines intersect and link in a national system. (That wasn't always the case—before the advent of interstates, some state highways stopped at their respective state lines, too.) But the EU looks to jump ahead—establishing high-speed rail service between major cities and creating a single European freight rail market, including upgrading freight rail service with a satellite system to track the movement of goods throughout its transport system (the equivalent of GPS).

The European Parliament, composed of legislators from each member country, sets objectives and priorities and identifies projects of common national interest. The EU supplements TENs funding, helped by $150 billion in promised financing from the European Investment Bank. But the majority of underwriting derives directly from member states, which foot the bill and oversee development of their segment of each project under TENs guidelines. National self-interest can block EU goals—"there's a get-mine-at-the-expense-of-the-whole mentality"—but connectivity planning has been widely accepted "because it makes sense practically and economically to link." Environmental concerns over global warming engage government leaders. Transport ministers collectively look to relieve congestion and focus on pollution and carbon footprint issues.

Europe's global gateways flex their muscles and "try to take on more responsibility" for managing their needs as key hubs in Trans-European Networks, at the expense of strong national government involvement. Europe realizes earlier missteps in overinvesting in airports serving smaller cities, instead of expanding service at major international hubs and then linking to secondary cities by rails.

United Kingdom

The U.K. continues as world incubator and leader in public/private partnerships (PPPs), with more than 700 projects (about 15 percent of infrastructure expenditures) completed or underway, many involved in rebuilding or constructing schools, police/fire stations, hospitals, and water/sewage treatment.

- High-speed rail from London connects to the continent via the Chunnel.
- Inevitable high-profile PPP hiccups occur. Metronet, a private consortium contracted to refurbish London's subway stations and tracks, filed for bankruptcy in 2007. The city takes over the project.
- The government increasingly ties land use and infrastructure—development rights are sold around rail stations for housing and retail.
- The country has a good reputation for road planning, but "bloody expensive rails are all over the place, privatized among different companies with other entities owning tracks." Rail has grown 40 percent in the past decade. The government seeks to double ridership by 2030 and considers expanding high-speed rail north of London, linking to Manchester and Scotland.
- London, the country's global gateway, plans a $30 billion Crossrail project through the heart of the city, enabling rail service between eastern suburbs and Heathrow Airport to the west. Travel times would be cut dramatically. Officials hope the project, which has been on the drawing boards for 20 years, finally gets underway by 2010.
- The city also extended its five-year-old congestion pricing zone and added emissions surcharges on polluting trucks.
- The Olympics village under construction for the 2012 games leads revitalization of London's east side. "Without the Olympics, that project would not have been politically possible." But critics complain of some overkill, centering on a new international high-speed rail terminal that duplicates the costly St. Pancras Station renovation on the city's north side.

The new Terminal 5 at London's Heathrow Airport was designed to reduce the time passengers spend waiting, but it has suffered startup pains.

Infrastructure requires attention and care; expanding populations can stress or overwhelm capacity.

Europe struggles with its share of suburban sprawl surrounding urban cores, and disagreeable vehicle congestion, clogging center cities and ring roads alike. Car dependence increases and American-style big-box shopping centers and mall developments become more prevalent. But unlike the United States, Europe features neither coreless metropolitan areas (e.g., the Dallas-style Sunbelt suburban agglomerations) nor extensive regional megalopolises of unplanned, interconnected suburbs and cities (like the I-95 corridor stretching from north of Boston to Richmond, Virginia). Many European metropolitan areas benefit from greater reliance on passenger rails and mass transit to offset car dependence as well as a greater tradition of regional planning than in the United States.

Europe's Suburbs

Europe's adherence to regional land planning and more centralized government control over land use derives partly from its history of kingdoms and principalities ruled by monarchs and governed by feudal laws. During her 17th-century reign, Queen Elizabeth I ordered a halt to development at the edge of London. Most countries were mindful about creating greenbelts around their cities, if for no other reason than to protect the interests of land-rich nobles and other elites in the surrounding countryside. A strong state planning tradition endures in the context of democratic governments since World War II, reinforced today by a broadening movement to integrate economic, environmental, and social policy agendas.

- In England, the postwar government purposefully stemmed some expansion around London by reinforcing the greenbelt and calling for new town ("garden city") construction in suburban zones linked by rail.

- Ring suburbs have sprouted up around Paris in the postwar period, served by rail and metro lines. Business centers have been pushed away from the historic urban core to edge-district, high-rise commercial developments like La Défense. Capacity has been added to heavily used rail lines to serve these new centers. The city considers congestion pricing and cracks down on parking violators to discourage drivers from the suburbs. The city has also instituted a popular bicycle rental program as an alternative to driving cars.

- Copenhagen planned its suburban growth along "five fingers" of transit and rail lines, separated by farmland and green space. Today, transit rides represent 70 percent of commuter trips from the suburbs into the city center.

- Embodying its history of strong city-states, Germany integrates planning at the federal, state, regional, and city levels—80 percent of the nation's population lives in and around its cities. In Lower Saxony, for example, Hanover and 20 surrounding local governments joined forces in 2001 to agree on a legally binding regional development plan of commercial centers, including locations of retail outlets, shopping centers, and big-box stores.

The evident contrast in suburban development between the United States and Europe also derives from a combination of historical timing, intended and unintended consequences of government policy, availability of open space, and differing approaches to infrastructure planning.

HISTORY. The formative years of major European capitals go back centuries and certainly well before the invention of the car. Attractive core city neighborhoods interlaced commercial and government districts and were embedded with cultural attractions, parks, and markets. In reaction to congestion and industrialization, cities pushed gradually outward over time. Today's primary American 24-hour cities (New York, Washington, Boston, Chicago, and San Francisco) not coincidentally also established themselves during the pre-auto era, creating strong cores modeled on Europe's exemplars. At first, these cities also expanded along rail and subway lines, not highways.

FARM SUBSIDIES. In Europe, government subsidies to important farmer constituencies discouraged agricultural land conversion to suburban development and have reinforced rural zones around major cities.

TAX POLICY. Most European countries skew taxes toward value-added, income, and sales levies and away from property assessments, helping support owners of farms and other large land tracts. High gas taxes enacted in many European countries to raise revenues temper driving, while homeowners receive few of the tax benefits provided in the United States (e.g., mortgage deductions, property tax write-offs, attractive capital gains exemptions). Compared with the United States, suburban homeownership in Europe simply does not pencil out as well economically for families and more people rent flats than own homes. GI Bill inducements also made buying suburban homes affordable in the United States.

POPULATION GROWTH. America's rapid population growth and demographic shifts to the South and West coincided with the automobile revolution and highway expansion. The car made living outside the crowded city core and away from work locations both possible and desirable. Instituted as a defense measure to move armaments more quickly in case of attack, the federal interstate highway program accelerated and effectively subsidized suburban expansion after World War II.

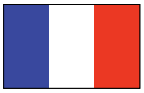
AMPLE SPACE. Abundant wide-open spaces around American cities provided cheap land on which to build suburban communities and the road systems serving them. Farmers operating near cities readily sold land to subdivision developers, while the country's overall agribusiness needs were met in less populated areas, particularly in the Midwest. Rapidly expanding Sunbelt metropolitan areas spread out along highways and roads without the need for substantial mass transportation infrastructure. To increase their tax base, local suburban governments readily approved haphazard subdivision developments and competed for commercial projects, especially retail malls, to serve the influx of residents.

Germany

The country's central location makes its roads and rail systems critical components of EU connectivity strategies.

- The country establishes cross-country corridors for trucks and railroads and institutes a leading-edge freight tolling system, moving away from tax-based funding of roads. These user fees on trucks, 35 percent of which are registered outside the country, will cover half of annual federal highway motorway expenditures.
- Transponder/satellite technologies eliminate tollbooths and other roadside infrastructure needed to enforce freight tolls. Trucks pay 24 cents per mile (15 cents per km), traveling nearly 14.375 billion miles (23 billion km) a year.
- The Autobahn system increases its road capacity to facilitate cross-Europe transport. The government focuses on maintaining main roads. Some of these finely engineered high-speed motorways require significant upgrades.
- A new high-speed rail line links Cologne and Munich.
- Predicted population declines attributable to low birthrates will increase per-capita infrastructure costs. Systems like water treatment may operate below capacity and require operational changes to be more efficient.
- The government "has been slow" on the public/private partnership front, but ramps up more activity—300 projects are underway, mostly on public buildings like schools. Powerful trade unions resist a partial privatization of railways.

France



France boasts some of Europe's most advanced infrastructure systems.

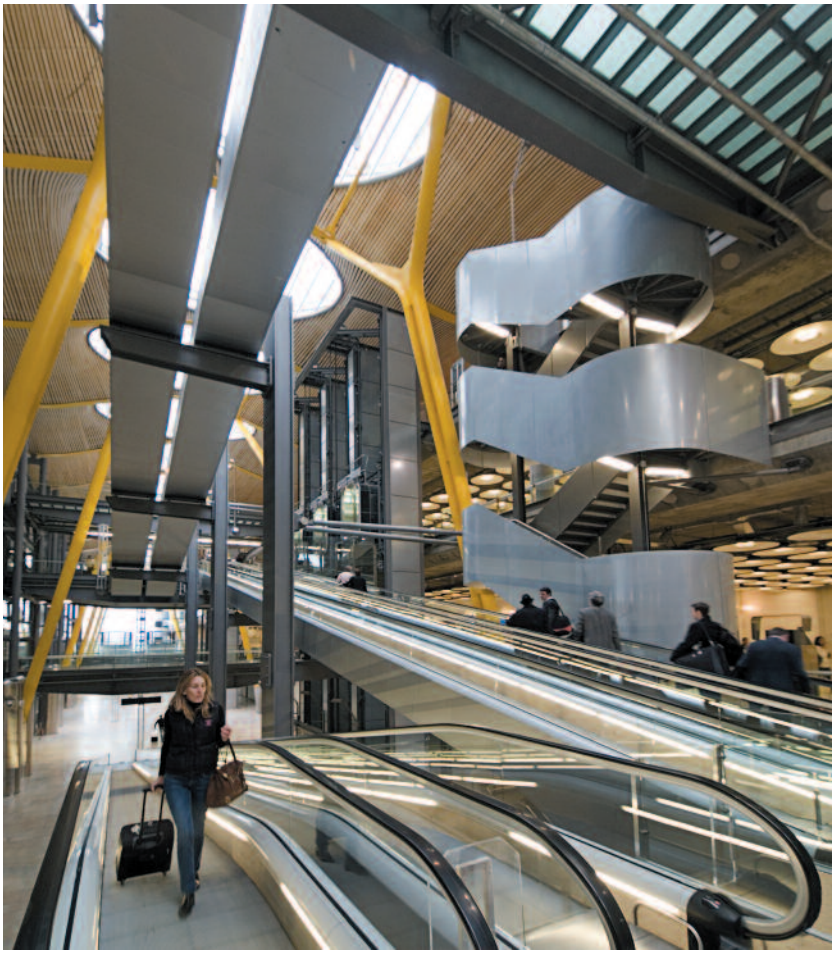
- The country unveils the highest-speed rail train in the world, which will run at more than 225 miles (360 km) per hour, 25 miles (40 km) per hour faster than current models. France's high-speed rail network is among the best anywhere, with connections increasing between Italy, Germany, Belgium, the Netherlands, Spain, and the United Kingdom.
- A new freight canal into Belgium is to be built.
- Private concessions manage about three-quarters of the country's 7,400-mile (11,840-km) motorway system under long-term contracts through 2032. Critics recently suggest that transactions may have given away too much to operators.
- Global warming concerns and calls to reduce carbon emissions reflexively lead some officials to recommend cutbacks on road funding.

Spain

Spain plays catch-up with its EU neighbors, making major across-the-board investments to expand networks and improve systems.

- The government undertakes 15-year, $375 billion plan to boost transport infrastructure, adding 5,625 miles (9,000 km) of high-speed rail (up from 625 miles [1,000 km]) and 3,750 miles (6,000 km) of new highways (expanding from 5,625 miles [9,000 km]).
- By 2020, these initiatives should put 95 percent of the population within 18.75 miles (30 km) of a highway and 90 percent within 31 miles (50 km) of a high-speed rail station.
- Spain ranks as a world leader in building privately managed toll roads and now looks beyond traditional transport projects to increase public/private partnerships.
- Airports and seaports also receive $11 billion in funding for expansions and modernizations. Airport allocations focus on Madrid and Barcelona gateways, and port spending zeroes in on Barcelona (Mediterranean), Bilbao (Atlantic), and Algeciras.

Spain's commitment to improve transportation capacity is writ large by its newly built terminal at Madrid's Barajas International Airport.



Russia

Flush with petro/energy dollars, the country has newfound wealth to underwrite needed improvements in dated infrastructure, starved for maintenance since the decline of communist rule.

- Only about half of the country's rail system is electrified. Road quality is poor by Western standards and mortality rates are multiples of other countries' rates even though traffic volumes are less.
- Reduced subsidies and higher fares for public transport have resulted in substantially lower ridership. Private car ownership expands and traffic congestion in and around Moscow increases dramatically.
- Major ports struggle to handle oil and gas exports, so the nation's monopolistic energy conglomerates reinvest some earnings into increasing capacity.
- A new $2.5 billion state investment fund targets financing transport projects.
- Privatizations increase, including revamping and operating the key Moscow to St. Petersburg highways and managing St. Petersburg's airport.

Infrastructure-Primed Growth

Fifty years ago, Abu Dhabi was not much more than a bunch of sand dunes perched along the Persian Gulf; its limited economy was sustained by camel herding, fishing, date farming, and pearl diving. Most citizens literally lived in mud-brick and palm-frond huts. Neighboring Dubai had been an important, if modest, regional trading post. The main road between the two cities formed at low tide along the beachfront. But then oil was discovered in 1958.

Now principalities within the United Arab Emirates (UAE), Abu Dhabi may rank as the world's richest city and Dubai builds the planet's tallest skyscraper and largest shopping center. Government investment in dazzling infrastructure has paved desert expanse into a commercial Mecca. Awash in petro revenues, the UAE purposely uses liberal trade and financial policies to diversify and establish what have become the most dynamic business centers in the Middle East, including international gateways with state-of-the-art ports and airport facilities. Up go office towers, high-rise apartment buildings, hotels, and retail malls—probably more cranes dot the horizon than any place outside of China. Dubai has become the third-largest re-export hub after Hong Kong and Singapore, and the world's ninth-busiest container port. Its airport capacity approaches 60 million passengers annually. As part of a planned $100 billion, five-year outlay, Abu Dhabi expands its airport to handle 20 million passengers a year and builds a deepwater port with an accompanying 38.6-square-mile (100-sq-km) industrial zone. Barrier islands just off the coastline morph into luxury beachfront resorts.

During this unprecedented transformation from Arabian outpost to global commercial giant, the population has multiplied approximately 20-fold to an estimated 4.4 million in 2007, concentrated in Abu Dhabi and Dubai. Most of the mushrooming growth comprises low-skilled expatriate workers from Pakistan, India, Bangladesh, and neighboring Mideast countries shipped in to construct glittering urban skylines. To the Emirates' credit, leaders realized that by using oil proceeds to pay for vast infrastructure improvements they could exploit their strategic location, creating an energy marketplace, distribution center, and resort destination all rolled into one. Then leveraging their own investments, rulers enacted business-friendly tax environments and free zones to attract additional foreign capital and diversified businesses in financial services, media, and technology.

