TOP TRANSPORTATION & ENERGY ISSUES FACING THE NATION

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Report Prepared by

David D. Perlmutter, Ph.D.
Ming-Heng Wang, Ph.D.
Steven D. Schrock, Ph.D., P.E.

A ship sailing without a destination is always lost at sea.
—Seneca the Younger

KU TRANSPORTATION RESEARCH INSTITUTE
The University of Kansas

Note: This report reflects a range of ideas presented by a diverse group of people from industry, government, and the academy. It is not to be understood as approval of or advocacy for any individual action but rather, as we put it, an outline of the varying *options* available to the new president and Congress. Nor are the contents of the report endorsed by the University of Kansas, the State of Kansas, or the Robert J. Dole Institute of Politics.

BACKGROUND & SUMMARY

America has tried many times to create a national transportation policy over the last century, with the latest and most comprehensive attempt in 2000-2001.[1] None of these ventures was conceived or executed at the presidential level save possibly President Eisenhower's "National Defense Highway System."[2] Now humankind confronts interrelated crises of energy and transportation in a rapidly changing world where we must deal with spiking petroleum prices, decaying bridges, growing congestion in all modes, an aging and inattentive driver population, a shortage of adequately trained transportation engineers, and the diverse ramifications of global climate change. The next president and next Congress of the United States of America will need to tackle each of these challenges immediately. Their decisions will affect the fate of the species and the planet.

In response, the University of Kansas Transportation Research Institute (KU TRI) and the Robert J. Dole Institute of Politics held a summit of major academic, government, business and advocacy & NGO leaders and researchers to outline energy and transportation policy and program priorities and options for action *[Please see appendix A for a list of participants.]* A group of University of Kansas researchers also presented and participated in the meeting.

The summit identified (a) a "top 9" list (see below) of the most pressing problems facing the nation and (b) a range of options for government and industry to consider. Some of the items on the menu of options reflected disagreement on courses of action, but everyone agreed that for each of these crises, America needs to take *some* actions immediately.

1. TRANSPORTATION PLANNING
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TRANSPORTATION PLANNING

Many would contend that we have never had an integrated national transportation policy in this country. We had a goal started in 1956 to build the interstate highway system and we built it. That is just as far as we went. Many of the bridges on this system were never designed to handle the volumes and weights of traffic they handle now. We have a huge rail system and port system maintained and operated by cities or private port authorities, but they are not connected together….We flow our national transportation dollars almost exclusively to state DOTs but they can't act beyond their borders. Yet, of course, the roadways all need to connect together…We need a way to bring a regional perspective to the selection of projects. For national transportation policy purposes, we need to think differently about how a national program is delivered. We need to think about what really matters in our world. We ought to start doing this thinking from a business perspective and from the community perspective. The answers would be different from the present answers.
—**Deb Miller**, Kansas Secretary of Transportation

Lack of national planning is behind so many of our problems. The nation's transportation network is filled up, and a federal transportation policy and vision is needed to renew and expand the nation's transportation network. There is not one now.
—**Peter J. Rickershauser**, VP, Network Development, BNSF Railway

There is a systemic opportunity in air transportation to create infrastructure and policies for integrating inter- and intra-state air travel that we haven't imagined before. As scheduled air service consolidates toward larger, more congested markets, smaller non-hub communities are losing service. This contraction results in increasing geographic and economic isolation for the nation's suburban, rural, and remote communities. The opportunity for innovation in air service can capitalize on a new generation of quiet, extremely efficient aircraft and 21st century next-generation airspace infrastructure to enable the diffusion of economic opportunity beyond the over-burdened hub-and-spoke airport system while relieving the pressures of growth on the large airports. Capitalizing on this opportunity requires a new architecture of federal-state-municipal relationships, programs, and policies supporting infrastructure investments in next-generation airspace and airports.
—Bruce J. Holmes, D.E., NASA (Retired); President, Holmes Consulting LLC

