2-1-2014

Engaging Transportation Students in Florida’s Future Corridors Initiative

CUTR

Follow this and additional works at: https://scholarcommons.usf.edu/cutr_reports

Scholar Commons Citation
CUTR, "Engaging Transportation Students in Florida’s Future Corridors Initiative" (2014). CUTR Research Reports. 64.
https://scholarcommons.usf.edu/cutr_reports/64

This Technical Report is brought to you for free and open access by the CUTR Publications at Scholar Commons. It has been accepted for inclusion in CUTR Research Reports by an authorized administrator of Scholar Commons.
For more information, please contact scholarcommons@usf.edu.
Principal Investigator
Kristine M. Williams, AICP

Faculty Advisors
Jason Bittner, USF Center for Urban Transportation Research
Trent Green, USF School of Architecture and Urban Design
Abdul Pinjari, PhD, USF College of Engineering
Yu Zhang, PhD, USF College of Engineering

Graduate Students

Team A
Casey Jarrell, Civil Engineering
Mohammadreza Kamali, Transportation Engineering
Singeh Saliki, Urban and Regional Planning
Christian Stanley, Architecture

Team B
Patrick Buddenbrock, Civil Engineering
Jessica Djaha Mata, Urban and Community Design
Noureddine Elmehraz, Computer Science and Engineering
Daniel Shopf, Urban and Regional Planning

Team C
Nikhil Menon, Transportation Engineering
Josh McDonald, Global Sustainability
Eric Pohlman, Urban and Community Design

Disclaimer
The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Florida Department of Transportation or the U.S. Department of Transportation.
Engaging Transportation Students in Florida’s Future Corridors Initiative

This report includes visionary concepts produced by University of South Florida graduate students for future transportation corridors in Florida. The project was made possible by a grant from the Florida Department of Transportation (FDOT). The concepts are presented here for consideration by FDOT and interested stakeholders as part of the statewide Future Corridors initiative—an effort to proactively plan for the future of Florida’s major transportation corridors over the next 50 years.

The project engaged three multidisciplinary teams (Team A, B, and C) of engineering, planning, and architecture students with an interest in transportation and asked them to prepare visionary design concepts that answer the following question: “What would a future corridor look like and how might it operate?” Faculty advisors guided the student visioning process, and students were given full creative license throughout the project. In addition to this summary report, each student team prepared posters and presented their concepts to FDOT. The students wish to express their sincere appreciation to FDOT for the opportunity to help shape Florida’s future transportation system.

The Future Corridors initiative is a statewide effort led by the Florida Department of Transportation (FDOT) to plan for the future of major transportation corridors critical to the state’s economic competitiveness and quality of life over the next 50 years. This initiative builds upon the 2060 Florida Transportation Plan, which call for planning a transportation system that maintains our economic competitiveness by meeting current and future transportation needs for moving people and freight.

Northwest Florida
Tampa Bay to Northeast Florida
Tampa Bay to Central Florida
Southwest Florida through the Heartland to Central Florida
Southeast Florida through the Heartland to Central Florida

flfuturecorridors.org
We envision an environmentally-friendly corridor that accommodates the movement of both people and goods, which will in turn help to create a better economy. This vision includes the addition of a dedicated truck lane, modular sections in the roadway, implementation of a smart roadway, and intermodal stations to promote connectivity within and between three major cities along the corridor.

The proposed concepts in this vision consider future trends. Emerging technology affecting transportation, including autonomous and electric vehicles, was considered. The concepts also apply green engineering and environmentally-friendly designs aimed at reducing emissions, fuel consumption, and energy use. The Tampa Bay to Central Florida corridor was selected as the focal point of this futuristic vision. According to FDOT, this emerging “super-region” is now the 10th largest region in the U.S., making it an important candidate for application of new and innovative strategies.
The three most populated cities in this corridor, Tampa, Lakeland, and Orlando, will be equipped with intermodal centers. These intermodal centers will bring together all the possible modes of transportation available throughout the corridor.