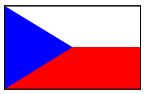
But while the UAE features best-in-class ports, airports, and roads, its recreational facilities suddenly also cope with outsized congestion, power needs, and water availability requirements. Addressing problems that stem from supercharged growth, principality governments increasingly embrace partnerships with business, privatizing water and electricity production as well as wastewater infrastructure. Dubai also exports its expertise in managing port and airport facilities through a state-owned conglomerate, Dubai World.

The following are among the country's infrastructure initiatives to help sustain future growth:

ELECTRICITY AND WATER. The parched region's groundwater reserves have become severely depleted during the country's rapid growth wave. About 80 percent of residents rely on water from gas-fired desalinization plants and 115 new dams are built to recharge groundwater. Natural gas–powered generators, meanwhile, provide almost all of the nation's electricity. Gas is imported from Qatar via a 231-mile (370-km) pipeline. Both Abu Dhabi and Dubai enter into public/private partnerships to build, own, and operate power and desalination plants, anticipating growing needs. Abu Dhabi's public utility retains a 60 percent shareholding in its plants, with 40 percent owned by offshore investors. Dubai needs nearly $40 billion to fund anticipated power needs and looks to foreign investors.

MASS TRANSIT AND ROADS. Traffic congestion promises to only get worse, if population continues to increase at present levels. Belatedly, the two primary cities look to mass transportation alternatives for some relief. Since the beginning of the decade, the number of vehicles in Abu Dhabi increased from a manageable 31,000 to an insufferable 240,000, straining the emirate's impressive new highway system and clogging city streets. The city undertakes construction of a 7.5-mile (12-km) circular railway system in hopes that 5 percent of drivers will get out of their cars. Dubai, meanwhile, earmarks $4.5 billion for a driverless light-rail system that will link downtown with other districts as well as the airport. Both emirates plow billions into more roads, bridges, tunnels, and car lanes, and Dubai embraces radio frequency identification (RFID) technology to introduce tolling and enable congestion pricing on its arterials.

Czech Republic



Like other former Eastern Bloc states, the republic looks to benefit from European Union connectivity programs and financing initiatives. The Czechs may feature the best roads in eastern Europe, but 40 percent are in poor condition

ASIA PACIFIC

China

The world leader in developing and spending (about $150 billion annually) on infrastructure to support vast urbanization and industrialization, China utilizes transport connectivity to enable manufacturing and commercial growth, extending into its hinterlands.

- The government not only aims to build capacity to handle population growth, but also strives for "best-in-class" projects, positioning the country for long-term benefits.
- With only 169 miles (271 km) of expressways in 1989, China today has close to 25,000 miles (40,000 km), with plans to increase to 51,250 miles (82,000 km).
- Megaregion cluster urban developments are tied together by complex road, rail, and transit networks designed to move millions of people efficiently.
- The following are among the $400 billion in key transport projects slated for completion by 2010:
  - Six high-speed passenger railways, including a Beijing-to-Shanghai route;
  - Fourteen expressways, including a road stretching from Hong Kong to Beijing;
  - Dredging the Yangtze and Pearl rivers and expanding rail and road systems into major ports; and
  - Expansions of ten airports, including construction of the world's largest terminal building in Beijing.
- Hong Kong plans in excess of $30 billion in ten major projects alone, focused on rail and road connections to the mainland, as well as water main replacement and rehabilitation.
- Carbon footprints and controlling emissions appear to get short shrift in the drive to modernize, but cluster development plans have significant green-space components.
- The ultra-massive Three Gorges Dam hydroelectric project may turn into an environmental nightmare, and widespread construction of coal-fired power plants electrifies the country at the expense of air quality. Water quality is poor in much of the country.
- The national government owns most infrastructure projects in shareholder arrangements with regional governments and private interests. An unclear PPP regulatory framework doesn't mean private deals aren't happening, but investors and operators need strong government connections, usually based on long-term relationships.

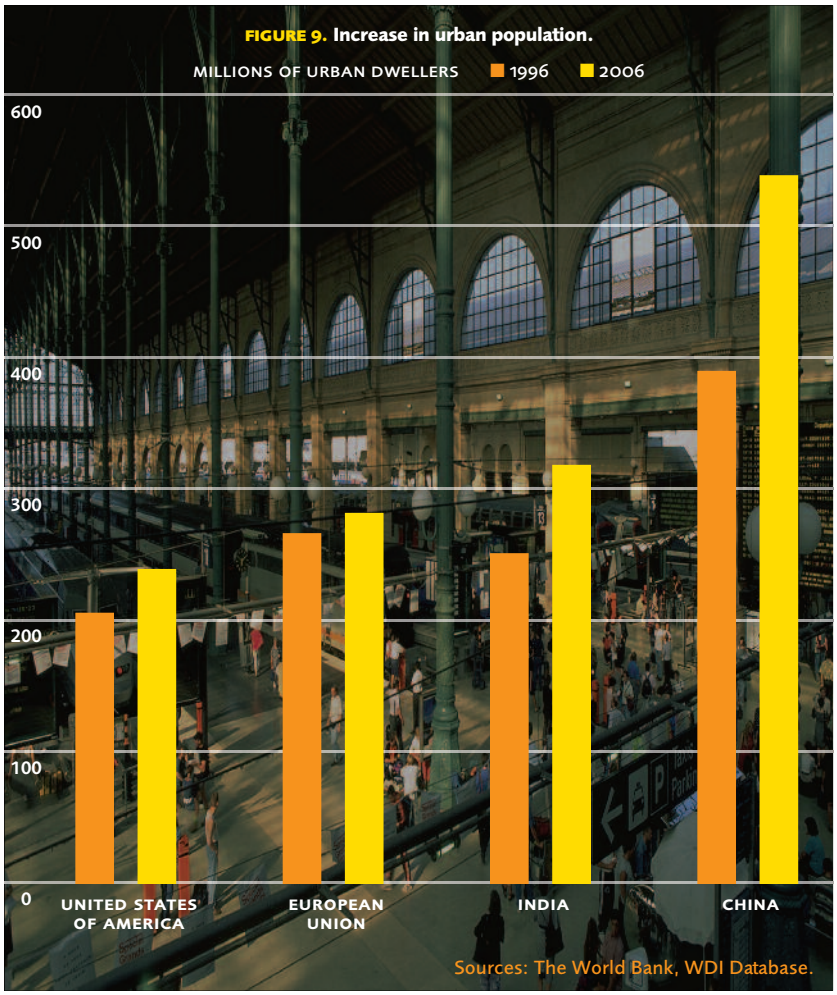


FIGURE 9. Increase in urban population.

MILLIONS OF URBAN DWELLERS ■ 1996 ■ 2006

Sources: The World Bank, WDI Database.

India

"Third World"–quality infrastructure throughout much of the country hobbles economic expansion. The finance minister estimates that infrastructure spending must increase from 4.6 to 8 percent of GDP to sustain a 9 percent growth rate.

- More than 90 percent of the nation's 40,625 miles (65,000 km) of national highways are single- or two-lane roads with speed limits at or below 31 miles (50 km) per hour. Power availability is unreliable or nonexistent in many

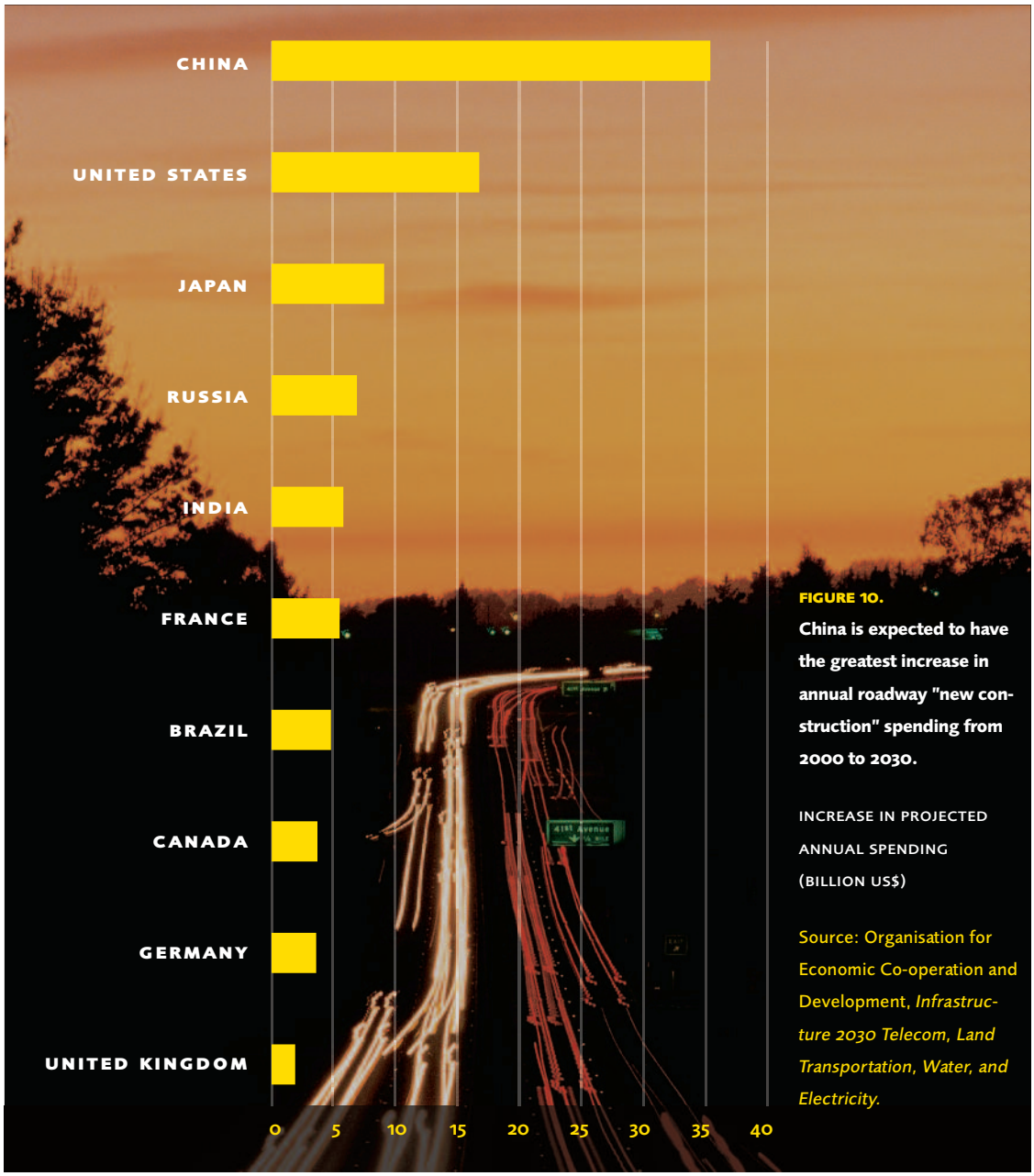


FIGURE 10.
China is expected to have the greatest increase in annual roadway "new construction" spending from 2000 to 2030.

INCREASE IN PROJECTED ANNUAL SPENDING (BILLION US$)

Source: Organisation for Economic Co-operation and Development, *Infrastructure 2030 Telecom, Land Transportation, Water, and Electricity.*

areas—about 45 percent of households have no power—and water quality is poor.

- Realities hamstring mandates. The national government revises upward infrastructure outlay objectives from $150 billion to $475 billion over the next five years, but currently spends about $21 billion annually. The country requires at least $20 billion each year in private investment. Construction companies, meanwhile, can't meet the demand for new road projects—a shortage of labor and expertise hampers efforts.

- State governments control regional decision making and most urban infrastructure, sometimes derailing national initiatives. "India is a democracy—there's a huge difference in getting things done compared to China." Corruption and a lack of transparency raise concerns among potential investors.

- But progress occurs and private investment increases—the value of PPPs had reached 3.5 percent of GDP by year-end 2006:

  - An 11,250-mile (18,000-km) national tolled motorway, linking major cities, should be completed by 2010.

  - Dubai World Ports commits $2 billion to upgrade facilities under its management.

- Private operators take over the country's large airports, including those serving Mumbai and New Delhi. A $1.5 billion proposal would expand New Delhi's airport capacity to 35 million passengers annually from 16 million and develop adjacent land into malls, hotels, and offices. Major new airports with private operators will open soon in Hyderabad and Bangalore.
- New Delhi's metro line expands by 76 miles (122 km), and is expected to carry 2.2 million passengers daily.
- Bangalore constructs a $1.5 billion metro rail system, scheduled for opening in 2011. Other plans call for a $1.1 billion light-rail system to ring the city.

Japan

Since the 1960s, Japan has been a leader in relative spending on its infrastructure—about 10 percent of GDP.

- Bullet trains, finely engineered roads, and efficient airports are the country's calling cards.
- Congestion worsens around Tokyo—car speeds average about 13 miles (21 km) per hour. The city builds new ring roads and a seven-mile (11-km), underground central city line at a cost of ¥100 million for each meter. Building any major new above-ground roads through the central city is practically impossible.
- The city also tests "Smartway" technology, which provides drivers with real-time traffic and accident alerts to help manage traffic flows.
- Many commuters rely on famously on-time subways and rails to move in and around the capital city. *Shinkansen* bullet trains carry about 290 million passengers annually.
- Government support for domestic air travel helps keep airlines competitive with bullet trains.

Singapore

This small nation reigns as a prominent world infrastructure innovator, continuously reinvesting in transport networks.

- Comprehensive 25-year planning and central government control keep the city-state's transport systems "world class" and "notoriously" efficient.
- The government traditionally uses infrastructure development as a stimulus in economic downturns, and attracts private sector financing in upturns.
- The country has been an innovator in congestion pricing and electronic tolling.
- Commuter rail, subway, and light-rail systems expand to underserved locations.
- Changi Airport ranks among the "world's best."

