

## **I. RESEARCH PROJECT TITLE**

The Economics of Potential Reduction of the Rural Road System in Kansas

## **II. GENERAL PROBLEM STATEMENT**

When the county road grid was established in Kansas each road was used by a large number of households and farms operating small vehicles. Today each road is used by a small number of households and farms operating large vehicles. In many counties the road and bridge characteristics are not sufficient to handle the stresses of the larger vehicles.

It is well known that Kansas agriculture has consolidated into fewer and larger farms due to economies of scale from larger farming operations. The increased size of farms has been accompanied by increasing vehicle size as well. Tractor and combine weight and width has increased and the great majority of farmers deliver their grain in semi trucks. Tandem axle trucks are used to deliver farm supplies. Declining rural population has caused school districts to use larger buses to transport fewer children over longer distances to consolidated schools. The road and width design characteristics of rural roads and bridges are inadequate for the larger and heavier vehicles that are using them.

Kansas ranks fourth in the nation in the number of public road miles and bridges. According to the KDOT website Kansas had 135,019 public road miles in 2005, 92% (124,151 miles) of which were classified as rural. In 2005, Kansas had 25,796 bridges, 22% of which were classified as structurally deficient or functionally obsolete. The financial ability of Kansas counties to maintain and rebuild the road and bridge system isn't keeping up with the rate of deterioration. Many rural Kansas counties don't have the funds to maintain the existing system with the heavier vehicles that are using them. If the county road and bridge system can't be maintained as it is, reducing the size of the system should be considered.

## **III. BACKGROUND**

In order to evaluate the feasibility of road and bridge closure, a benefit-cost technique will be used and applied to a small sample of Kansas counties. The benefits of rural road and bridge closure are the savings to the traveling public in the area from keeping the roads in the system. The costs are the costs of the county of keeping the roads in the system including maintenance, reconstruction, and resurfacing costs. If measured benefits exceed the costs the evaluated roads should remain in the county road and bridge system, or be abandoned if the costs are greater than the benefits. The fixed maintenance costs on paved roads include drainage, signing, ditch maintenance, snow removal, and painting lane stripes. The variable maintenance costs on paved roads depend on road surface type and thickness, sub-base thickness, and number and weight of vehicle axle passes. Other costs include road resurfacing, patching and shoulder resurfacing.

The fixed costs of gravel roads are signing, drainage, snow removal, and weed control. The variable costs include gravel resurfacing and bladeing. Major reconstruction costs and resurfacing costs vary by road type and traffic volume.

#### **IV. BENEFITS**

This research can provide KDOT with the ability to develop guidelines for county engineers to evaluate rural road and bridge investment decisions. It will also give KDOT economically sound information to advise the Kansas legislature in developing rural road and bridge investment policy.

#### **V. WORK PLAN AND SCHEDULE**

The work plan will accomplish the objectives of the research project. The overall objective of this research is to estimate the economic impact on selected Kansas county road and bridge systems from reducing the size of the system. Specific objectives include:

Objective A – For a small sample of Kansas counties develop a procedure to measure the benefits of keeping the county road and bridge system as it currently exists, rather than eliminating some roads and bridges on those roads.

Objective B – For the same sample of Kansas counties develop a procedure to measure the costs of not eliminating some roads and bridges.

Accomplishment of these objectives is expected to require the successful completion of the following tasks.

Task 1. Meet with the project monitor to finalize the proposal.

Task 2. Conduct a literature review of studies concerning the economic impacts of reducing the size of county road and bridge systems. This review should provide alternative empirical frameworks for studying this issue.

Task 3. Measure the benefits of keeping certain road segments (and bridges on the segments) in the county road system rather than eliminating them. This is expected to be the avoided additional travel costs incurred by road users if the roads and bridges are removed from the system.

One way to measure these benefits is through use of a network model for each study area. The model would estimate the minimum travel cost routings of all the trips in the study area. The network model routes each of the trip classes from the trip origin, through the county road system to the destination at minimum cost. The network model is re-estimated without the designated road segments in the network. The difference in the costs of the two scenarios is the benefit of keeping the designated roads in the system.

The data requirements for estimating the benefits include the following:

1. The quantity, origins, and destinations of all household and farm travel by vehicle type that originates and terminates in the study area in a year's time.
  2. The travel costs of each type of vehicle traveling in the county. The variable costs of each vehicle includes fuel, oil, tires, maintenance, and travel time cost. The fixed costs are the sum of time-related depreciation, insurance, and licenses.
  3. The mileage and types of roads and the number and size of bridges in the county.
- Task 4. Measure the costs of keeping the same road segments and bridges in the county road system rather than eliminating them. This is expected to be the road and bridge maintenance, reconstruction and resurfacing costs. These costs are reduced by the incremental maintenance, resurfacing, and reconstruction costs to the roads inheriting the traffic from the eliminated roads.
- Task 5. Develop a questionnaire to be used to obtain the data in point 1 of Task 3.
- Task 6. Develop a model to measure the vehicle variable cost per mile for each type of vehicle that uses the study area road and bridge system.
- Task 7. Working with KDOT personnel, develop maintenance, reconstruction, and resurfacing costs for paved and unpaved county roads.

## **VI. PROPOSED BUDGET**

The source of funds is \$43,000 from the Kansas Department of Transportation (K-TRAN).

## **VII. STAFF AND FACILITIES AVAILABLE**

Michael W. Babcock, Professor of Economics will be the Principal Investigator (PI). He has been the PI on 17 previous KDOT research projects. A graduate student in Economics will assist Professor Babcock.

## **VIII. REPORTS AND DELIVERABLES**

The deliverables are the principal outputs of the research which are:

1. Develop a user-friendly procedure-framework to evaluate the benefits and costs of county road and bridge investment/disinvestment decisions.
2. Provide county engineers with investment guidelines based on county road and bridge characteristics and the vehicles using them. Try to answer the question of what are necessary conditions to achieve saving from road closure.

A draft of the final report will be prepared for review by the KDOT monitor about a month before the end date of the project. After review by the KDOT monitor, corrections and revisions will be made if needed. The research team will meet quarterly with the KDOT monitor to discuss any problems and assess research progress.

#### **IX. RECOMMENDED IMPLEMENTATION PLAN**

The results of the project will be widely distributed to all major stakeholders including KDOT, the Kansas legislature, Kansas county engineer organizations, and county road commissioners. This can be done through the final report, media reports, and presentations by the principal investigator to stakeholder groups.