High speed rail will connect each of these intermodal centers in these three cities. Local bus systems and bus rapid transit will serve the intermodal hubs, and more routes will give people additional options for using these modes. Therefore, the intermodal centers in all three cities will incorporate local bus and bus rapid transit modes.

It is also proposed that the Tampa and Orlando stations add a bike sharing program and an autonomous carpooling option. The autonomous carpooling option will allow people arriving at the Tampa and Orlando intermodal centers to use an autonomous car to travel to areas with others who need to travel to those same places. This option will be particularly useful for the elderly, people with disabilities, and people who use rail to commute to other cities for work. The autonomous carpooling option and bike sharing program can be easily implemented into the Lakeland station in the future as demand grows.

With all of these options being conveniently located in one place, people will be more inclined to use public transportation as opposed to a personal vehicle.
Innovative Strategies

- Autonomous Vehicles
- Tarmac 2.0
- Modular Roadway Design
- Intermodal Centers
- Truck Lane

I-4 is the primary focus for this vision. The first concept proposed for improving I-4 is to implement modular sections. These modular pavement sections can be gradually implemented over time by replacing damaged pavement areas with pre-made roadway sections. Generating the sections by using 3D printing will allow for easier off-site creation. Beneath the modular sections will be an arterial plenum space, allowing for the placement of utilities.

Moreover, some parts of I-4 can benefit from installing a smart roadway known as Tarmac 2.0. This advanced roadway system has the capabilities of harvesting solar energy, charging electric vehicles, and is equipped with dynamic LED lights that respond to traffic conditions. All of these concepts promote the use of electric vehicles, making for a greener environment. Tarmac 2.0 can be placed at one mile lengths every 10 miles along I-4, allowing for electric vehicles traveling over long distances to get the charge they need to reach their destination.

Freight movement can be improved by adding a dedicated truck lane along I-4 that will separate truck traffic from general use lanes, better accommodating roads trains of autonomous trucks. This application will benefit freight providers through reduced cost through increased freight movement capacity. General-use lanes will benefit from this added truck lane by the resulting increase in visibility and a reduction in congestion. The truck lane will be separated from the general-use lanes by a solar panel guard rail, capable of harvesting solar energy.
This corridor will be enhanced by offering new public transportation modes. High speed rail along I-4 will provide a fast way for people to travel throughout the corridor. Guarding the high speed rail will be berms equipped with solar panels, allowing for harvesting of solar energy for street lights and transmission back to the grid. The high speed rail will require ground level and above grade conditions. The elevated rail will be placed where it is necessary for the rail to travel above existing roadways. The ground level section will allow the high speed rail to exit the median to reach its destination - the intermodal centers - where people can then choose one of many available modes of transportation to continue on with their travel.
“To develop an environmentally friendly multimodal design for future rural, suburban, and urban corridors that can be applied throughout the state as new construction or as a retrofit.”

In 2060, we envision environmentally-friendly corridors that connect people and goods to urban places through a variety of transportation modes. Our design concept for future corridors integrates smart green technology and promotes mixed-use development to enhance economic growth.

To reduce vehicular emissions and environmental degradation attributable to transportation facilities, we have incorporated natural resource systems and “complete street” strategies in the design of future corridors. We believe that this type of design will prove to be more popular and more sustainable than current designs.

“This vision was developed by the following graduate students:

Patrick Buddenbrock
Civil Engineering

Nouredinne Elhmeraz
Computer Science & Engineering

Jessica Djaha Mata
Urban and Community Design

Daniel Shopf
Urban and Regional Planning

“In this vision corridors are designed to be technologically smart, environmentally friendly and safe for all users.”
The red corridors in the map on the left are Florida’s Strategic Intermodal System (SIS) highways that were heavily congested in 2009 during peak periods. The map on the right shows expected SIS congestion levels in 2035. Even after making all of the roadway improvements in the SIS Cost Feasible Plan, the roadways outlined in red are expected to be heavily congested.