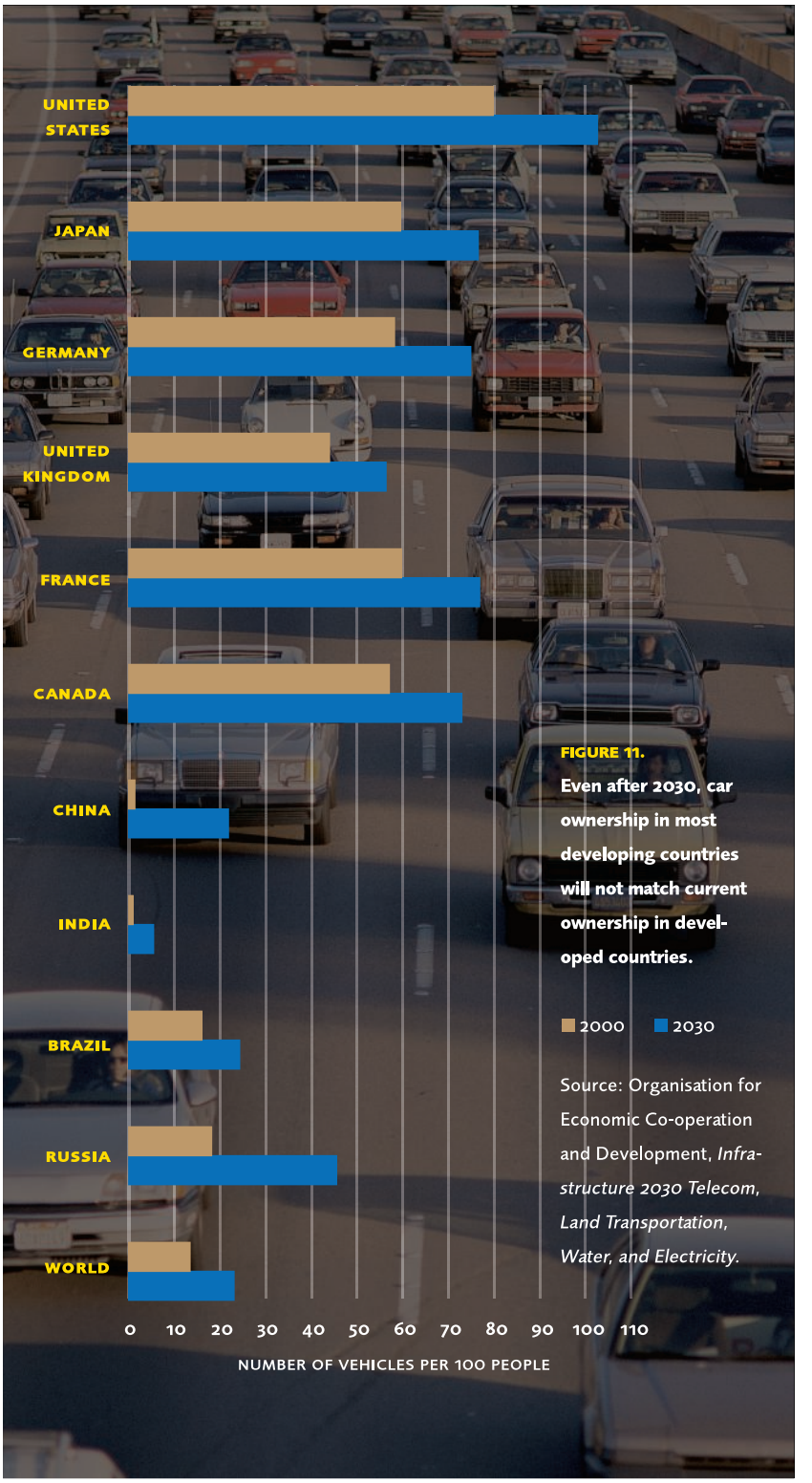


FIGURE 11.
Even after 2030, car ownership in most developing countries will not match current ownership in developed countries.

Source: Organisation for Economic Co-operation and Development, *Infrastructure 2030 Telecom, Land Transportation, Water, and Electricity.*

Australia

Although the government has halved infrastructure spending since the 1970s, public/private financing structures tap large domestic institutional funds to support new initiatives.

- Like the United States, this country, including its six states, has been resting on laurels of post–World War II infrastructure investment, spending only about $5.8 billion annually from 1985 to 2005.
- Since the beginning of the decade, the country starts to address underinvestment, estimated at a $23 billion shortfall.
- A recent infrastructure report scorecard from an engineer group recognizes improvements in roads, rail, and water since 2001, but only to "adequate" levels. Congestion-related costs are anticipated to triple over the next 20 years.
- Superannuation funds—government-mandated pensions managed by investment firms—raise money to help finance many projects. Long-term pension liabilities match well against infrastructure returns. Australia has been a world leader in managing infrastructure investment funds, exporting the concept to the United States and Europe.

Canada

Road systems, mostly built during the 1960s and 1970s, show signs of wear and tear—officials start to address needs.

- Infrastructure investment fell from about 2.8 percent of GDP in 1961 to 1.4 percent in 2003, but a new Building Canada program targets $33 billion for new infrastructure projects through 2014 and provincial governments seek to catch up too by allocating more funds.
- About 60 percent of the nation's transport infrastructure is more than 50 years old, and bridges need particular attention. A Quebec overpass collapse killed five people in 2006, unnerving the public, and a recent report on municipal infrastructure calculates that the country has used nearly 80 percent of its infrastructure's service life. The report estimates that $240 billion will be needed for maintenance and upgrades to meet expected population growth.
- New initiatives focus on enhancing national highways, railways, and airports, as well as improving Internet connectivity. The government turns to environmentally re-

Like its other transportation systems, the port facilities in Singapore are world class.

sponsible approaches with attention to mass transit, green energy, and improvements in solid waste management. Because of long distances between major cities, passenger rail has limited application.

- About one-third of Building Canada funding comes from a federal gas tax.
- The government establishes a federal agency to foster and encourage public/private partnerships and matches funding.
- Ontario and Quebec each budget $30 billion on infrastructure in the 2005–2010 period.
- Western provinces, in the midst of an oil boom, undertake rapid expansion of roads and water facilities to accommodate the influx of workers. Alberta issues a 20-year, $120 billion project plan.

Mexico

The Calderón government makes a major push to increase infrastructure funding and attract private investment by improving greater transparency and legal certainty.

- New five-year, $250 billion program targets modernizing 12,400 miles (19,840 km) of highways and rural roads to international standards, expanding rails by 930 miles (1,488 km), and developing suburban rail, particularly around the Mexico City gateway.
- Less than half of the country's 213,000-mile (340,800-km) road system is paved and the rail network has not been expanded in more than a decade. The country must double its record $2.7 billion road budget for 2008 to meet actual needs.
- Road privatization underpins plans. The government wants to convert 16 public freeways to private operator–managed toll roads and construct an additional 24 privately managed toll roads.
- As in much of the rest of Latin America, privatization has increased efficiency and decreased cost in some sectors—particularly airports, rails, and telecommunications—but shady operators as well as corruption have compromised results and created public distrust. Mexico's toll road privatization of nearly two dozen routes in the 1980s and 1990s resulted in a messy government bailout and assumption of $14 billion in debt. Operators had cut corners and drivers steered clear of these highways to avoid paying the tolls. Revenues fell short of projections and the roads weren't maintained.
- Airport privatization, the largest in the Americas, has been more successful under three operators, managing 34 fields. The government retains control of Mexico City's airport.
- Mexico City streamlines bus routes and uses more low-carbon-emissions vehicles—a new express bus line carries 260,000 passengers daily, and cuts trip times in half. Nine new lines are planned.

Panama

The country widens its nearly 100-year-old canal to ensure a Central American passage for the new generation of super-sized freighters and tankers. The $5 billion expansion is scheduled for completion by 2014.

Brazil

Underdeveloped infrastructure networks could restrain economic development.

- Poor road infrastructure—only 12 percent of Brazil's 1 million–mile (1.6 million–km) road system is paved—severely hampers the country's economy, particularly agriculture, its major growth industry.
- According to the World Bank, infrastructure spending of 1 percent of GDP falls far short of the 3 percent–plus needed to maintain 2 percent economic growth, and recent economic gains (4.3 percent growth in 2007) exacerbate transport bottlenecks.
- Infrastructure deficiencies have been blamed for two recent aviation accidents. Airports suffer from inadequate runways and capacity as well as antiquated technology and equipment, while air traffic grows at a 15 percent annual clip since 2004.
- The government's growth plan calls for $237 billion in public and private investments between 2007 and 2010, most coming from state-owned companies. About $56 billion targets new housing projects and $21 billion covers sanitation and sewage treatment in slums.
- Greater regulatory certainty—the government keeps renegotiating concession contracts—would help attract more private investment, according to studies. Imprecise laws and arbitrary interpretations of regulations can confound operators.

Part Three
Time for an Overhaul

The system is broken. The United States suffers in the absence of national infrastructure priorities, relying instead on an archaic regional planning process mandated by Congress 45 years ago during the interstate highway boom. The obvious result is increasing congestion and a hodgepodge of disconnected local and state project initiatives. But an analysis commissioned by the Urban Land Institute points to extreme policy shortcomings that could hamper America's ability to compete against China and the European Union in the future. Outdated regional frameworks, myriad bureaucratic rules, and conflicting funding sources short-circuit the possibility for integrated and coordinated infrastructure schemes, ignoring housing and related land use imperatives.

ULI's Regional Growth and Transportation Study* of 23 metropolitan planning organizations (MPOs) in the nation's largest urban areas highlights the consequences of inadequate federal policy and guidelines:

- Most of the metropolitan areas assessed in the study, including the nation's primary global gateway cities, don't expect to accommodate forecast population growth without increases in congestion even with effective implementation of their plans. Congestion is expected to worsen significantly in these areas, increasing commuting costs and lowering productivity. While these MPOs comply with federal law by providing "congestion management plans," only two states (Texas and Georgia) voluntarily set congestion reduction goals.

- Regions operate in myopic bubble worlds, working independently without any federal mandate to link plans with those put forth by neighboring regions. In fact, most plans provide no vision for mobility across states or regions. Worse still, many regional planning boundaries are now too limited and confining, no longer effectively representing the current dimension of their regional growth and reach. Multiple MPOs cover the continuous metropolitan regions of New York and south Florida, for example. "Multiregional or cross-state initiatives are largely ignored."

- Most plans do not assess the physical quality of existing systems in order to calculate funding needs, even though a significant portion of requested funds is based on estimates of maintenance and preservation. Only one region (Phoenix) on its own initiative conducts "life cycle" analyses of future needs for transit and highways, and few other plans even discuss recapitalization of aging systems.

* ULI commissioned research on 23 of the nation's largest metropolitan regions; information from that research can be found throughout this chapter. For additional information on the research as well as a list of the regions studied, please see page 56.

Even after the calamities in New Orleans and Minneapolis, maintenance and preservation initiatives take a back seat to new projects.

- Federal funding mechanisms encourage regions to lock-in outlays for roads, transit, or other transport modes based on availability from various federal funding pools rather than to develop optimal plans and integrated modal solutions to cope with future growth. Projects are not compared or reviewed for cost effectiveness across modes, and no single state or regional government agency in any region has responsibility for managing "cross-cutting" issues like congestion, pollution, and safety.

- The plans use different measures, metrics, definitions, and levels of detail, underscoring how the federal government requires neither a uniform approach to presenting information nor benchmarking of results. In particular, short-term spending plans use a wide variety of formats and styles, and some contain limited and inconsistent information. "None of the transportation improvement programs [TIPS] quantifies the impacts of expenditures on regional goals."

- The funding process encourages "project mirage," promoting unaffordable, ever-distant schemes. MPOs conveniently assume that more federal, state, and local dollars will be forthcoming in later years and thus budget outsized expenditures for major projects in their long-term plans, typically understating recapitalization costs and, until recently, even ignoring inflation. Typical 3 to 4 percent inflation scenarios "significantly understate" the effect of reduced buying power from the weak dollar and recent increases in worldwide material costs. Planners keep pushing out the timing of these wish-list items as costs increase.

- Potential growth constraints—water availability or global economic changes—are largely ignored by plans. "[MPOs] all forecast a Lake Woebegone [above average] future." A lack of sustainable water resources could upend growth forecasts, especially for arid southwestern metropolitan areas (Phoenix and Las Vegas) and rapidly growing southeastern markets (Atlanta and cities in Florida). (See sidebar on page 37.) Also, the loss of manufacturing jobs in the Rustbelt may permanently impose economic hardships, generating further population declines.

- All plans predict sharply improved air quality, not based on improved transport schemes derived from their programs, but on incidental fleet turnover to less polluting vehicles. None of the plans analyzes carbon footprint issues, but many regions begin assessments.

- Most fail to mesh infrastructure planning and zoning initiatives to discourage suburban spread and enable

Regions are dependent on federal funds even as the federal government has decreased its commitment to infrastructure.

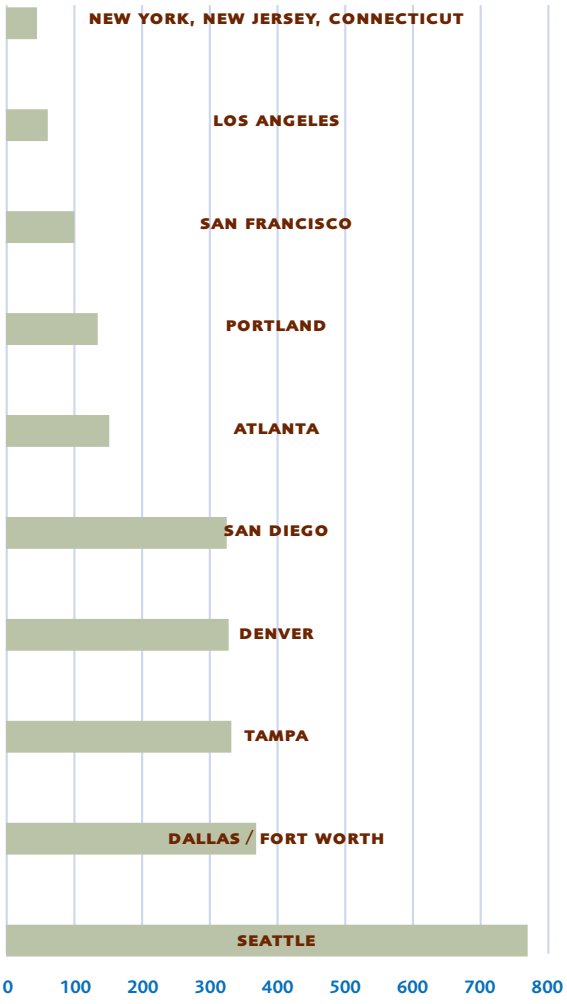


FIGURE 12.
The success of regional plans is predicated upon the acquisition of additional funds; of those studied, the following ten cities need the most.

UNSECURED FUNDS PER CAPITA PER YEAR (US$)

Source: *Are They Ready? Regional Growth and Transportation Investment;* ULI-commissioned research.

What Is an MPO?

Since construction of the interstate system, the United States has pushed national transportation planning down to the local level through the states and metropolitan planning organizations (MPOs). The 1962 Highway Act mandated MPOs in any metropolitan area with more than 50,000 residents. Today, there are nearly 400 MPOs, some serving parts of larger metro areas. Initially focused on roads, MPOs now also produce long- and short-range plans for multimodal transport networks, requisite for states to receive federal funding aid for local projects—highways, bridges, mass transit, ports, and airports.

As multijurisdictional entities, MPOs comprise a potpourri of state political appointees: typically local elected officials, state agency executives, and sometimes business leaders and planning experts. The panels' responsibilities vary from state to state, but they are charged with evaluating transportation needs and allocating resources in conjunction with departments of transportation, transit and airport authorities, and other government units responsible for managing regional and local transport programs. This collection of planning bodies has become a guiding force in regional growth across the nation, helping set the agenda for how and where billions of dollars in federal transportation funds are used.

The dramatic growth of Atlanta's water-thirsty suburbs has exacerbated the city's drought, threatening continued economic growth in metropolitan Atlanta and intensifying the state of Georgia's longstanding legal battle over water with neighboring Alabama and Florida.

convenient access to mass transit stations from surrounding communities. Pedestrian and bike improvements get short shrift—nonhighway/transit expenditures total 4.5 percent of funding in mid-term budgets.