Big Picture

The United States faces many challenges in transportation and energy without a comprehensive plan that has been agreed upon at all levels of government, let alone by labor, science, and industry. We need a unified and empowered body to organize such a plan and encourage its execution with a timetable and agenda for its completion. The main problem is the "grain silo" mentality of the public works community in America. Basically, each state raises and seeks funding for its own projects with little or no coordination even with neighboring states. The political competition for the federal pie gets in the way of good sense, efficiency, and the economic sustainability of our transportation system. As former presidential science adviser Jack Gibbons commented in a national policy lecture at KU, the major transportation and energy problems our country confronts will only be solved by people crossing disciplines and divisions of industry and government.

Options for Action

Create regional bodies to integrate state DOTs and construction projects that affect each state's roadways and transit corridors; encourage the pooling of funds and investments

especially in repairing infrastructure and planning traffic flow. Support federal-state-municipal coordination infrastructure investment strategies for air transportation system expansion and modernization; encourage public-private partnering and cost-sharing for airport and airspace advancements.

Authorize a national "transportation czar" to create an integrated transportation plan for the country that takes into account projections about the nation's social, economic, and environmental needs, not just those of the individual states. The plan should be driven by a set of clear objectives for the country as a whole, especially in relation to goals of energy independence and national security.

Encourage the integration or the pooling of research data by independent transportation research institutes associated either with policy organizations or with public universities. The federal government needs to fund comprehensive surveys of state, regional, and national transportation that will lead to the goal of enacting nation-wide standards for measurement and materials.

Create a national databank of all transportation research created by any entity and a policy staff to integrate it for use by industry, advocacy groups, and government.

Change the culture of transportation from the "more is better" and "if we have the money we need to build it" mentality and see where money can be saved by better planning and integration of existing transportation networks, whether on land (roads, rail), air, or waterways and seas.

Encourage the creation of extra-governmental consulting bodies composed of representatives of industry, advocacy groups, and science communities to advise policymakers about the most efficient and necessary long-term planning goals for transportation.

CONGESTION

The annual delay per rush hour traveler in 2008 has grown to 38 hours from just 14 hours in 1982. Travelers in the nation's very large metropolitan areas face an average 54 hours of annual congestion per person. The average American in metropolitan areas wastes 26 gallons of fuel each year due to congestion. This may not seem like much, but aggregated it means nearly 2.9 billion gallons each year is wasted—about one-fifth of the total amount of gasoline imported each year. Factoring in this wasted fuel and wasted time, metropolitan congestion is now costing Americans about $78.2 billion each year, an increase of $20 billion since 2000.
—**Robert Puentes**, Senior Fellow and Director, Metropolitan Infrastructure Initiative, Brookings Institution

Congestion isn't just about commuter cars. In short-line railroads, for example, we know that the congestion of rail traffic in Kansas City and Wichita brings adverse consequences. The rail congestion in these areas affects the timely delivery of goods shipped by rail throughout the state. Congestion in these areas, coupled with at-grade crossings, can also delay highway freight movement and create emergency response concerns. These situations will be exacerbated as rail traffic increases in these areas.
—**W. Robert Alderson**, Partner, Alderson, Alderson, Weiler, Conklin, Burghart & Crow, LLC

Big Picture

America faces gridlock on its roads and highways within this generation. The physical and financial costs to ordinary drivers in delays and lengthy commutes are becoming both social and political issues. For government and industry, congestion creates "hidden costs" that undermine the economy as well as contribute to other transportation problems such as our dependence on foreign oil. In fact, due to heavy congestion and rising fuel prices, the total transportation logistics costs to American businesses—the expenses of managing, moving, and storing goods rose to 9.9% of GDP in 2006.[3]

Highway Transportation

Highway congestion—characterized by slower speeds, longer trip times, and increased lining up of non-moving vehicles—is a common scene in most urban areas, since around 87% of all passenger trips are made in private vehicles.[4]

