



# Global Efforts on **GREEN** Highways and Bridges

by M. Myint Lwin, Federal Highway Administration

On April 22, 1970, millions of Americans of all ages and from all walks of life, from coast to coast, participated in the first Earth Day celebration—a celebration of the enactment of a very important legislation, the National Environmental Policy Act (NEPA) in January 1970. On that day, millions of Americans made it clear that they were deeply concerned over the deterioration of our environment and the dissipation of our natural resources. That was the time when rivers caught on fire and cities were covered with dense clouds of smoke.

The first Earth Day had brought about major and lasting changes in improving and protecting our environment and our natural resources. The U.S. Environmental Protection Agency (EPA) was established on December 2, 1970, to provide stewardship and oversight of environmental protection standards and national environmental goals. Congress passed legislation and enacted into law: the Clean Air Act, the Water Quality Improvement Act, the Water Pollution and Control Act Amendments, the Resource Recovery Act, the Resource Conservation and Recovery Act, the Toxic Substances Control Act, the Occupational Safety and Health Act, the Federal Environmental Pesticide Control Act, the Endangered Species Act, the Safe Drinking Water Act, the Federal Land Policy and Management Act, and the Surface Mining Control and Reclamation Act, new emission standards, cleaner fuels and engines, and so on. (Please see *ASPIRE*™ Fall 2008 for more details on the missions and accomplishments of the EPA).

On April 22, 2009, people from around the world celebrated Earth Day with a common hope of creating a greener, cleaner, and healthier environment.

## Partners in Green Highways and Bridges

FHWA is one of many partners, including federal and state regulatory and transportation agencies, consultants, contractors, industry groups, academic institutions, and nongovernmental organizations,

working on improving the natural, built, social, and environmental conditions, while addressing the functional requirements of the highway infrastructure. The key is to meet the mobility and safety needs of the traveling public, while protecting or enhancing the environment and assuring the livability and sustainability of our communities.

In the design, construction, operation, and maintenance of highway facilities, it is suggested to consider at least the following in the promotion of and the development of guidelines for “green highways and bridges”:

- Improving highway safety for motorists and wildlife by reducing collisions with wildlife
- Maintaining wildlife habitat connectivity across highway facilities
- Attention to safety, durability, mobility, and economy
- Compliance with environmental and preservation laws and regulations
- Application of context-sensitive solutions
- Sustainable site selection and planning
- Utilization of high-performance and environmentally friendly materials, and quality workmanship
- Safeguarding air, water, soil, and wetland quality
- Conservation of materials and resources
- Avoidance of negative impacts on the ecosystems

## Green Highways and Bridges in Europe

An interdisciplinary delegation of federal, state, and conservation group representatives visited some European countries including Switzerland, Germany, and France. Although each country uses different approaches to address “green highways and bridges” issues, they have formed an international network to share information. The Infra Eco Network Europe (IENE) is an initiative for creating a transport infrastructure that harmonizes with the surrounding landscape. Here are some approaches to “green bridges” in some European countries.



*Pond and vegetation on a Swiss green bridge.*

### Switzerland

Switzerland’s transportation and environmental programs have a long history of research and actions related to wildlife. Swiss actions are scientifically based, supplemented by hunter information. Swiss scientists have completed geographic information system-based identification of wildlife habitat and corridors nationwide, pinpointing bottlenecks and voids in connectivity. They characterize the wildlife corridors as impacted, impaired, or interrupted, with only one-third categorized as intact.

The Swiss use a variety of structural and nonstructural measures. Vegetated overpasses, called “green bridges” or “ecoducts,” are a preferred structure for maintaining habitat connectivity. Swiss research demonstrates that the diverse habitats on “green bridges” provide important connectivity for a broad spectrum of species.

Many of the “green bridges” are of multiple uses, accommodating forestry roads and wildlife. The structures are monitored using standard approaches, such as animal tracks and photography, and evolving technologies including infrared video. The video makes it possible to record the behavior of the animals while using the structures. The Swiss research indicates that “green bridges” with a width of 164 ft or greater are used by the widest variety of species and the animals exhibit natural behavioral characteristics when using the structures.

### Germany

Landscape planning plays an important role in identifying protected flora and fauna and mitigating impacts to the natural environment. The Germans apply landscape ecology principles to highway

planning in areas where adjacent land use and distribution can be expected to change because of highway development. All proposed detrimental changes to natural areas require compensation measures. Three kinds of compensation are possible: in-kind, off-site, and compensation fees (in-lieu-fees), in that order of preference.

Legal requirements in Germany necessitate wildlife fencing (needed because many highway stretches have no speed limits), signing, underpasses, green bridges, and land conservation as mitigation for highway facilities. Germany has one of the largest numbers of “green bridges” in the European countries. The overpasses vary in width from 28 ft to 2854 ft. Forest and agricultural roads cross about half of Germany’s “green bridges.”



