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RESEARCH PROJECT TITLE

Iowa's Renewable Energy and
Infrastructure Impacts

SPONSORS

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PRINCIPAL INVESTIGATOR

Konstantina Gkritza
Asst. Prof. of Civil Engineering
Iowa State University
515-294-2343
nadia@iastate.edu

MORE INFORMATION

www.ctre.iastate.edu/

CTRE

Iowa State University
2711 S. Loop Drive, Suite 4700
Ames, IA 50010-8664
515-294-8103

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Iowa's Renewable Energy and Infrastructure Impacts

tech transfer summary

Iowa's growing bioeconomy could have significant impacts on Iowa's rural transportation infrastructure.

Objectives

- Estimate traffic growth and pavement deterioration due to Iowa's growing renewable energy industries in a multi-county area.
- Develop a traffic and fiscal impact model to help assess the impact of additional biofuels plants on Iowa's transportation system.
- Suggest public policy changes to local governments in order to provide adequate infrastructure for the renewable energy industries.

Problem Statement

Iowa has become a leader in renewable energy, particularly biofuels (e.g., crop-based ethanol) and wind energy. A new "bioeconomy" is thus rapidly evolving in Iowa.

The impacts of this bioeconomy on Iowa's roads and bridges could be significant. In one respect, the large, heavy turbine components and machinery used to construct Iowa's wind farms must be transported along rural roads and bridges. The turbine components are meanwhile increasing in size and weight. In another respect, Iowa's transportation system may be further strained by the next generation of biofuels—cellulosic biofuels made from switchgrass and corn cobs—which could increase the quantity of raw material shipped on Iowa roads.

The costs of renewable energies for Iowa's transportation system include the costs for maintaining roads as well as the costs of enticing a company to build a biofuels plant or wind farm within a jurisdiction. Often, Iowa's counties and cities pay for the bioeconomy.

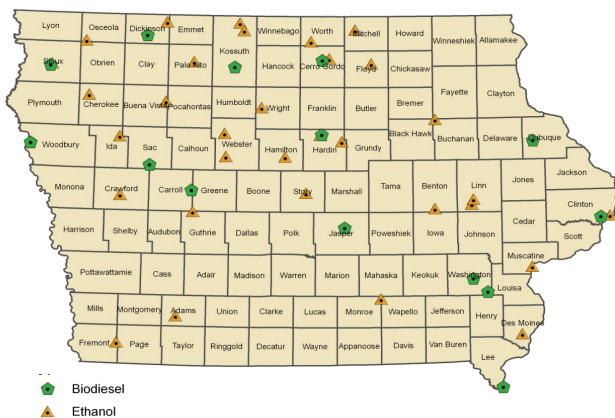


Electrical transformer en route to a wind energy tower contributing to rutting (Photo courtesy of Mitchell County)

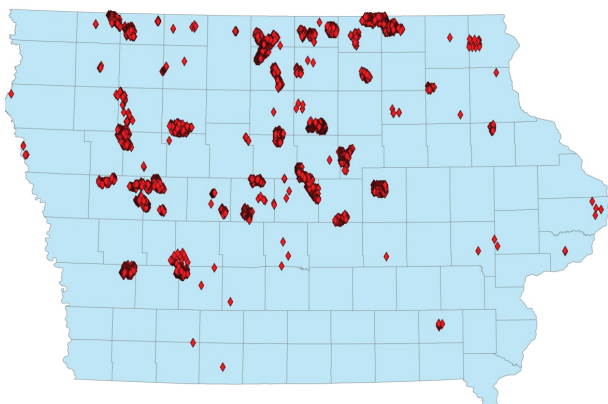
Research Description

A total of 96 of Iowa's 99 counties responded to a survey regarding the types of biofuels production plants or wind energy farms in place, under construction, or in the planning stage. County engineers from Worth, Mitchell, Cerro Gordo, and Floyd Counties in north-central Iowa and Des Moines and Lee Counties in southeastern Iowa were selected for in-depth interviews. During the interviews, county expenditures for pavement repair, granular and blading, and winter and bridge maintenance were examined. Historical maintenance cost data from the Iowa County Engineer's Service Bureau were used to determine cost trends before and after biofuels plants and wind farms were constructed in that county.

The researchers also designed an impact calculator to determine the incremental cost of new traffic generated as a result of a biofuels plant based on plant capacity, quantity of raw material, and pavement thickness data. Impacts were also visualized using geographic information system (GIS) tools.



Biodiesel and ethanol processing plants in Iowa as of 2008



Wind turbines in Iowa as of 2009

Key Findings

- County paved road systems typically experienced deterioration around a biofuels facility within a couple years of the plant opening.
- For wind farms, the major damage occurred during construction activities and predominantly on gravel roads.
- Expenditures for pavement repairs and maintenance increased during and after plant construction.
- Counties lacked adequate revenues to continue full maintenance on all roads.
- Counties lacked formal evidence to support their impression of increased bridge deterioration and shortened life due to additional haul loads.
- The impact calculator estimates the number of truckloads and maintenance costs, but does not factor in the impacts of construction/plant maintenance traffic or safety-related costs (e.g., adding turn lanes).
- Turning radii for local roads should be considered thoroughly as wind turbine lengths increase.
- County road maintenance expenditure data reporting is not standardized, which sometimes complicated the estimation process.

Recommendations

- Cooperate and communicate with cities adjacent to plant sites regarding annexations that may be necessary early in the process so that future tax revenues (or loss thereof) may be considered in economic analysis.
- Consider using Tax Incremental Financing (TIF) districts as a short-term tool to produce revenues within a local jurisdiction.
- Conduct regular pavement evaluations on a county's system to help compare pavement condition before and after a plant's opening.
- Consider more effective ways to tax (assess) the industry to offset additional costs to the local jurisdiction, such as a tax or fee per bushel of corn, gallon of product, kilowatt hour, or per-axle-weight-mile.
- Consider changes to local government public policies, such as regulations regarding acceptable locations for renewable energy plants, and to policy administration, such as standardizing the reporting of expenditures.

Implementation Benefits

Examining the renewable energy industry and its impact on Iowa's transportation system can help counties predict how their infrastructure needs and expenditures will change when a biofuels plant or wind farm is constructed in their jurisdiction.