Costs of congestion have the greatest impact on high-value-added, skilled-labor occupations.[5] For greater New York, for example, a net loss in regional economic output of from $3.2 billion to $4 billion annually is due to congestion. Combined business costs, lost revenues, and lost productivity mean that there are 37,000 to 52,000 fewer jobs created in the NYC metropolitan area each year.[6]

Trucks

According to forecasts by Global Insight, Inc., economic output in the U.S. is projected to grow by 150% and total freight movement (ton miles) by 92% over the next 30 years. Trucks are expected to move over 75% more tons in 2020 than today, capturing a somewhat larger share of total tonnage.[7]

Truck traffic accounts for more than 30% of the vehicles on about one-fifth of the Interstate network. Those portions of the highway network designated as truck routes are already

consistently more congested than car routes.[8] The FHWA's freight analysis framework (FAF) forecasts a 2.5% annual increase in truck VMT (Vehicle Miles Traveled) through 2035.[9]

Railroads

The U.S. freight rail system faces a capacity crisis due to increases in traffic and shortage of rail capacity. Freight traffic on U.S. railroads increased more than 50% from 1990 to 2003 principally from the growth in both coal and intermodal traffic.[10]

The average length of each freight haul rose from 615 miles in 1980 to 902 miles in 2005; the total length of freight moved on rails in the U.S. rose from 572 million miles in 1960 to 1.5 billion in 2005.[11]

The U.S. freight rail network has declined dramatically over the years. In 1960, there were 207,000 miles of Class 1 rails (large freight railroad) in the U.S. In 2005, there were just under 100,000 miles of track left.[12]

Ports

West Coast ports capacity—the estimated capacity of a port or an anchorage to clear cargo in 24 hours, usually expressed in tons—is predicted to grow by 183% by 2035.[13]

Some predict that our ports may be unable to handle the staggering projected growth in Asian trade over the next 20 years because of constraints on the rail and highway system.[14]

Intermodal port connectors have significant mileage with pavement deficiencies and suffer from a general lack of public agency awareness and coordination.[15] Perhaps more important is that conflicting uses of high-value shoreline for residential use are competing with expanding port needs and the 24-hour traffic and noise are rankling residents along access corridors.

Border Crossing

Potential increases in the use of Canadian and Mexican ports for U.S.-bound cargo after the North American Free Trade Agreement (NAFTA) was enacted will shift more trade to rail and truck crossings at borders. Combined with new security procedures, there may be significant congestion, delays, and cost increases at border crossings with Mexico and Canada and on corridors serving NAFTA markets.[16]

Options for Action

Design national and regional transportation plans that address all modal congestion issues, which affect and overlap all the other transportation and energy concerns and crises.

Create a national education program that calls attention for the public to the actual costs of congestion that may affect their decision about whether or not to use public transportation alternatives and may reduce "Not in My Back Yard (NIMBY) opposition to new routes or airports.

Design future public transit systems that not only connect ring communities around major cities to the center but also internal communities to each other, i.e., short-term or short-time public transportation that encourages using modes other than the personal car to get to shopping or medical services or social gatherings.

Create a new electronic, multimodal booking, tracking, and port clearance system that augments security checks, accelerates movement, pickup and delivery, provides tracking and accurate notification of delivery time, and minimizes congestion. Develop a "one stop shopping" system for the nation's freight movement needs.