The Bottom Line

In conclusion, existing federal infrastructure policy neither produces effective regional solutions for congestion and pollution reduction nor provides value for spending taxpayer dollars. Of greatest importance, current policy fails to address or achieve essential national goals for ensuring efficient and productive movement of goods and people in the future. The aforementioned ULI study concludes that the current federal funding model "appears headed on a collision course with traffic growth, and a future characterized by ineffective shifts in modal shares, higher household commuting costs, less than adequate highway capacity, significantly higher congestion, and economic stagnation."

Incredibly, a national government that propelled development of what was the world's premier road network during the 1950s and 1960s today stands by as that same aging interstate system no longer meets the needs of a changed country and world view. Disjointed, bottom-up planning constrains the United States from developing intercity transport corridors and freight transport systems that could help relieve congestion in global gateway seaports and create new distribution hubs in less densely populated areas. Setting strategic locations for new airports and developing interstate high-speed rail have been sidestepped. The United States still has no dedicated high-speed rail lines and has built only two new airports in the past 35 years (Dallas/Fort Worth in 1975 and Denver in 1995).

Compounding serious questions about the viability of U.S. transport infrastructure planning, the Federal Highway Trust Fund confronts near-term shortfalls just as a Congressional commission recommends the country spend $225 billion annually over 50 years on its transport systems, a startling $140 billion-per-year increase.

Looming trust fund insolvency gives legislators a signal opportunity to consider overhauling the entire infrastructure funding and planning process. Congress could start by considering whether to replace or supplement the foundering gas tax with various user and congestion fees. Next, legislators could address how to establish a national infrastructure agenda to manage growth, reduce congestion, and speed the movement of people and goods on integrated transport networks linked to global marketplaces. At the very least, a federal agency needs to coordinate a more

Americans take plenty for granted. Take water. It comes out of taps and showerheads, fills swimming pools, sprays from sprinklers, and flushes through toilets everywhere. And it's practically free; water bills in most places don't amount to much. Seemingly incidental to our way of life, water is an absolute necessity, but until recently (aside from an occasional regional drought) most Americans did not consider the harsh realities of doing with less. Those attitudes may begin to change—and quickly.

Two of the country's fastest-growing metropolitan areas—Las Vegas and Phoenix—sit in the middle of deserts. Should anyone be surprised, then, that these cities face potential crises as droughts intensify and increasing populations tap into precious flows from a dwindling Colorado River lifeline? In fact, a recent study suggests that Lake Mead, the reservoir serving Las Vegas, could run dry within 13 years. Continued growth in these places will be predicated on finding new water sources and pervasive conservation efforts, including recycling wastewater and replacing lawns with rock gardens. Without enough water, boom times would end—in fact, these metropolitan areas could contract. Under any circumstances, water will become a more expensive and highly valued resource, affecting the cost of living as well as quality of life.

High-growth southern California—including the Los Angeles, Orange County, and San Diego population bastions—must worry too. These centers of immense sprawl, dotted with backyard swimming pools and verdant golf courses, are concentrated in arid environments, dependent on what's left of the Colorado watershed.

But people in other, more fertile U.S. regions also get religion about how uncontrolled growth and poor planning can precipitate critical water shortfalls when inevitable droughts strike. In Atlanta, Georgia's governor actually resorted to holding a prayer service, appealing for rain, as the Lake Lanier reservoir drained to a precariously low four-month supply last year. The Atlanta metropolitan area's predicament not only affects its 3 million residents—who are rapidly growing in number—but also sends shockwaves south through Alabama and into the Florida Panhandle. Even Tennessee gets drawn into what has become a regional battle royal over water.

As hot-growth Atlanta sucks water from the Chattahoochee River watershed feeding into Lake Lanier, downstream users get less. In Alabama, the Farley Nuclear Power Point depends on water levels in the Chattahoochee to remain high enough for its cooling system. Water shortages could shut down Farley, which provides electricity to more than 800,000 households in the region as well as various industrial users, which grow concerned about power reliability. Other utilities throughout the area confront similar scenarios. Reduced Chattahoochee flows into Florida's Apalachicola River and Bay also threaten marine life and the local fishing industry. The economic impact extends to farmers who could face hundreds of millions of dollars in losses from desiccated crops. Rampant development and population growth also threaten water supplies through the rest of Florida, where many communities confront saltwater incursions into water tables.

The U.S. Army Corps of Engineers finds itself stuck in the middle of what has turned into a three-state "water war" since the federal agency controls the release of water out of Lake Lanier for Alabama and Florida users. The states and various cities engage in a tangle of litigation between each other and the corps to secure their water rights. Florida and Alabama officials, meanwhile, have leveled broadsides at Georgia's leaders for failing to impose conservation requirements as Lake Lanier levels dwindled to expose old road beds and home foundations, while leaving docks high and dry. That's when Georgia's governor sought divine intervention and finally told residents to stop watering their lawns. The crisis eventually led to the January 2008 enactment of Georgia's first-ever water management plan. The law requires a three-year assessment of the state's supply/demand requirements before deciding on how to share water from the state's rivers, lakes, and aquifers among 11 districts. Not leaving anything to chance, Georgia also challenged 18th-century land surveys in an over-the-top bid to push its border north so that it could tap into the Tennessee River, whose watershed is controlled by the Tennessee Valley Authority. Georgia officials seem to hope that a hurricane or change in weather patterns will end the drought and forestall drastic conservation measures, including curtailing massive development activity, which has been the lifeblood of the state's economy for more than three decades.

Water Wars

Georgia's recent gamesmanship underscores the self-serving political rivalries emerging over securing suddenly precious water supplies. Eventually, this regional feud must lead to some commonsense approach to resource sharing and water management. And even if drought is a temporary phenomenon, the region's continuing growth track puts its population at risk in the event of another dry period. Forecasts call for the population of Atlanta to expand by another million people over the next 20 years. Warmer southern states, meanwhile, continue to draw waves of new residents from the Midwest and the Northeast. Unless habits change, Atlanta and the rest of the Southeast will confront the reality that water can't be taken for granted after all.

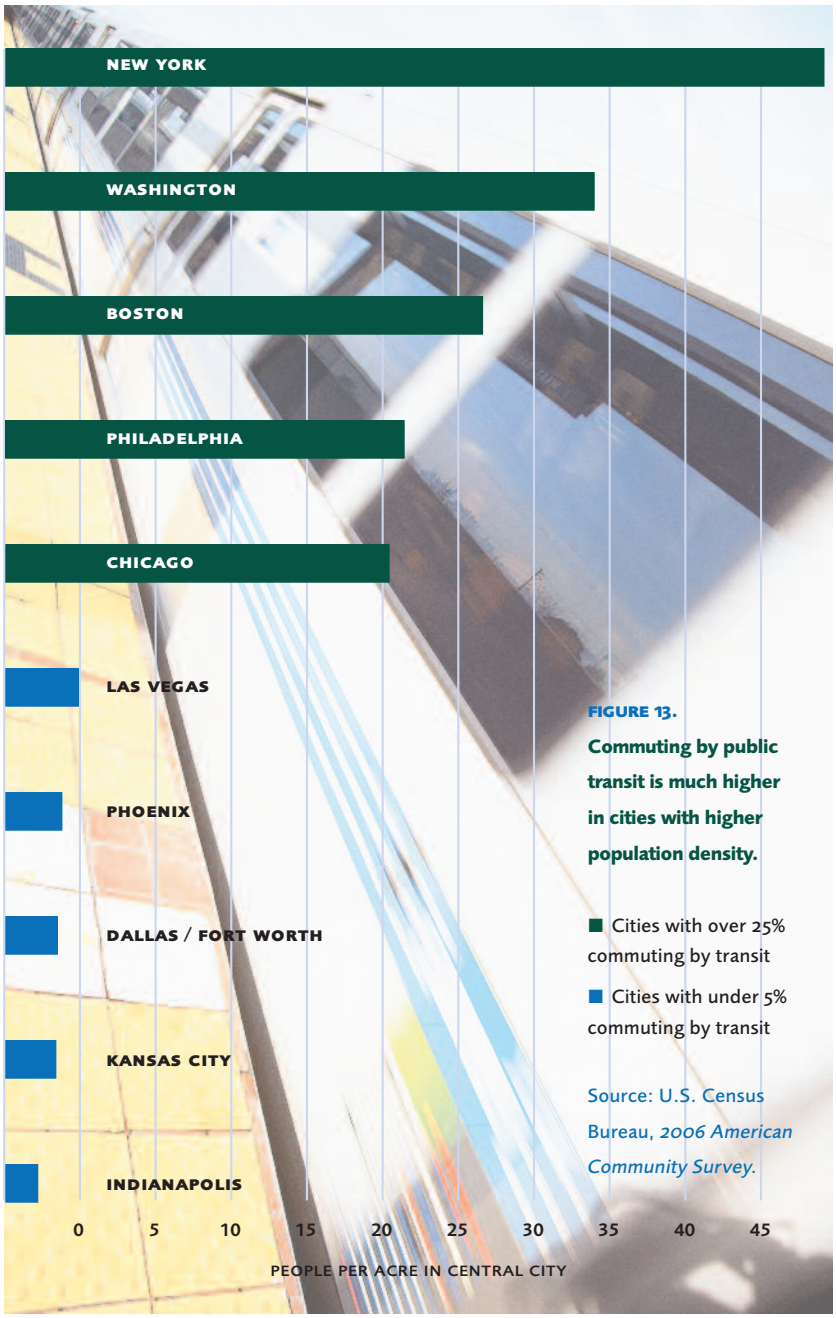


FIGURE 13.
Commuting by public transit is much higher in cities with higher population density.

Source: U.S. Census Bureau, *2006 American Community Survey.*

uniform approach to regional planning that is synchronized with national priorities.

Chronic traffic problems and airport delays represent early signs of underinvestment in infrastructure—many issues can take decades to materialize and decades more to fix. "Infrastructure does not turn on a dime and the choices we are making today will have a greater impact on the next generation than they will on us. America runs the risk of losing its seat at the head of the table over the next 50 years."

Failure to Align Transit and Land Use Policy

Unsatisfactory alignment of transit projects with land use planning may help explain discouraging MPO forecasts for increased ridership despite outsized projected expenditures. Although transit budgets constitute about 50 percent of aggregate expenditures in long-range plans (approximately $610 billion), the expected share of transit commuting averages a measly 5.5 percent. Although most plans seek behavioral changes in driving habits, they assume continued growth patterns toward the suburban edge, where car-dependent lifestyles predominate out of necessity. No wonder forecast increases in mass transit use are so tepid. Further proliferation of the standard suburban subdivision model works directly at cross purposes with reducing car use and increasing mass transit ridership.

If regions fail to modify land use models to integrate with infrastructure plans, people will remain car bound. Only two MPO plans even discuss land use integration with infrastructure planning—Portland and Seattle employ land use boundaries to concentrate future growth closer to urban cores. In addition, Denver expands light-rail lines and clusters residential development around suburban transit stops. For the future, success in increasing mass transit volumes and reducing traffic hinges on developing residential communities in and around densifying suburban nodes and providing pedestrian access from neighborhoods to transit centers and retail districts. The federal government could help this process by allocating funding carrots to regions that adopt such approaches.

Poor Value for Taxpayer Dollars

Below are other key findings from the ULI study of MPO forecasts, plans, and budgets, which total $1.3 trillion for the next quarter century:

- Over a 25-year forecast period, the 23 regions collectively anticipate a 39 percent increase in population and a larger 51 percent increase in traffic. Predicted growth will

FIGURE 14. **Surface transportation (road and public transit) networks are congested; unfortunately, little improvement is on the horizon.**

Current Network Capabilities		Network Capabilities After Approved and Funded Projects Are Completed	
Handles all network flows with minimal congestion	0.0%	Meets all needs	0.0%
Congestion at peak hours in specific bottlenecks	36.4%	Meets most needs	18.2%
Congestion at bottlenecks during most hours and networkwide during peak hours	59.1%	Meets some needs	36.4%
Moderate networkwide congestion during most hours	4.5%	Does not meet most needs	45.5%
Major capacity additions needed	0.0%	Does not meet any needs	0.0%

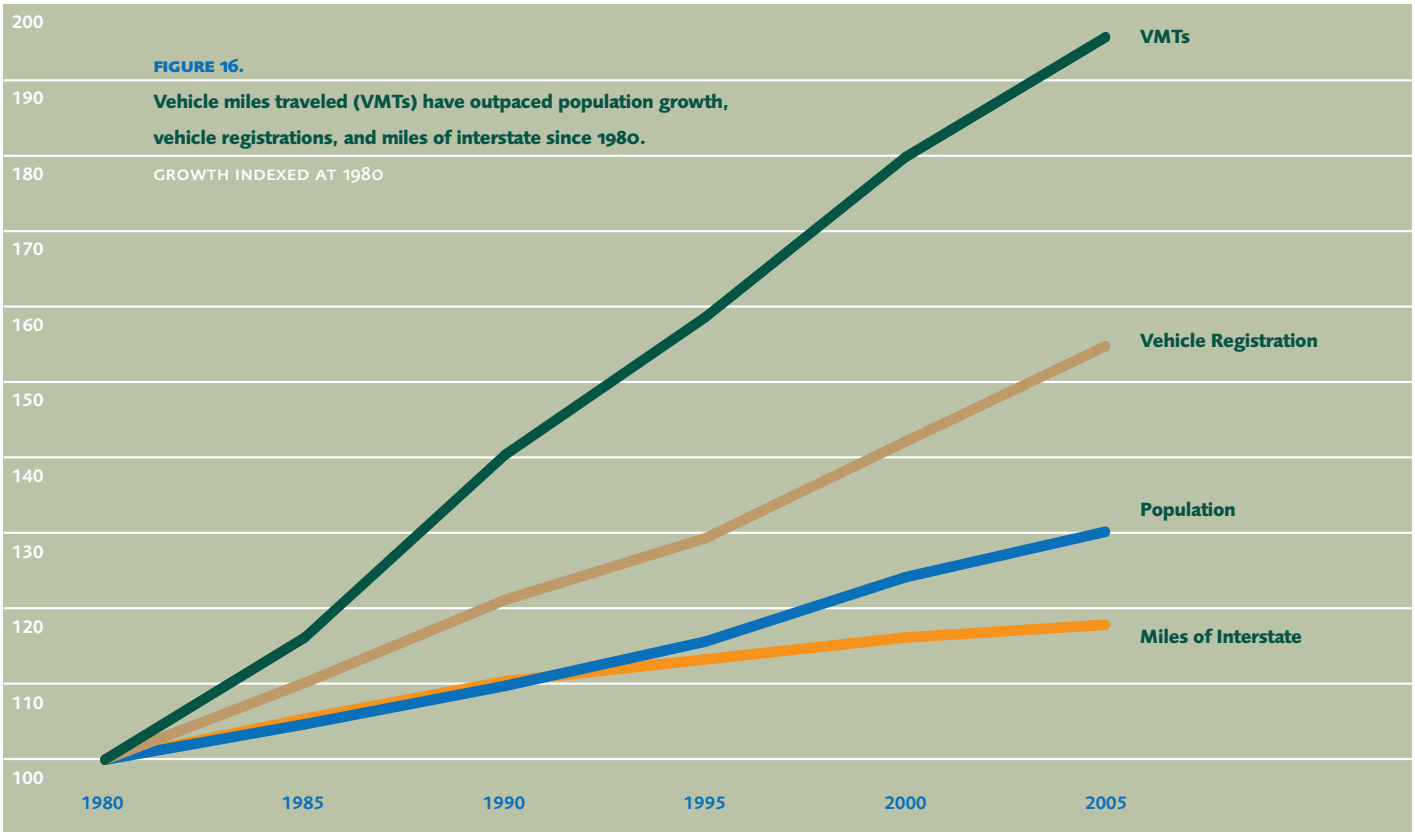
Source: ULI Survey of Metropolitan Planning Organizations, January–February 2008.