*Germany's green bridges.*

Germany builds extensive projects, such as fences and crossing structures to keep amphibians and other small animals away from roads. More than 100 such projects for small animals were completed nationwide. The Germans also report that more than 130 “green bridges” over rivers were designed to accommodate wildlife passage and keep the animals away from the traffic lanes. The Germans are very thorough in considering every detail in determining what and where to construct a “green bridge.”

## France

The French Transportation Ministry’s primary objective when looking at transportation and wildlife issues is to increase motorist safety. Approximately 30 deaths per year result from collisions with animals. The French consider motorist safety as a major reason for measures to keep animals off the highways.

The French have taken numerous measures to reduce wildlife collisions. Fencing for wildlife is required on all federal highways. Permanent signage has not been effective in reducing wildlife mortality, and measures such as reflectors and vehicle-mounted whistles generally are ineffective. “Green bridges”

*French green bridge and fencing.*



are used as structural alternatives. France has been developing and building “green bridges” for wildlife since the 1950s.

## China's Green Highways and Bridges

China’s green highways and bridges are integrated into the master plans for their eco-cities. Integration is the theme in planning the eco-cities. Roads and bridges are considered at the same time as parks and health care. They are interrelated—the more convenient and attractive to walk or bicycle to parks or work, the less air pollution, the healthier the people, the lower the health care costs, and the more productive in the factories.

China’s developer, Shanghai Industrial Investment Corporation (SIIC) contracted with Arup, the British engineering consulting firm, to design and master plan Dongtan, an eco-city on Chongming Island close to Shanghai. Dongtan is one of four eco-cities envisioned in China. The cities are planned to be ecologically friendly, with zero greenhouse-emission transit and complete self-sufficiency in water and energy, together with the use of zero-energy building principles. Energy demand will be substantially lower than comparable conventional cities due to the high performance of buildings, roads, and bridges, and a zero-emission transport zone within the city. Waste is considered to be a resource and most of the city’s waste will be recycled.

Dongtan proposes to have only green highways and bridges along its coastline. People will arrive at the coast and leave their cars behind. The people then travel on foot, by bicycle, or on sustainable public transportation vehicles. The only vehicles allowed in the city will be powered by electricity or hydrogen. When completed, this eco-city will house up to 500,000 inhabitants.

The development of Dongtan will incorporate all of the economic, social, and environmental principles, and the “green highways and bridges” concepts. This will reduce the impact on the natural environment and provide a model for healthy living for future development across China. Dongtan aims to be a post-industrial, sustainable city of the highest quality.

## Closing Remarks

Great global efforts are devoted to applying the concepts of “green highways and bridges” to design, construction, operation, and maintenance of transportation facilities to improve livability and sustainability of the communities and wildlife habitats. “Green” or “sustainability” is everywhere. Nearly all current concrete seminars or conferences focus on

“green” or “sustainability.” The owners of bridges are demanding it.

The Precast/Prestressed Concrete Institute (PCI) has an educational seminar on sustainability. It provides training on sustainability and stresses its importance to the construction industry. In the PCI Annual Bridge Design Award Competition, there is an award category on “Best Sustainable Design” to bring awareness of the significance of sustainability in concrete construction, and promotes the use of “Green Bridges” concepts in concrete bridge design.

The American Concrete Institute (ACI) dedicated the February 2009 edition of Concrete International to “Green Concrete.” In October 2008, ACI conducted a survey of over 1100 members to obtain more information on involvement and interest in sustainability. Sixty-seven percent of the respondents indicated they were professionally involved with sustainability and related issues, while 89% were personally interested in sustainability and related issues. Seventy-seven percent of the respondents thought sustainability design and construction would become increasingly important and would be required globally at increasing rates.

One of the four FHWA strategic goals is on System Performance: the nation’s highway system provides safe, reliable, effective, and sustainable mobility for all users. FHWA is committed to improving the performance of the highway system—as part of a fully integrated, multimodal transportation system—to levels needed to achieve national economic, security, energy, environmental, and other goals.

In his confirmation hearing in February 2009, the new Secretary of the U.S. Department of Transportation, Ray LaHood, outlined four key themes for his tenure as Secretary. In addition to economic recovery, which is of primary immediate concern, and safety, which is always an important part of the mission of the department, Secretary LaHood suggested that sustainability and livability would be hallmarks of his policies.

Finally, we must use green design and construction principles in the building of new highways and bridges and in the rehabilitation of existing highway facilities for the benefits of the present and future generations!



U.S. Department of Transportation  
Federal Highway Administration