ENERGY PRICES & INDEPENDENCE[17]

The world's oil reserves are not infinite. It is clear that humankind must replace them with a more sustainable energy source. There are signs that oil fields that are available using the easiest production methods are in decline.
—**Erno Sajo**, Associate Professor, Louisiana State University

The energy crisis clearly impacts every American. In addition to the increased cost of fuel, producers who use petroleum or natural gas-derived fertilizers and other products have seen prices double in the last two years largely due to increasing demand in other sectors and a lack of production capacity at home. We must adopt a "more of everything" approach to solve this crisis.
—**Terry D. Holdren**, National Director - Governmental Relations, Kansas Farm Bureau

Domestic energy diversity is the key to transportation energy policy. The United States has 3% of the world's oil reserves but 25% of oil demand. We don't get to dictate the market price, whether we expand drilling or not. It is difficult to dictate whom we are buying from, or at what price, but we can diversify to alternatives that are more domestic.
—**Brett Williams**, Transportation Sustainability Research Center, University of California-Berkeley

Energy independence is not just about supply, it is about energy efficiency, conservation, and R&D. If you talk to any one of the energy experts, we are under-investing in the energy R&D in this country. Let us think about how vehicles move, not just their fuel efficiency.
—**John Heimlich**, VP and Chief Economist, Air Transport Association of America

Big Picture

The United States economy and the livelihoods of many of us are held hostage to political developments in energy-producing regions of the world and market speculation in fuels and other forms of energy. There is a political consensus that the present system of relying on imported fossil fuels not only hurts our pocketbooks but also is a threat to the safety and security of the nation.

The link between energy prices, foreign dependence and transportation policies, and military activities is indisputable.

The average price for gasoline rose from $0.965 per gallon in 2002 to peaks at $3.835 in 2008 (as of September 15).[18]

A national survey found that 80% of U.S. adults have made changes to their lifestyles due to rising gas costs in 2008. Ninety-four percent believe it is important to reduce energy consumption from automobile use. Nearly 80% consider it important to develop and use alternative fuels and almost 75% believe it is important to increase the fuel efficiency standards on all vehicles.[19]

Another national survey found that more than 25% of vehicle owners want to have plug-in hybrid engine technology in the next vehicle they purchase.[20]

The automotive fuel efficiency of new U.S. vehicles significantly trails that of other industrialized countries. Australia and China, for instance, each average slightly more than 29 MPG, compared to the U.S. average of 24.1 MPG. The average fuel economy of new

vehicles in the European Union clocks in at 37.2 MPG. Japan's 46.3 MPG nearly double the U.S. mark.[21]

The transportation sector is 97% dependent on oil. In 2000, cars and trucks guzzled 132 billion gallons of gasoline and an additional 33 billion gallons of diesel and other special fuels. Cars and trucks accounted for 43% of all petroleum consumed in the U.S. in 2000.[22] In fact, cars and light trucks consume more energy than domestic oil producers extract. And the trend is expected to worsen: The growing popularity of SUVs and trucks has led to a decrease in fuel economy, and the total U.S. fleet's fuel economy reached its lowest point since 1980 in 2001.[23]

Americans spend over $100,000 per minute to purchase foreign oil, making oil consumption an important part of the national trade deficit. The transportation sector's dependence on oil is not fully reflected at the gas pump.

Options for Action

Tie all bailouts, tax rebates or deferments, land use incentives, or any other government support or economic assistance to both domestic and foreign automakers to increasing fleet mileage and investing in alternative, non-CO2 producing technologies. Create specific targets for achievement tied to further support.

Repeal all tax incentives tied to greater vehicle size and create a taxing structure tied to reduced CO2 emissions and increased mileage rather than just price. (This has already been done in the EU, which could be used as a model.)

Create national CAFE (Corporate Average Fuel Economy) standards that include percentages of fleets powered by alternative technologies.

Create incentives for gas stations and gas distributorship companies to create electrical-charging or hydrogen-dispensing kiosks on existing properties. Create the "grid" of the future for plug-in vehicles. Explore all options for creating the hydrogen supply needed, including nuclear energy.

Create specific, directed, and scientifically advised cooperation between industry and government focusing on domestic production of battery technologies that will advance electric cars and hybrids.

Go beyond current $25 billion loan authorization for conversion of manufacturing facilities to the next generation of energy efficiency and emission quality. Create a national agreement of manufacturers, government, researchers, and advocacy groups to set standards of loan guarantees and tax incentives at the local and national levels to allow both individuals and corporations to convert everything from home heating systems to smokestacks to increase energy efficiency and decrease CO2 emission.