FIGURE 15. **The rural fringe and the suburbs are expected to grow faster than the central city.**

Average Expected Growth Rates in Cities Studied	
Central city	25.7%
Suburbs	52.2%
Rural fringe	66.1%

Source: *Are They Ready? Regional Growth and Transportation Investment;* ULI-commissioned research.

FIGURE 16.
Vehicle miles traveled (VMTs) have outpaced population growth, vehicle registrations, and miles of interstate since 1980.



Sources: Vehicle Miles Traveled, Bureau of Transportation Statistics;
Vehicle Registrations and Driver's Licenses, Federal Highway Administration; Population, U.S. Census Bureau.

FIGURE 17.

Very few metropolitan regions even mentioned land use integration in their long-range plan.

MAJOR GOALS IN 23 REGIONAL LONG-RANGE PLANS

Goals Mentioned	Count
Improve accessibility or mobility	9
Maintain or preserve infrastructure or system	7
Improve performance or efficiency	6
Improve environment/air quality/energy use	5
Increase transit use	3
Reduce or manage congestion	3
Economic development or growth	3
Increase capacity	2
Integrate land use	2
Improve reliability	2
Support community values	1
Promote societal benefits or values	1
Provide choices or options	1
Connectivity	1
Prioritize projects	1
Financial prudence	1
Modal balance	1
Security	1
Quality of life	1
Total	51

Source: *Are They Ready? Regional Growth and Transportation Investment;* ULI-commissioned research.

occur faster in suburbs and at regional fringes, but urban cores also will experience substantial numerical growth.

- As annual per-capita transit spending increases 45 percent from $132 to $191—about the same as anticipated traffic growth—annual per-capita highway spending goes up by just 8 percent from $230 to $250, well behind anticipated population and traffic growth.

- Highway expenditures elucidated in long-term plans total about $590 billion, slightly less than transit. Moreover, the expansion in highway capacity is largely through toll roads and congestion prices, which are relatively uncommon today with little experience of driver response.

- Despite higher transit investments and new highway user fee strategies, overall highway congestion is expected to double in most regions, with most suburbs facing even higher increases in traffic volumes. Two cities—Seattle and San Diego—anticipate a decrease in congestion: they "predict large and unlikely shifts in travel behavior." In aggregate, "the plans seem to fall considerably short of dealing realistically with anticipated highway traffic growth."

- Plans do not adequately address the physical condition of highway and transit systems. Only three plans report data on the current condition of roads and only one region (New York/New Jersey/Connecticut) assesses future road and bridge conditions. Many plans reserve significant funds for maintenance and preservation, but capital expansion initiatives take precedence.

- Several states—Colorado, Washington, Arizona, Texas, Pennsylvania, California, Florida, and Georgia—have initiated reviews of transportation needs or congestion-reduction assessments, but only Texas and Georgia have taken action to develop plans to reduce congestion.

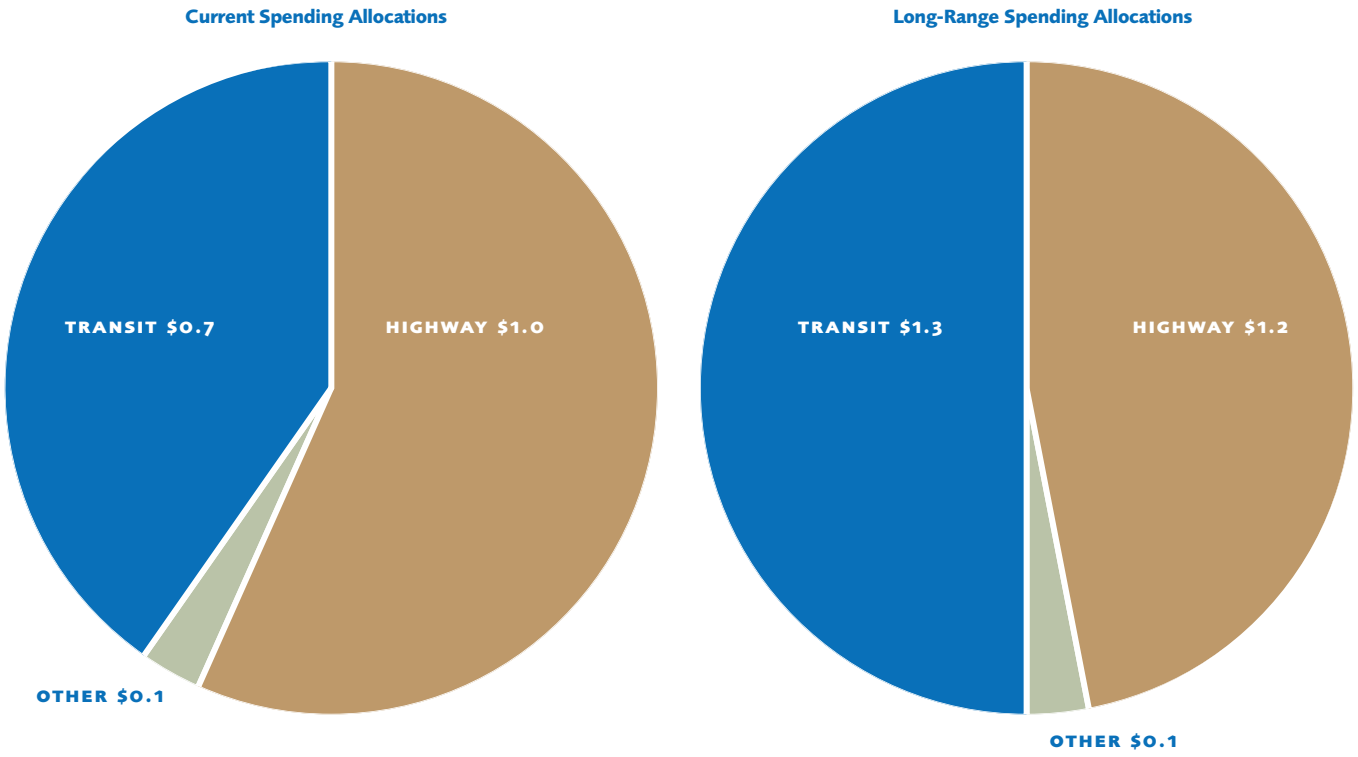
- In many plans, public/private partnerships appear as the primary means for expanding highway capacity through high-occupancy toll lanes, priced or managed lanes, and new toll roads. Some regions, including Denver, Miami, Minneapolis, San Francisco, and Washington, D.C., begin to explore public/private transit initiatives.

- Two cities—New York and San Francisco—consider downtown congestion pricing zones, and three—Portland, Seattle, and Denver—have in place or have developed plans for urban growth boundaries.

- Several regions undertake port access and freight corridor initiatives. Miami plans an ambitious seaport access expressway, New Jersey studies a "Portway" truck road into New York harbor facilities, and Atlanta and Los Angeles consider truck tollways. Only St. Louis discusses potential impacts from globalization and no regions anticipate effects

FIGURE 18. **The country is witnessing a historic shift away from highway spending and toward transit spending.**

AVERAGE ANNUAL FUNDING ALLOCATIONS FOR REGIONS STUDIED (IN US$ BILLIONS)



Source: *Are They Ready? Regional Growth and Transportation Investment;* ULI-commissioned research.

on freight traffic from the widening of the Panama Canal, which could shift more tonnage to deepwater East Coast and Gulf Coast ports.

According to a leading consultant, "Transportation plans seem to fall short of their basic purpose to chart and provide adequately for future needs. On the transit side, plans need to be more realistic about behavioral shifts, weighed against rising capital and operating costs. On the highway side, plans need to focus on the expected growth wave, which cannot possibly be managed by outlined strategies. "[In return for a $1 trillion–plus investment], we should get measurable and significant improvements in congestion, safety, and condition, but that is not likely with most present plans."

Regional Highlights

Regions embrace varied long-range objectives in their planning and budgeting. Older cities with substantial existing networks like New York and Chicago place priorities on maintaining aging infrastructure over new projects. For southern California highway centers—Los Angeles and San Diego—improving traffic flow gets the most attention. Atlanta and Houston—Sunbelt suburban agglomerations built around interstates and road networks—also focus on controlling congestion and enabling mobility. Philadelphia, Phoenix, and Providence cited safety as their primary concern. Only Sacramento emphasized "supporting smart land use" as the main goal. Overall, the top long-term regional concerns are improved mobility and infrastructure preservation. Increasing capacity and integrated land use receive scant mention. The plans place bets on congestion schemes and user fees to produce mobility gains rather than road building; new projects focus on light-rail transit.

- Most regions plan significant transit expansions with minimal changes in highway programs—new road rights-of-way are impractical and expensive in built-out areas, and increasing mass transit ridership over car use is preferred. Subways are expensive, but aren't as disruptive above ground. Light rail can operate on existing street systems.
  - Legacy/large network transit regions planning expansions: San Francisco and Washington, D.C.
  - New transit/smaller network regions planning expansions: Los Angeles, Dallas/Fort Worth, Atlanta, Phoenix, San Diego, Houston, Minneapolis/St. Paul, St. Louis, Sacramento, and Milwaukee.

You could be on the train or on the road—your choice.

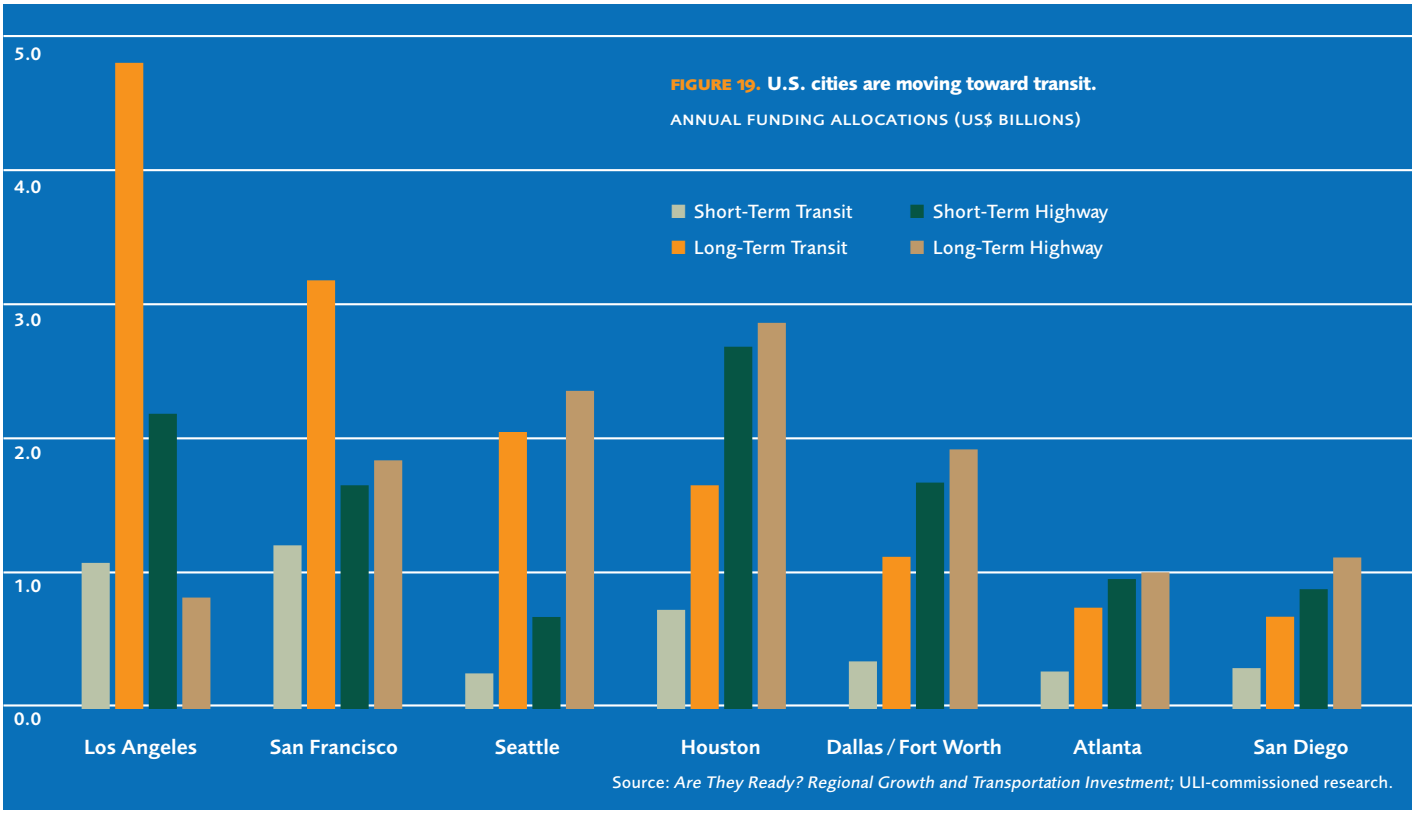


FIGURE 19. U.S. cities are moving toward transit.
ANNUAL FUNDING ALLOCATIONS (US$ BILLIONS)

Source: *Are They Ready? Regional Growth and Transportation Investment;* ULI-commissioned research.

- San Diego plans a modest increase in highway funding; most expenditures focus on expansion and maintaining existing roads. The region predicts lowered congestion levels.
- Dallas, San Francisco, and Chicago expect modest congestion increases.
- Despite transit initiatives, the following regions expect significant increases in congestion: Phoenix, Minneapolis, Los Angeles, Atlanta, Portland, Washington, and New York/New Jersey. These cities plan either modest highway expansions or no highway expansions. Los Angeles anticipates a drop in highway spending and Portland, which recently completed an extensive light-rail system, expects cutbacks in transit.
- Denver plans to quintuple annual road spending, but reduce transit spending by 20 percent after completion of its current network under construction. Most highway spending goes toward operations and maintenance. Road congestion nevertheless increases from significant traffic growth.
- Philadelphia's expected doubling of highway and transit spending will be insufficient to accommodate expected increased traffic growth, 32 percent over current levels.
- Sacramento anticipates major congestion increases upwards of 127 percent, despite planned hikes in transit and highway spending.
- Houston expects traffic to double, but pins hopes on transit and highway funding to control congestion increases.