Strategies and Innovative Technologies

Our design focuses on the accommodation of all users and is applicable both to Florida’s existing corridors and proposed future corridors. Through implementation of the innovative pavement and materials technologies and best practices noted below, these corridor designs will revolutionize the way corridors are developed in Florida and across the United States. The next section illustrates urban, above grade highway, suburban, and rural corridor concepts with these strategies in mind.

- Permeable Pavement with Cisterns to Collect Water
- Interactive Lighting
- Glow in the Dark Lines
- Electric Inductive Charging
- Solar Powered Street Lights
- Piezoelectric Lanes
- Dynamic Paint
- Intelligent Networked Highways
The urban corridor concept promotes various modes of transportation through strategies such as the inclusion of transit only lanes with signal priority, integrated bicycle lanes, promoting a mix of land uses, and encouraging infill development.

Above Grade Highway Concept

The above grade highway concept incorporates parks and open space below the highway with easy pedestrian access to transit stops, piezoelectric energy generation, smart technology for bus stops, and transit-only express lanes.
Suburban Corridor Concept

The suburban corridor concept promotes mixed use development, incorporates bioswales and rain gardens to collect and filter stormwater runoff, stimulates infill development, and integrates “complete street” strategies.

Rural Corridor Concept

The rural corridor concept integrates food distribution through rail systems, incorporates green energy farming, installs interactive roadway lighting, and develops waste collection systems for agricultural purposes.
Our vision is for transportation corridor planning in Florida to shift from a focus on movement of cars to movement of people. With population growth, energy uncertainty, and environmental changes, Florida cannot afford to focus the majority of its resources on accommodating individual automobiles. If Florida is to continue growing in population and expand its tourism industry, a more efficient and cost effective, yet realistic, transportation corridor design is needed for the future. That design should accommodate several modal alternatives, including various types of public transportation that can move large numbers of people over long distances into and through densely developed urban corridors. These strategies are detailed on the following pages.
Innovative Strategies and Trends

Movement of People, Not Cars

Future corridors should aim at movement of people instead of the movement of cars. Built on the lines of a sustainable tomorrow, the corridor aims to provide solutions for the mobility of a growing population. The future corridor designed in this manner is set to directly influence urban form and community character. Such a corridor has the power to influence urban form and function, quality of life in a community, and energy consumption.

MultiModal Transportation

A multimodal network integrates different geographical scales, from the global to the local. The future corridor should aim at providing a range of transportation choices for the everyday user. An ideal system is one in which the user has more than one modal option to access a particular place. Recent studies by the American Public Transportation Association (APTA) show encouraging trends from the Millennial generation on their attitude towards the use of multimodal transportation options.

Public Transportation Options

The main focus of the future corridor should be to curb the dependency of the road users on their private vehicles. American Public Transportation Association (APTA) has shown that Millennials are ready to make the shift toward public transportation if their expectations are met. This calls for a sustainable multimodal strategy to support the economic growth and prosperity of the region’s communities, while dealing with the problems pertaining to congestion, emissions, and safety for travelers.
**Proposed Urban Arterial Concept:** This concept allows for multiple modes of transportation, while at the same time encouraging street level business and community interaction. This design strives to optimize existing modes of transportation, without adding exorbitant cost. Wider sidewalks, dedicated bicycle lanes, street amenities and accommodations, and fewer storefront parking spaces are noticeable traits.

**Proposed Suburban Corridor Concept:** The design facilitates several modes of transportation, and as with the urban arterial concept, encourages pedestrian interaction. Again, noticeable traits will be wider sidewalks and less on-street parking. Additionally, a dedicated lane for bus rapid transit will be employed where feasible.
Proposed Interstate Concept: This corridor concept accounts for rail stations, commuter rail, and a dedicated automated freight lane, in addition to general use lanes. The concept emphasizes safety and modal options for long distance travel.