Enhance tax and other incentives for early-adopter purchase of plug-in and green-fuel vehicles. Follow the model of tax incentives for vehicles based on the kWh capacity of batteries that were passed as part of the first financial bailout plan.

Create a national plan for the adoption of nuclear energy to programmatically replace fossil plants and introduce engineering standards for safer next-generation (Gen IV) designs. Aggressively pursue research and development to close the fuel cycle, reduce or eliminate nuclear waste, and provide for safe nuclear waste disposal facilities. Further, introduce

science- and evidence-based public education, incorporated into the elementary and secondary education system, about radiation and nuclear energy, and aggressively combat misinformation.

Create symbolic changes in ways the public views fuel economy. Consider changes in rules for everything from NASCAR to municipal fleets to conversion to efficient- or alternative-energy technologies.

Create tax and other incentives for individuals, especially in sun, wind, or geothermal-rich areas, to purchase renewable power. Specifically, target loans and transportation funding for municipal building conversions (such as parking garages) to provide green power to recharge vehicles and possibly to "feed back to the grid" excess energy.

GLOBAL WARMING

Global climatic change is strongly related to the use of fossil energy sources, which are limited in supply. Non-fossil energy generation methods (nuclear fission, solar, wind, geothermal) are currently available to significantly reduce our need for fossil sources in the foreseeable future. Therefore a rapid shift towards these energy sources is needed.
—**Erno Sajo**, Louisiana State University

With a growing mountain of evidence and nearly universal agreement on the causes of global warming, climate change has quickly emerged as the main environmental problem linked to transportation. And the scope of the problem is far greater than previous transportation-related problems. While smog and sprawl affect metropolitan areas—with negative externalities crossing county and state lines—climate change threatens national and global impacts.
—**Robert Puentes**, Senior Fellow and Director, Metropolitan Infrastructure Initiative, Brookings Institution

Everything that we look at has to be in terms of how it contributes to the decarbonization of the economy.
—**Sandra Rosenbloom**, Professor, University of Arizona

The impact of the climate change on innovation and investment strategies for extremely efficient, more personalized air transportation is going to be very substantial and is going to require our thinking about drop-in alternative fuel in the near term and alternative propulsion in the longer term. The investment banking business on Wall Street is going to change the landscape for innovation. We have never really seen the sky fall and maybe that is not something that we ought to expect but we certainly get to see the sky change here a little bit every now and then. The bottom line is that the role of the Federal Government in investments supporting innovation will become vital.
—**Bruce J. Holmes**, D.E., NASA (Retired); President, Holmes Consulting LLC

An overly aggressive greenhouse gas reduction plan could severely harm the overall economy. Timelines for program implementation must match the commercialization and availability of necessary mitigation technologies, such as carbon capture and storage. Otherwise, energy reliability and affordability could be jeopardized with negative consequences for the consumer and the economy. Beyond that, railroads are part of the emissions reduction solution. The "low-hanging fruit" that we can grab right now to reduce emissions that is less costly relative to other actions and can be implemented much more quickly includes incentives to expand the capacity and shift traffic from highways to make greater use of the nation's railroads.
—**Peter J. Rickershauser**, VP, Network Development, BNSF Railway

My priority for the president is decarbonizing transportation fuel. It is the direction for improving efficiency, air quality, and energy security; reducing global warming; and stabilizing climate change—all with lots of benefits.
—**Brett Williams**, Transportation Sustainability Research Center, University of California-Berkeley

Big Picture

Our auto-oriented transportation system is threatening the planet by altering the Earth's atmosphere. According to the Intergovernmental Panel on Climate Change (IPCC), the 1990s was the hottest decade of the 20th century and probably of the last 1,000 years. The

IPCC further predicts that the Earth's average temperature will increase by as much as 10° F during the next century.[24] We must change the ways that energy is supplied and used. This necessitates a long-term commitment by policymakers upon which industry leaders can rely.

