

## Sustainable Infrastructure: Is making our infrastructure more sustainable one solution to the funding challenge?

As the nation is determining a vision to guide federal surface transportation policy and funding well into the future, we examine the role sustainability will play in this new era. Creating a more sustainable system can provide a solid foundation for a fuller vision of our country's infrastructure future and generate cost efficiencies that aid in the overall funding needed to maintain and operate this system.

A growing need to improve our transportation system and the global sustainable movement are forcing a more sustainable approach to reduce long-term maintenance and operations costs.

According to HNTB's America THINKS surveys conducted in 2009 and 2010, 64 percent of Americans are willing to pay more today for national infrastructure that is energy-efficient and less wasteful in order to save money and resources in the future, up from 58 percent in November 2009. And, 96 percent of Americans agree all new construction should take sustainability into consideration.

More than 81 percent of Americans agree making sacrifices to pay for infrastructure improvements now will make the difference between a more prosperous or a more difficult future for the next generation. Almost 68 percent are willing to pay more taxes to support highway and bridge maintenance and new construction. In fact, the average American would part with \$22 a month to reduce the time spent in traffic by 20 percent.

As reported in HNTB's America THINKS surveys, regardless of the approach, most of the country sees value in sustainability as a movement. More than 76 percent feel that large-scale infrastructure developments with sustainability in mind are an important investment for future generations. Fifty-one percent said they would be willing to add some amount to their yearly taxes to ensure new construction within their region was sustainable, averaging approximately \$256.

The need for more efficient and flexible transportation systems to support the nation's economy and quality of life continues to be a priority. At the same time, climate change, energy security, diminishing natural resources, and questions about long-term transportation financing raise concerns about the long-term viability of our current approaches to designing, constructing, and maintaining our infrastructure. That is why many roadways, airports, and rail projects now include green aspects.

The adoption of sustainable practices is becoming commonplace in the aviation industry.

The City of Chicago's Department of Aviation developed a Sustainable Airport Manual, which incorporates best practices, new technologies, and lessons learned from six years of design and construction on the \$8 billion O'Hare Modernization Program. The manual also includes contributions from more than 195 airport executives, environmental experts, and industry leaders.

Santa Barbara Airport's new \$60 million terminal, to be completed in 2011, will be one of aviation's first to receive LEED® Silver, if not LEED Gold, certification by employing a range of sustainable initiatives. Among its strategies, the municipal airport will exceed LEED requirements and reduce its water use by 40 percent, in part, by using 100 percent reclaimed water for its trademark lush landscaping. The conservation measure is possible because of the airport's proximity to a wastewater treatment plant.

The strategies get even more creative as airports leverage their geographic locations for alternative energy production:

- Las Vegas' proposed Ivanpah Airport master plan will take advantage of solar power;
- Hawaii's Kona International Airport has the ability to leverage deep ocean water to cool its terminal building; and

- Mid-Century Airport in Wichita, Kan., is studying the use of wind turbines, which could generate enough electricity to help light its parking garage.

Today's airports have a growing manifest of sustainable strategies from which to choose with the economic payback from these measures ranging from two to 20 years.

### 1. Water management

These water management and conservation techniques can result in lower utility costs and sanitary sewer district fees:

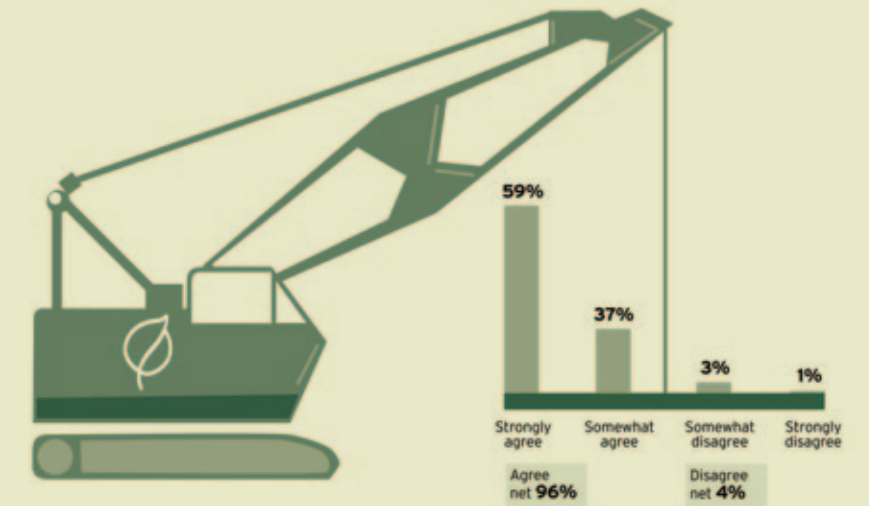
- Bioswales that remove silt and pollution from surface runoff;
- Low-flow plumbing fixtures, such as automatic faucets and waterless urinals;
- Cisterns that reduce runoff, provide irrigation and decrease flooding downstream;
- Recycled wastewater used for landscape irrigation, vehicle washing, and other non-potable activities;
- Pervious paving that percolates rainwater back into the ground aquifer; and
- Landscape vegetation that grows without supplemental irrigation.