Part Four
Paying the Way

It still all comes back to money—finding enough of it to pay for all needs. And the equation doesn't change. Ultimately, the public must pay for infrastructure maintenance and improvements through sales, property, and income taxes, and various types of tolls and user fees. Governments can delay or string out payments by funding projects through bond issues, but those bills ultimately come due for future generations of taxpayers. Private operators may pay the government for concessions and take on project risk, but they charge users to make their appropriate profit. You can't get something for nothing.

Lessons from Europe

The United Kingdom instituted public/private partnership (PPP) strategies more than 20 years ago under the Thatcher government, and interest from European countries has steadily gained momentum since then with a recent uptick in activity. Financing volume in the European PPP market (excluding the U.K.) grew by one-third during the first half of 2007, mostly for transport projects, after the PPP market size increased 37 percent in the 2005–2006 period. Spain, France, and Italy have privatized many motorways, and now the EU looks for PPP participation to accelerate the implementation of connectivity projects. A new program has been established to help governments develop PPP projects that can meet guidelines for funding support from the European Investment Bank and other EU entities. Germany steps up PPP activity as the government gears up to address maintenance and refurbishment projects, while Greece and new EU members from poorer countries in eastern Europe like Bulgaria and Slovakia employ PPP structures to upgrade systems closer to the quality of those of their western neighbors.

A new report estimates that PPPs provide funding for about 15 percent of infrastructure projects in Europe. But some ministers fret: "Consultants dominate the field and government does not have enough embedded expertise." Private financing may move expenditures off public balance sheets, "but [this] is not necessarily wise." "The role of government remains key," says an interviewee. Government has to provide the framework to make the overall system work and connect to best advantage. Private funders and operators focus on their one-off projects. When it comes to transport concessions, they want to maximize revenues for their segments, which may conflict ultimately with integrated planning for rails, roads, transit, and air routes. High-speed rail, for example, has affected airport volumes in some secondary markets. Agreements on existing concessions cannot be allowed to block necessary new projects, which might eat into investment returns if they are built.

China's Model

Until recently, China's sudden transformation from rice paddies to industrial power was funded directly by the government treasury. But the headlong foray into building networks of roads and rails, new ports, airports, dams, and power grids could not be sustained at the $150 billion annual pace. Running out of cash and taking some pages out of the capitalist playbook, this totalitarian communist state fashioned its own hybrid financing model, creating corporations to develop and manage infrastructure projects. The government owns the corporation as a shareholder together with private entities and local governments participating in the venture. These private shareholders may be international firms or more likely army leaders or well-connected party elites who manage the projects and get them built. All owners earn returns on the same pro-rata basis, sharing risks and rewards. These corporations can be taken public as initial public offerings (IPOs), and the government directs proceeds back into other projects. The China Railways IPO, for example, raised $3 billion in 2007. And Hong Kong uses the "government as shareholder model" to build new railways

Chunnel Value

From a project economics standpoint, the 31-mile (50-km) Channel Tunnel (Chunnel) unquestionably looks like a bust. Completed in 1994, the $15 billion sub–English Channel railway passage linking England and France still operates in the red after repeated financial restructurings. An extraordinary engineering feat boring the world's second-longest underwater tunnel, it is one of only two investments on which the European Investment Bank has ever lost money in its 50-year history. Opponents to government outlays for major infrastructure initiatives can effortlessly point to the Chunnel and Boston's smaller-scale "Big Dig" as egregious examples of cost overruns and fiscal irresponsibility ultimately at taxpayers' expense.

Saddled with paying off onerous debt, Chunnel operators and shareholders continue to grapple with the necessity of implementing high toll charges, which result in freight and other traffic volumes well below original projections. But the Chunnel enables greater Eurozone connectivity essential for facilitating more efficient and faster movement of people and goods, relieving congestion at ports and airports, while avoiding the vicissitudes of unpredictable regional weather. More business transacts between Europeans capitals, and tourist travel has been facilitated. And the Chunnel shows signs of meeting its formidable potential, especially for passenger trains.

Connecting Britain to the continent by rail and road had been an obvious economic imperative for nearly two centuries. Since 1800, various regimes and entrepreneurs had contemplated a channel passage seriously, but various wars and engineering conundrums led to repeated false starts and dashed expectations. In the post–World War II period, officials overcame national security hurdles, finally pushing forward with excavation. The potential outweighed the obstacles and the costs. Simply put, "It had to be done," said an interviewee, to meet the needs of the next 50 to 100 years.

Despite missed forecasts, more than 2 million cars and 1.3 million trucks shuttle through the tunnel annually, and passenger travel on high-speed Eurostar trains continues to grow, exceeding 8.2 million riders in 2007 with a 15 percent revenue increase over 2006. Train trips from London to Paris take about two hours and 15 minutes center city to center city, and rail travel now eclipses planes as the favored mode between these global business centers. Rather than being a white elephant, the Chunnel cements its promise as an essential part of Europe's integrating transport system, which increasingly takes advantage of high-speed rail technologies.

Already popular, London to Paris or Brussels rail service got a big boost in November 2007 when the U.K. leg began running on the country's first high-speed line out of a refurbished international terminal in St. Pancras Station. The St. Pancras facelift cost $1.6 billion. Eurostar trains can now ply the English countryside to the southeast coast at speeds above 180 miles (288 km) per hour, cutting 45 minutes off previous travel times. Trains slow down temporarily in the Chunnel to about 100 miles (161 km) per hour before accelerating again in France. For many riders, taking the train instead of the plane has become a no-brainer, with coach tickets pricing out at about $100 one way. It's possible to travel more reliably door to door between these cities in comfortably less time than the flying alternative.

Located in north London just east of Regent's Park, St. Pancras is a gorgeous, gingerbread brick Victorian church–like edifice with a magnificent glass roof that is easily reachable by the city's vast network of "Tube" trains. Even with its Paddington Express rail line, Heathrow Airport cannot compete in accessibility and drivers take their chances with inevitable congestion on roads to London's airports. Time-constrained business travelers particularly like avoiding airport security checks—the railway employs a modified passport control and screening process that speeds passengers through X-ray machines. And the airy new international terminal boasts all the comforts of cushy airline waiting areas.

Except in extraordinary storms, trains avoid weather snafus that can derail airline or hydroplane schedules, especially in rainy northern Europe. Cellphones, BlackBerries, and laptops function on most of the passage, although tunnels can interrupt service. The train doubles and triples speeds of cars along passing motorways, and the bar car is available at all times for food and drink without the obstacles of turbulence and seat belt requirements. Arrival at Gare du Nord Paris leaves passengers steps away from connections to the city's major Metro and RER lines or a ten-minute walk to the Opera House. Hourly train service can accommodate upwards of 1,000 passengers—three to four times what a typical passenger jet can carry—and the railway boasts of its environmental benefits on ticket folders: "Traveling on Eurostar . . . releases ten times less CO_2 emissions than flying between destinations."

Many essential large-scale infrastructure ventures may never pencil out without factoring long-term multiplier effects of increased commerce and interactivity that substantially outweigh upfront costs and early losses. The Chunnel arguably represents an essential loss-leader project that should help propel European economic synergies for many decades to come.

Despite critical infrastructure failures and the sheer necessity of consensus, shoring up political will to repair infrastructure in the United States is a major challenge.

along highways with stations, forming hubs in high-rise residential districts. "The U.S. and the rest of the world could learn a thing or two about financing its infrastructure needs from, of all places, China."

The United States Starts to Focus

The United States has endured two recent reality checks about its deteriorating infrastructure—Katrina and Minneapolis. People died because poorly maintained levees burst and a bridge collapsed. The incidents scared the public, and politicians held hearings. Engineers were sent out to inspect overpasses and bridges in every state—they found plenty of problems to reinforce the 2005 American Society of Civil Engineers report card, which graded the nation's roads (D), bridges (C), and dams (D), hardly reassuring marks. After a month or so of hand-wringing and posturing, the headlines diminished and the politicians went back to talking about "no new taxes" and "cutting spending." Now, the country enters an economic downturn, the job picture sours, gasoline prices soar, and inflation takes off—nobody has the stomach to pay more for anything, taxes and tolls included. Recent reports attribute the Minneapolis tragedy to poor design, not necessarily a lack of maintenance. People rationalize that maybe fixing things can be put off after all. And worsening congestion and a few more potholes—well, that's just a fact of life; these things have been happening for years.

"People called me up after Minneapolis and thought I'd be inundated," said an infrastructure fund manager. "But I'm not busy. We're doing deals like parking lots instead of roads. The reality check hasn't registered yet." Says another interviewee: "We will need to suffer more crises to change attitudes; it has to become more obvious before we do something, and we're not there yet."

Despite the discouraging U.S. political environment, some progress is occurring, particularly at the state and local levels, where politicians call for increased investment and start to generate support for or at least discussion of various infrastructure initiatives:

- California passes an infrastructure bond issue, recognizing the need to upgrade roads, levees, and public buildings.
- Texas and Florida hire private companies to build and operate new toll roads and Virginia moves to toll some lanes.
- New York City attempts (and fails for now) to enact congestion pricing for its Manhattan business district, targeting

FIGURES 20–22: Breakdown of All Transportation Infrastructure Deals Involving PPPs, January 2006–February 2008

FIGURE 20. Ten largest transactions in 2007.

PROJECT NAME	PROJECTED VALUE (US$M)	COUNTRY
Iefsina-Corinth-Patras-Pyrgos-Tsakona Motorway Peloponnese Road	$3,000	Greece
M6 & M60 Motorway Expansion PPP	1,588	Hungary
Maliakos Kleidi Toll Road PPP	1,234	Greece
London Underground Northern Line PPP Refinancing	1,218	United Kingdom
Quadrilatero II Lotto Motorway	982	Italy
Interstate 95/495 Virginia HOT Lanes PPP	937	United States
Tyne Tunnel Crossing PPP	835	United Kingdom
Milan Metro Line 5 II Maxilotto SA/RC	818	Italy
Brussels-Schaerbeek-Mechelen Diabolo Rail Links PPP	801	Belgium
M3 Clonee to Kells Road PPP	776	Ireland
Total	$12,189	

FIGURE 21. Type of PPP transactions worldwide, January 2006–February 2008.

(US$ BILLIONS)

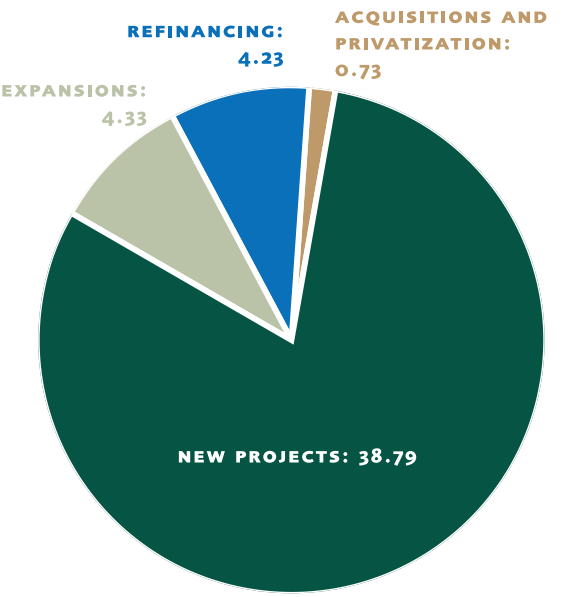
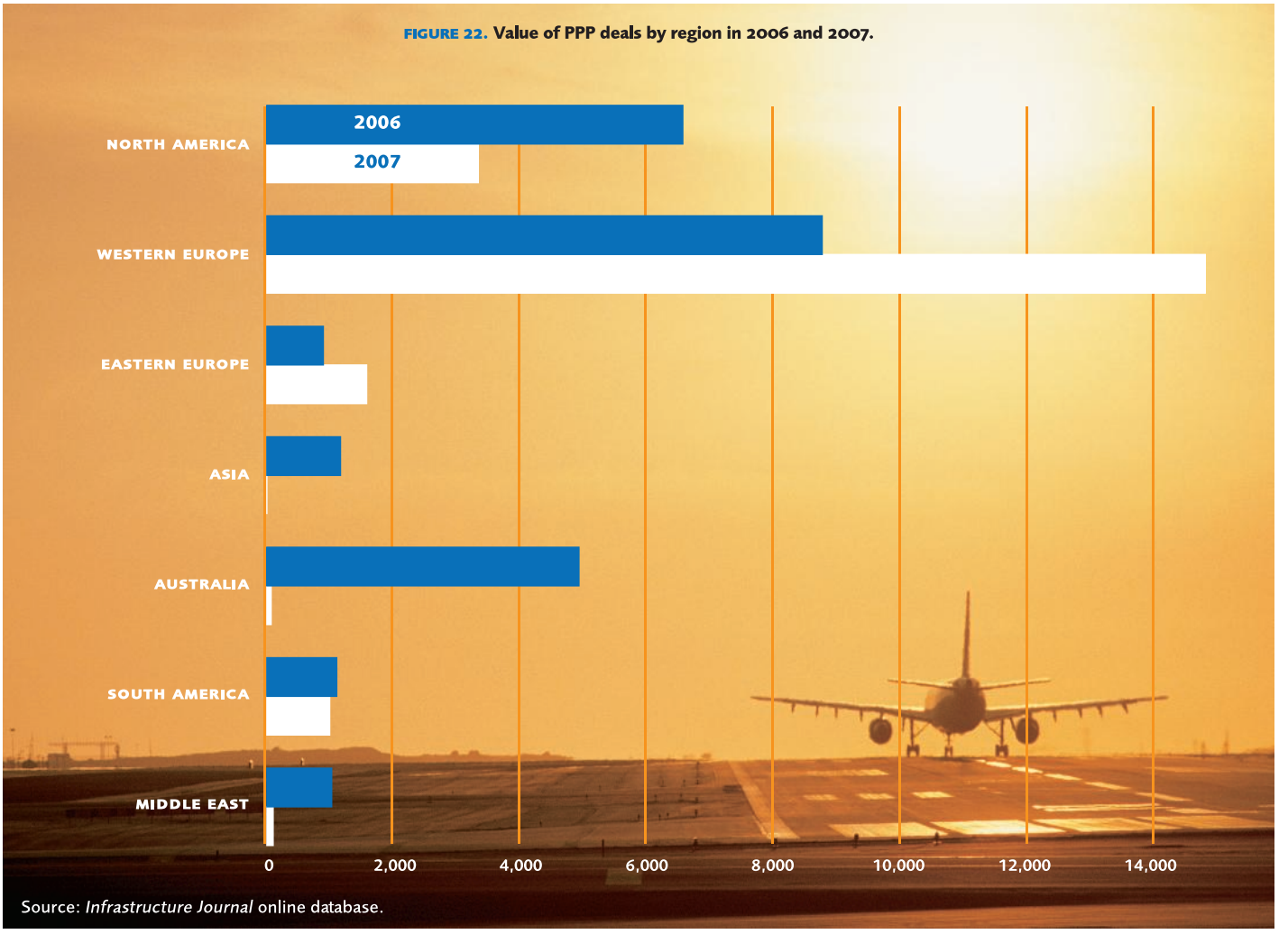


FIGURE 22. Value of PPP deals by region in 2006 and 2007.