### 2. Energy and atmosphere

These tactics help airports lower operating and maintenance costs by reducing energy use or transition to alternative energy sources:

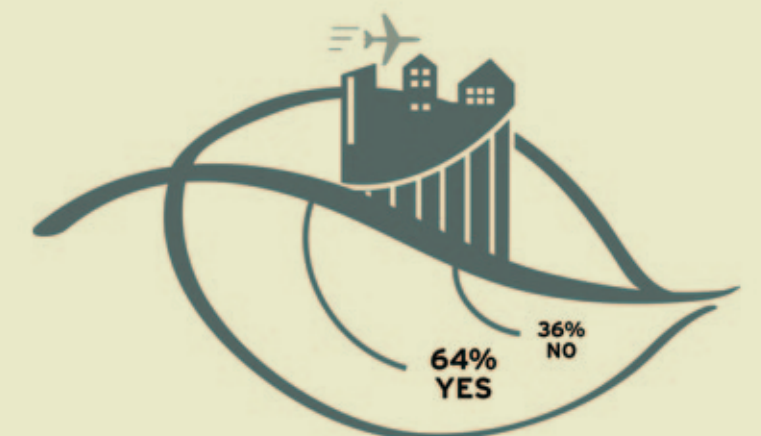
- Highly efficient and variable speed motors for baggage systems, moving walkways, escalators, and other airport systems, which combined consume 60 percent of a terminal's energy;
- Efficient light fixtures, such as LEDs, daylight harvesting sensors, motion sensors, and timers;

Q. How strongly do you agree or disagree with the following statement: All new construction should take sustainability into consideration.



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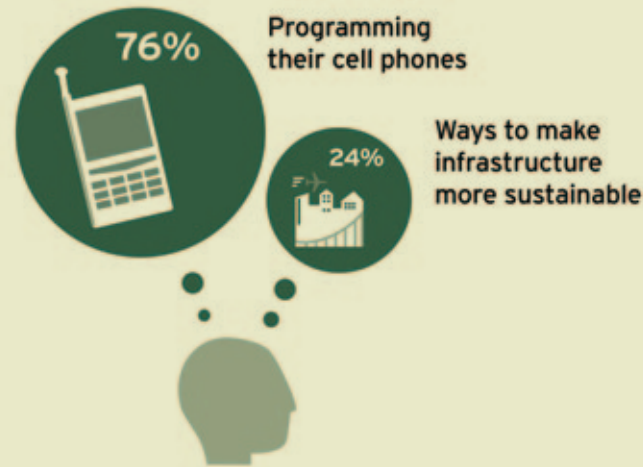
Q. Keeping the state of the U.S. economy in mind, are you willing to pay more today for national infrastructure that is energy-efficient and less wasteful in order to save money and resources in the future?



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Q. Which of the following do you think Americans understand better?



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- Automated building management systems driven by flight activity can power down HVAC and electrical systems when a terminal is not in use;
- Pre-conditioned air and 400-hertz ground power gate systems allow airlines to turn off their aircraft auxiliary power units, reducing air emissions and fuel costs;
- Mass transit, such as light rail stations, can reduce congestion and fuel consumption; and
- Electrical- and biodiesel-powered aircraft ground service equipment can save fuel.

### 3. Alternative energy production

Airports can generate their own power and lower their long-term utility costs with:

- Solar thermal power that heats water or converts steam to electricity;

- Thermal energy storage systems that produce and store ice at night to chill water and cool the terminal building during the day;
- Cogeneration plants that generate electricity using steam and other waste heat;
- Fuel cells that produce electricity from waste products;
- Wind turbines that generate electricity; and
- Vegetative roofs that reduce the “heat island effect” generated by dark-colored roofs.

### 4. Materials and resources

Recycling demolition materials, such as concrete, is probably best associated with this category. Other strategies include:

- Using products with recycled content, such as carpet, asphalt, and wood sheathing;

- Procuring local and regional materials that reduce shipping and fuel costs during transportation; and
- Building with certified wood, which comes from forests managed by strict environmental, social, and economic standards.

As agencies seek ways to save costs, increase efficiencies, and enhance construction techniques, more of them are seeking sustainability as a way to accomplish these goals.

Although the definition of sustainable surface transportation varies, there are many techniques being undertaken to improve infrastructure in a sustainable manner. This includes:

- Recycled material, such as pulverized rubber tires, plastics, glass, and broken concrete used as road surface and underlays;
- Habitat preservation that includes roadside native plantings;
- Green drainage that diverts water to rain gardens, which ultimately filter it back as groundwater;
- Green lanes dedicated to buses, ride-sharing commuters, and energy-efficient vehicles;
- Permeable pavement that helps keep stormwater infiltration at preconstruction rates, recharges the local aquifer, effectively cleans roadway pollutants, and strains suspended solids from runoff;
- Road lighting that is self-generated from wind or solar applications and that uses energy efficient LED fixtures;
- Recycled coal fly ash that serves as a mineral filler in asphalt paving applications; and
- Plastic-fiber reinforced concrete that increases structural integrity and density.

The King County Department of Transportation in Washington is applying a more systematic green building strategy with the design of its new South Park Bridge. Green building elements include river-bank restoration, efforts to minimize the in-water footprint of bascule piers, and a low-impact development strategy for the bridge’s stormwater management system.

Other sustainable features include:

- Solid concrete bridge decking that will enhance traction and convey polluted roadway runoff to the low-impact development features for treatment before discharging it back to the river;

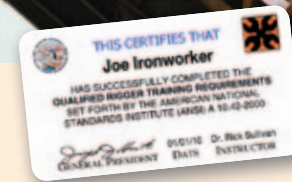
- Lightweight concrete on the bridge’s moveable spans, which requires smaller motors and consumes less energy;
- Ecological restoration and improved public access along the riverbank; and
- Extensive use of recycled plastic materials in place of treated wood for the bridge protection piers.

Once the bridge is constructed, King County anticipates these sustainable construction techniques will result in lower operating costs over time that total between \$3.5 million to \$6.9 million, along with lower greenhouse gas emissions estimated at 36 tons annually.

Today’s transportation agency understands that sustainable transportation infrastructure is not only inevitable—it could be a welcome solution for stretching long-term operating and maintenance budgets while meeting public expectations for a greener world. [CM](#)

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