Source: *Infrastructure Journal* online database.

proceeds for new subways and bus lines to areas without mass transit. Other cities including San Francisco, Seattle, Minneapolis, and Miami consider congestion pricing zones.

- Governors in New Jersey and Pennsylvania jawbone for raising turnpike tolls.
- Presidential candidates debate increased infrastructure spending to stimulate economic growth and provide jobs during a recession.
- President George W. Bush hints at support for direct user fees and more tolls to replace the sunsetting federal gas tax, which funds the Highway Trust Fund.
- A bill is introduced in the Senate to create a national infrastructure bank to finance projects of substantial national or regional significance that are not adequately served by existing funding sources. Other proposed legislation calls for "Build America Bonds" to pay for transport infrastructure.
- Governor John Corzine of New Jersey announced a plan to consolidate the state's small municipalities in order to facilitate regional planning and find efficiencies.

Though sporadic and unfocused, these proposals and actions set the stage for dealing with the country's infrastructure issues. Looming Highway Trust Fund insolvency will force debate about how to pay for the country's roads and mass transit systems and draw attention to immense funding gaps. The federal gas tax–supported highway and transit trust funds account for nearly 40 percent of the nation's road and transit funding. Politicians who are loath to increasing the gas tax, one of the lowest in the industrialized world, may latch onto user fees as a solution for raising necessary revenues.

Jobs Program

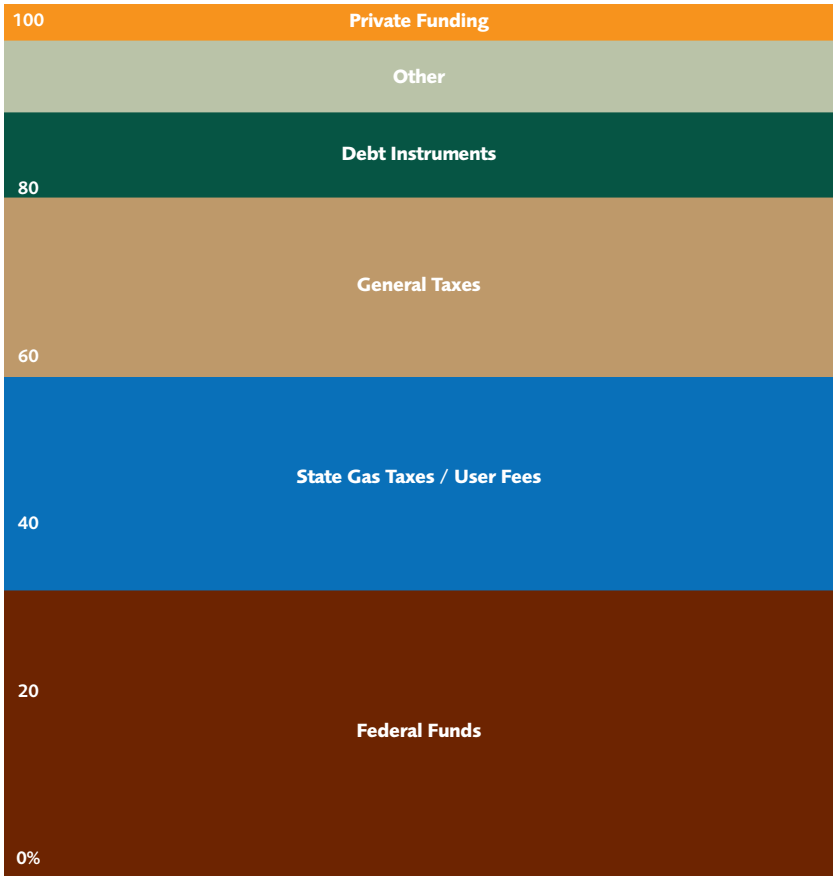
Depending on election results and the potential for enduring economic weakness, funding jobs programs related to rebuilding infrastructure could gain political traction as part of a stimulus program that reduces unemployment. "A jobs program can be a means to an end, a powerful tool for economic development, funding future infrastructure to increase employment and improve economic competitiveness." If properly directed, short-term funding could address upgrading and refurbishing high-need roads, tunnels, bridges, and other facilities identified to be in less than satisfactory condition.

FIGURE 23.

Regions still expect to receive the majority of funding from familiar sources.

EXPECTED FUTURE FUNDING SOURCES FOR FUTURE INFRASTRUCTURE PROJECTS (NEXT TEN YEARS)

Source: ULI Survey of Metropolitan Planning Organizations, January–March 2008.



Airport Financing Turns Nowhere into Somewhere

Public/private infrastructure collaborations have not been confined to industrialized nations or countries like India with substantial emerging growth potential. For more than a decade, Egypt has used build-own-transfer (BOT) financing structures to secure necessary infrastructure investment without sapping its fragile national treasury. But creating a tourist destination on a barren sand strip, located closer to Sudan's border than to Cairo, presented particular funding and logistics challenges for Egypt's aviation and tourism officials.

By the mid-1990s, the realities facing a cash-starved government had stymied efforts by Egypt's Ministry of Tourism to jump-start its grand plan—a new resort area along isolated southwestern Red Sea coastline. The ministry had identified a seaside stretch harboring some of the world's finest coral formations, tropical fish habitats, and a snorkeling/scuba diving paradise. The ministry's problem was how to get people there. Near an obscure fishing village called Marsa Alam, this desolate desert patch dotted with Bedouin huts needed a first-class international airport as well as basic utilities before any developers would chance building hotels and other tourist amenities. And there was no way the government could pay for a big-ticket transport project even if it meant building on the success of earlier resort developments.

During the 1980s and early 1990s, Egypt enjoyed success by expanding its tourist industry beyond the pyramids and ancient Nile River sites to alluring Red Sea resort-style locales. By attracting foreign investors, developers, and hotel companies, the government transformed Sharm El Shiekh on the Sinai Peninsula and Hurghada east of Cairo into popular sun-and-fun "party" destinations catering to both domestic and European mass-market vacationer segments. More like Fort Lauderdale than South Beach, Sharm and Hurghada had not created upscale environments to compete against high-end Mediterranean, Caribbean, and South Seas resorts. The ministry's Marsa Alam strategy would target this more affluent segment.

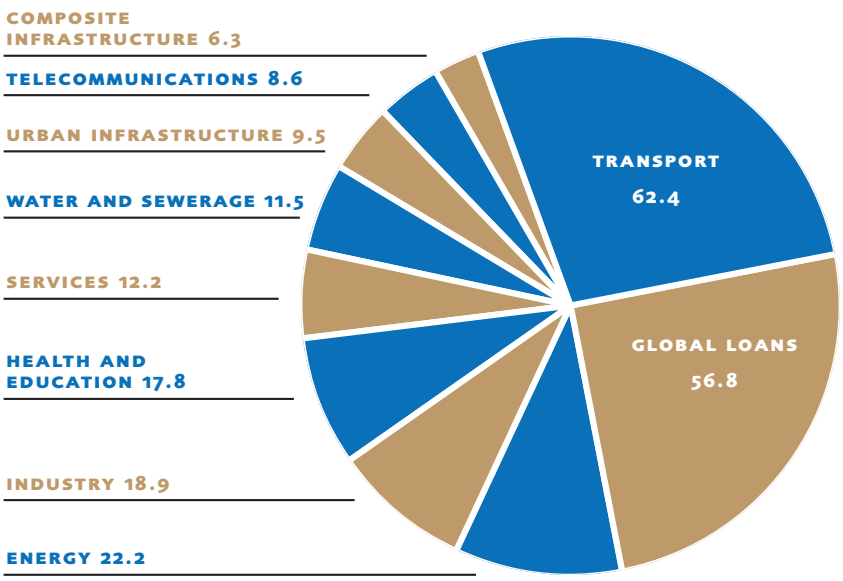
Up against a wall, Tourism and Transport officials borrowed from BOT concepts that had funded major power projects, transferring risks from the government to the private sector. But the airport project had to be economically viable to attract any capital—a tough sell considering only 800 hotel rooms existed in an area without basic services like water, power, telecommunications, and sewage treatment. Tendered in 1997, the venture attracted little interest except from a Kuwaiti company, M.A. Kharafi Group, which had greater designs.

Kharafi struck a deal with the government to build a $160 million international airport as well as power, telecom, and water treatment facilities in return for a 40-year concession on the airport and development rights to an adjacent $2.5 billion master-planned resort branded as "Port Ghalib." Encompassing 301.3 million square feet (28 million sq m), the development ultimately is slated to feature 12 hotels, the Middle East's largest private marina, retail malls, a convention center, vacation apartments, and condominiums. Kharafi secured financing from foreign sources without tapping stressed Egyptian banks. The government invested nothing and incurred no debt, but receives a share in landing fees, generating sought-after foreign currency flows, and from various airport franchises—parking, shops, and restaurants.

So far, airliner and passenger traffic into Egypt's first privately owned airport has increased from 23 flights and 2,900 passengers in 2001, the year when the field opened, to nearly 5,000 flights and 642,000 passengers in 2007. Hotel rooms, some rated four and five stars, now total 11,500. Jobs in the area have increased to 34,000 from only 2,400 in 1998. The airport accommodates 767 airliners and attracts regular weekly flights from diverse European capitals including Paris, London, Vienna, and Brussels as well as Cairo. Indeed, the BOT-financed airport project has met the government's objective—establishing a new tourist destination that provides jobs and attracts euros and dollars into the country's hard-pressed economy without having dented the national treasury for any contribution.

FIGURE 24. **The European Investment Bank is involved in all aspects of infrastructure finance, with transportation being the largest.**

ALLOCATION AND VALUE OF EIB FUNDS FOR PAST FIVE YEARS (BILLIONS EUROS)



Source: European Investment Bank.

Infrastructure Bank

A U.S. infrastructure bank might provide a solution for helping fund a jobs/infrastructure program as well as future large-scale projects. The bank concept could be modeled on the European Investment Bank (EIB), a mainstay of the continent's infrastructure funding for more than 50 years. The EIB has been instrumental in financing major cross-border projects for rails and roads as well as integrating housing and commercial development into transport projects. In 2007, the bank doled out $55 billion. Only two of its projects have recorded bank losses—the Chunnel and London's Canary Wharf—both of which have had transformative economic impacts since completion. Under the Senate proposal, an independent national bank would be financed with a $60 billion bond issue. Up to 50-year long-term bonds would be issued by the bank, aligning with timelines for infrastructure paybacks. As bonds pay off, the bank would be self-sustaining.

A national infrastructure bank could also help integrate policies and planning for large-scale projects with impacts across state borders and municipal jurisdictions. Funding guidelines could be used to encourage various government entities to fall in line with best practices and common-good solutions, and to help sublimate parochial interests.

Coordinated Federal Policy

No more time can be lost. The federal government must set a policy course that enables greater mobility and productivity as the nation's population grows and concentrates in major gateways and megaregions. Congress probably has no desire to reformulate federal bureaucracy, but good arguments can be made for streamlining agencies to break down funding silos and coordinate transport and land use policy, working with state and local governments. At the very least, the 100-plus federal programs doling out money for transport projects need consolidation. Ideally, cabinet-level responsibility should be established for setting national infrastructure priorities, identifying transport corridors, facilitating connectivity between regions, and reducing congestion. Special attention needs to be directed at developing infill housing in emerging suburban nodes near mass transit stations. Dedicated routes must be identified for railroads and trucks to move freight into and out of key seaports and airports. Emphasis needs to be placed on preserving urban and suburban green space, and creating environments that are less car dependent.

"No Flood" of Privatization

After a spurt of concession agreements—the Chicago Skyway and Indiana Toll Road in 2005–2006—and "significant" resulting backlash, state governments temporarily have veered away from embracing PPP transactions for road systems. "The premise was [that] all sorts of activity would break loose after these deals, but it looks like PPPs in the U.S. will be more of an evolution than a revolution." First, drivers naturally objected to increased tolls, and then naysayers argued that Chicago and Indiana didn't get enough in multibillion-dollar payouts for the 75- and 99-year concessions. Labor unions chimed in, railing against private takeovers and even subcontractors resisted—"government always seems to pay for overruns, but private operators might not." Most recently, Texas backed out of a concession arrangement on a state highway outside of Dallas, changing revenue parameters after soliciting bids. For private investors, the bidding process has become too expensive and ambiguous to stoke much enthusiasm.

Now, both government officials and private operators "take a breather" and step back to figure out how to do more deals. Cash-strapped federal and state governments can't afford to turn tail on the estimated $400 billion of buying power available in infrastructure funds, raised by various investment banks and money managers from around the world. Fund managers, meanwhile, hone in on an array of choice road/bridge/tunnel assets throughout the country,

which are proven revenue producers and transport monopolies. "PPPs happened out of necessity in the U.K. and Australia, and slowly the U.S. is figuring it out." The following are various PPP trends and issues that need to be addressed:

- Private operators tout how PPPs shift risk away from taxpayers, but they increasingly shy away from construction deals and refurbishments on tunnels, bridges, and subway systems—"there are too many unknown elements." Consortiums restoring London's "Tube" stations and building a tunnel in Sydney went bankrupt. "Tunnels make for difficult PPPs—soil conditions can be a problem, putting too many risks on the contractor."

- Funds like "no-curveball deals"—building courthouses and schools or taking over existing road concessions where they can add value by finding operating efficiencies or installing new technology.

- Specialist operators of ports and airports have won plaudits throughout the world, but the United States has blocked private managers from running its major transport facilities. The most qualified operators are foreign owned and 9/11-related security concerns create political roadblocks. "It's a fertile field for U.S. companies to enter, but none seem to have sufficient expertise or qualifications."

FIGURE 25.

Almost all regions are receptive toward the use of PPPs to fund infrastructure projects.

How receptive MPOs are toward using PPPs		How MPOs perceptions of PPPs have changed over the last year	
Very receptive	13.6%	Much more favorably	0.0%
Receptive	45.5%	More favorably	18.2%
Somewhat receptive	27.3%	No change	81.8%
Not receptive at all	0.0%	More negatively	0.0%
Agency has not explored use of PPPs	13.6%	Much more negatively	0.0%

Source: ULI Survey of Metropolitan Planning Organizations; January–February 2008.

- Governors want to avoid "Skyway" fallout and focus PPP proposals on toll road construction projects. They figure that drivers won't whine as much over tolls when they get the value-add of a new highway. But higher risk—construction uncertainties and problematic traffic volume forecasts—pencils out to lower bids from funds/operators. "The states need to share the risk or the deals won't fly." Unions have been "more accommodating" on new development initiatives, which create jobs, than on concession takeovers. "The model is rolling out slowly and more states examine al-

High-rise development around Beijing's third ring road shows how Chinese cities are being built today.

An engineering wonder when completed in 1868, London's modernized St. Pancras Station is now the gateway for high-speed rail service to Paris via the Channel Tunnel.

ternatives." Florida, Texas, Virginia, North Carolina, and Georgia have new toll roads under construction or roads in planning stages with private operators.

- Private managers will pay more for established "brownfield assets" in high-travel corridors. They all want a piece of the New Jersey or Pennsylvania turnpikes, two prime interstates with grandfathered toll rights granted to the states. The Tappan Zee Bridge on the New York Thruway just north of New York City also gets noticed. But governors and state legislators could be staking their political futures on putting these cash-cow assets in the hands of private operators. Expect next-generation deals to share revenues and give states more control in overseeing management. Concession terms will be considerably shorter than those for the Skyway and Indiana deals.

- Support builds for Congress to allow states to establish tolls on interstates. Federal law allows only a small percentage of these highways to impose user fees. Such action would open thousands of miles of prime roads to potential concession agreements. Interstate tolls might become more politically palatable for drivers in return for elimination or reduction of the federal gas tax. States would gain a platform to impose behavior-changing user fees and generate sorely needed revenues for infrastructure maintenance and capital projects. Metro planners count on using more PPP-managed user fee systems in long-range traffic management programs.

- Interest diminishes for schemes that raise tolls to cover noninfrastructure-related shortfalls in state budgets. "It's just not good public policy." Governor Corzine's trial balloon in New Jersey dropped like lead, but he used the rejection as cover to make substantial spending cuts in state services. To work constructively and change behaviors, user fee charges should relate to maintaining and improving transport systems.

- The United States needs more experienced public and private-side practitioners to fashion policy for undertaking PPP transactions. "At this point it's all left to lobbyists, not experts." "Pressure mounts for creating a more uniform approach to handle these transactions." A standardized procurement process, used by all states, would facilitate bidding, reduce expenses for bidders, and establish discipline for understanding and reviewing deals. "We're doing it all backwards," says an interviewee. "States are asking private operators to bid without setting any parameters to bid on, and then determining parameters based on the bids." "This is far from ideal." The federal government could help find consensus among states by basing federal funding for projects on meeting federal procurement requirements. "Until this happens, private capital will steer clear. The states will learn."

- Freight railroad companies heavily invest in new tracks and facilities, a harbinger of "returning to pre–World War I times, when the private sector built railroads and commuter lines around cities like New York and Philadelphia." "There's really nothing new about private involvement in building and managing important infrastructure."

AN ACTION AGENDA FOR INFRASTRUCTURE

The Urban Land Institute advances the eight infrastructure principles listed below that will help make communities, regions, and the nation an appealing, competitive, and sustainable place in which to live, work, and play. Policy choices and examples follow as a guide to stakeholders in the achievement of these principles.

1 Build a vision for the community. Lead with a vision. Communities of all levels of affluence deserve high-quality, well-maintained infrastructure and thoughtful civic design. Infrastructure investment should be informed by a long-range vision for quality of life. Encourage strong community participation in the visioning process. Build walkable communities with access to transit to reduce the overall cost of living, increase affordable housing, and create access to good jobs. Encourage strong community building.

2 Invest strategically. Decisions made about infrastructure must begin with land use objectives. Make strategic, performance-based, outcome-oriented investments that support a common regional agenda. Cooperate across jurisdictions to produce infrastructure that encourages population and economic growth. Consider conservation of scarce resources in all investment decisions. Set criteria.

3 Fix and maintain first. Repairing and maintaining existing infrastructure keeps communities healthy and competitive. Invest in existing infrastructure before building new infrastructure. Prior to repair, evaluate old infrastructure against current standards to make sure that good money does not follow bad. Ensure that all investments are performance based. Create a schedule for funding and maintenance and stick to it.

4 Reduce driving. Current infrastructure patterns precipitated growth in urban travel that far exceeds population growth, resulting in congestion, pollution, greenhouse gas emissions, and driving costs. Reduce vehicle miles traveled by promoting projects that encourage bicycling, walking, and the use of public transit. Make drivers pay the full cost. Foster development patterns that provide transportation choices in individual communities rather than merely discouraging travel through congestion charges and tolls. Build transit to serve existing towns before stretching out to scarcely populated areas.

5 Couple land use decisions with water availability. Merge land and water use planning, renegotiate regional water use agreements, and create shared portfolios of water solutions to sustain growth. Advocate for states to actively encourage conservation and find new sources of water, including sharing costs for desalinization and graywater treatment plants. Encourage state and regional agencies to coordinate water use, flood planning, and land use data.

6 Break down government "silos." Governments must integrate infrastructure investment and sustainable land use by mandating cooperation among agencies. Use a regional vision to speak in one voice. Unify capital budgets to coordinate spending. Pool program dollars across agencies. Ensure that standards across agencies are not in conflict. Screen and score infrastructure funding requests, from open space to sewers to schools, through a matrix that encourages smart land use and sustainable development.

7 Pay up. Infrastructure spending must support sustainable land use objectives, rather than promote sprawl. Resist pork barrel spending. Educate and convince voters that their tax dollars support good-value projects with long-range benefits. Create funding policies that lead private investment to desired locations. Apply user fees, rather than subsidies, to influence behavior, reward smart choices, and discourage waste of limited resources. Recognize the full cost of choices and be honest about who is paying for them.

8 Keep score. Reward municipalities that invest strategically in infrastructure and keep local governments accountable. Use scorecards to level the competition for scarce public capital. Fund good projects with strong smart growth and sustainability metrics.

The Urban Land Institute commissioned the Hartgen Group, a transportation consulting firm based in North Carolina, to undertake a review of the latest transportation plans for the largest U.S. regions (i.e., those with 2 million or more residents). The Hartgen Group analyzed how well these plans position their regions to support future population growth. The analysis is based on review of various published planning documents produced by metropolitan planning organizations (MPOs) including long-range plans, transportation improvement programs, congestion management plans, and air quality determinations. The report was completed in February 2008. A list of the regions examined in the report follows:

Atlanta
Boston
Chicago
Dallas/Fort Worth
Denver
Houston
Los Angeles
Miami/Broward County/Palm Beach
Milwaukee
Minneapolis/St. Paul
New York/New Jersey/Connecticut
Orlando
Philadelphia
Phoenix
Portland
Providence
Sacramento
San Diego
San Francisco
Seattle
St. Louis
Tampa
Washington, D.C.

In addition, the Urban Land Institute conducted a survey of MPOs across the country regarding the current and future physical state of each region's infrastructure as well as current and future financing methods. Below is a list of MPOs that responded to the survey:

Atlanta
Atlanta Regional Commission (ARC)

Charlotte
Mecklenburg-Union Metropolitan Planning Organization (MUMPO)

Columbus
Mid-Ohio Regional Planning Commission (MORPC)

Dallas/Fort Worth
North Central Texas Council of Governments (NCTCOG)

Denver
Denver Regional Council of Governments (DRCOG)

Detroit
Southeast Michigan Council of Governments (SEMCOG)

Houston
Houston-Galveston Area Council (HGAC)

Indianapolis
Indianapolis Metropolitan Planning Organization

Kansas City
Mid-America Regional Council (MARC)

Los Angeles
Southern California Association of Governments (SCAG)

Memphis
Memphis and Shelby Division of Planning

Miami
Miami-Dade Metropolitan Planning Organization

Orlando
Metroplan Orlando

Philadelphia
Delaware Valley Regional Planning Commission (DVRPC)

Phoenix
Maricopa Association of Governments (MAG)

Providence
Rhode Island Statewide Planning Program

San Antonio
San Antonio–Bexar County Metropolitan Planning Organization (SA-BC MPO)

San Diego
San Diego Association of Governments (SANDAG)

San Francisco
Metropolitan Transportation Commission (MTC)

Seattle
Puget Sound Regional Council (PSRC)

Tampa/St. Petersburg
Metropolitan Planning Organization of Hillsborough

Virginia Beach
Hampton Roads Planning District Commission (HRPDC)

Interviewees

Frances T. Banerjee
President
Banerjee and Associates

Susan J. Binder
Director
Office of Legislation and Strategic Planning
Federal Highway Administration

Ad J. Buisman
Ernst & Young

John T. Doherty
Chief Executive Officer
Alameda Corridor Transportation Authority

Robert Dove
Infrastructure Investment Team
The Carlyle Group

Brian Field
Planning and Development Adviser
European Investment Bank

Mark Florian
Managing Director
Goldman Sachs & Co.

Douglas Foy
President
DIF Enterprises

Charles E. Howard, Jr.
Transportation Planning Director
Puget Sound Regional Council

Ronald Kirby
Director of Transportation Planning
Metropolitan Washington Council of Governments

Eva Lerner-Lam
President
Palisades Consulting Group

John Miller
Counsel in Construction Projects, Infrastructure, and Finance
Patton Boggs, LLP

James Neal
Ernst & Young

Jack Short
Secretary General
International Transport Forum

Brian Taylor
Director
Institute of Transportation Studies
University of California at Los Angeles

Anne Valentine Andrews
Managing Director and Global Head, Portfolio Strategy
Morgan Stanley

Trent Vichie
Associate Director
Macquarie Securities (USA) Inc.

Sadek Wahba
Managing Director
Morgan Stanley

C. Michael Walton
Ernest H. Cockrell Centennial Chair in Engineering
Department of Civil Engineering
University of Texas at Austin

Tom Warne
President
Tom Warne and Associates, LLC

Edward Weiner
Office of Secretary
U.S. Department of Transportation

Carl Weisbrod
Chair, ULI Infrastructure Initiative
President, Real Estate Division
Trinity Church

Mark A. Weisdorf
Managing Director and CIO
Infrastructure Investments
JP Morgan

Jay Zukerman
Ernst and Young

Forum Participants

Infrastructure and Western Growth Patterns
Los Angeles: September 24–25, 2007

Phyllis Alzamora
Executive Director
ULI Orange County
Hobbs Institute, Chapman University

Bill Anderson
Director
Planning & Community Investment
(City of San Diego)

Ramin Assa
Chief Knowledge Officer
Urban Land Institute

Frances T. Banerjee
President
Banerjee & Associates

Ross W. Barker
Vice President
Psomas

Frank Beck
Chief Development Officer
CENTRA Properties, LLC

Gayle Berens
Senior Vice President
Urban Land Institute

Rick Bishop
Executive Director
Western Riverside COG

George R. Bosworth
Executive Director
ULI Arizona

Suzanne Cartwright
Director, Community Outreach
Foster Pepper PLLC

Cheryl Cummins
President of the Americas
Urban Land Institute

James J. Curtis III
Principal
Bristol Group, Inc.

John Doherty
Chief Executive Officer
Alameda Corridor Transportation Authority

Bob Dunphy
Senior Fellow
Urban Land Institute

William Eager
President
TDA Inc.

Marge Fahey
Director, Media Relations
Urban Land Institute

Douglas I. Foy
President
DIF Enterprises

Joan Gladstone
President and Chief Executive Officer
Gladstone International

Marta Goldsmith
Senior Vice President
Community Outreach
Urban Land Institute

Richard M. Gollis
Principal
The Concord Group, LLC

Greenlaw "Fritz" Grupe
Chairman
The Grupe Company

John S. Hagestad
Managing Director
Sares-Regis Group

Philip Hart
Executive Director
ULI Los Angeles

Rick Haughey
Senior Research Director
Center for Balanced Development in the West

John H. Hodgson
President
The Hodgson Company

Michael Horst
Senior Vice President
District Councils
Urban Land Institute

Con Howe
Managing Director
Cityview

Gregory W. Hummel
Member
Bell, Boyd & Lloyd, LLC

Gregory K. Johnson
President
Wright Runstad & Company

David Kerr
Managing Director
Infrastructure Investments

Frederick A. Kober
Chairman
The Christopher Companies

Carl Koelbel
Research Associate
Urban Land Institute

Michael F. Leccese
Executive Director
ULI Colorado

Mary M. Lydon
Executive Director
ULI San Diego

Kelly Mann
Executive Director
ULI Seattle

Franklin A. Martin
President
Martin Community Development, LLC

Maureen L. McAvey
Executive Vice President
Initiatives Group
Urban Land Institute

Carmen McCormick
District Council Manager
West Region Office

Laurin McCracken
Chief Marketing Officer
Carter & Burgess, Inc.

Larry McKenney
Vice President
Watershed Management
RBF Consulting Inc.

Ellen M. McLean
Managing Director
Infrastructure Initiatives
Urban Land Institute

Seth Merewitz
Shareholder
McDonough Holland & Allen PC
Attorneys at Law

David A. Miller
Chief Executive Officer
Architects Hawaii, Ltd.

Emogene Mitchell
Senior Vice President
Meetings and Events
Urban Land Institute

Leslie F. Morton
Regional Vice President
Psomas

Ehud Mouchly
Vice President and General Manager, California/Nevada
UniDev, LLC

Tom Murphy
Senior Fellow
Urban Land Institute

Louise Nelson Dyble
Associate Director for Research
The Keston Institute for Public Finance and Infrastructure Policy
School of Policy, Planning, and Development
University of Southern California

George S. Nolte
President and Chief Executive Officer
Nolte Associates Inc.

John Olivier
Regional President
Fuscoe Engineering Inc.

Jerry Palmer
President
Alpha Community Development/Plaza West

Anthony J.H. Pauker
Regional President
The Olson Company

Dale Anne Reiss
Global & Americas Director of Real Estate
Ernst & Young

Richard M. Rosan
President, ULI Worldwide
Urban Land Institute

Shannon Scutari
Governor's Policy Adviser for Growth & Infrastructure
Phoenix, Arizona

Rizwan Sheikh
Associate
The Concord Group, LLC

Eric C. Shen
Director
Transportation Planning & Development
City of Pasadena, California

Stephen B. Smith
Architect/Planner
GSBS PC

Steve Speights
Principal
Psomas

Richard B. Stephens
Principal
Alpha Community Development

Gerard P. Tully
Senior Project Manager
Psomas

Marilee A. Utter
President
Citiventure Associates LLC

Carl Weisbrod
President
Real Estate Division, Trinity Church

Kate White
Executive Director
ULI San Francisco

Sunne Wright McPeak
President and Chief Executive Officer
California Emerging Technology Fund

Tim Youmans
Principal
Economic & Planning Systems

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SENIOR EXECUTIVES

Richard M. Rosan
President, ULI Worldwide

Cheryl Cummins
President, ULI Americas

William Kistler
President, ULI Europe

Maureen McAvey
Executive Vice President, Initiatives

Rachelle L. Levitt
Executive Vice President, Information Group

ULI–the Urban Land Institute
1025 Thomas Jefferson Street, N.W.
Suite 500 West
Washington, D.C. 20007

Telephone: 202-624-7000
www.uli.org

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GLOBAL REAL ESTATE LEADERSHIP

Dale Anne Reiss: Global Director of Real Estate, +1 212 773 4500

Howard Roth: American Leader of Real Estate, +1 212 773 4910

Mike Lucki: Global Infrastructure Leader, +1 949 437 0380

Anne Rabin: Americas Infrastructure Leader, +1 212 773 0192

James Neal: Infrastructure, +44 (0) 20 7951 6333

Chris Lawton: Infrastructure, +1 212 773 6020

Ad Buisman: European Real Estate Coordinator, +31 55 529 1428

Dean Hodcroft: Northern Europe, Middle East, India, and Africa, +44 (0) 20 7951 4870

Michael Hornsby: Continental Western Europe, +352 42 124 8310

Hartmut Fründ: Central Europe, +49 6196 99 62 6351

Soo Hock Teoh: Far East, +60 37495 8717

Tom Brown: Japan, +81 3 3503 2093

Stephen Chubb: Oceania, +61 2 9248 4799