The changing climate may pose the greatest risk to biodiversity in the coming century. A study of outstanding natural areas by the World Wildlife Fund found that climate change will lead to mass migrations of those species that are fast enough to keep up with the rapidly changing climate. The report further finds that because so many species won't be able to move to new areas fast enough, as many as one-fifth of the world's most biologically rich areas could suffer "catastrophic" losses of species.

America's reliance on the automobile has adversely affected our climate and influenced our foreign policy. The United States represents 25.5% of the world total consumption of petroleum (1999).[25] The transportation sector's share of U.S. oil consumption is 65% - or 16.5% of total world oil use.[26] The U.S. has 769 motor vehicles per 1,000 population compared to seven per 1,000 in India and eight per 1,000 in China. If other nations follow the lead of the U.S. and model their transportation systems and land uses on automobiles, climate change will rapidly accelerate. This will also heighten economic inequity. Overall mobility will be reduced and the entire transportation system will be less stable.

In 2005, transportation accounted for 33% of all U.S. carbon dioxide (CO2) emissions—the single largest contributor to total emissions of all end-use sectors.[27]

Based on current greenhouse gas (GHG) emission reporting guidelines, the transportation sector directly accounted for approximately 27% of total U.S. GHG emissions in 2003.[28] Transportation is the fastest-growing source of U.S. GHGs and the largest end-use source of CO2, which is the most prevalent greenhouse gas. Estimates of GHG emissions do not include additional "life cycle" emissions related to transportation, such as the extraction and refining of fuel and the manufacture of vehicles, which are also a significant source of domestic and international GHG emissions.

Options for Action

Currently available technologies can be used to reduce CO2 emissions or freeze them at current levels. This necessitates the introduction of CO2 reduction methods to current power generation. Certain energy production methods will be radically affected while others are marginally so.

Create national plan for industry-by-industry carbon caps, carbon trade-offs and sequestration. Use tax incentives and carbon allowances to encourage industry to reduce GHG emissions in amounts and on a timetable that won't hurt economic productivity.

Create a national carbon awareness number tied to individual consumer and industrial products so that everyone has a true picture of the "carbon cost" of everything from a box of cereal to a new car. Public awareness can assist in easing us to a low-carbon emissions society.

Begin introduction of carbon taxes, offset by reductions in employment taxes or by carbon dividends to reduce extreme fluctuations in energy prices that lead to harmful consumer behavior (e.g., artificially low gas prices leading to inefficient vehicle choice causing long-term economic hardship).

Create a revenue-neutral system of "feebates": fees for relatively inefficient vehicles that pay for rebates on efficient vehicles in a given vehicle size class.

Invest heavily in industry-allied research and development on next and succeeding generation hydrocarbon engine technologies, with the assumption that gasoline engines cannot be phased out in the short or medium term but can be made more efficient and less GHG emitting.

Connect realistic goals of decarbonizing the economy to energy independence, with incentives for research and accelerated deployment of alternative, low-carbon, or non-carbon fuels and engines.

FINANCE AND INVESTMENT

The current financing system for transportation is not sustainable. We need to be creative and pragmatic in designing a new system that will last well into the future. The new system needs to be aligned with important national interests relating to safety, security, the environment and commerce.
—**Mike Kelley**, Chief Sustainability Officer, YRC Worldwide Inc.

What happens if the gas prices just plummet? Happy days are here again and vehicle sales and miles driven rise? There has to be a new funding stream for transportation infrastructure beyond the gas tax. Those who pay need to see the benefits in terms of investment. In California we are seeing a growth in user fees tied to import and export steamship containers moving through the ports of LA, Oakland, and Long Beach. The series of fees are upwards of $300 a box in total, but only a portion, if any, goes to fund transportation capacity enhancements.
—**Peter J. Rickershauser**, VP, Network Development, BNSF Railway

Adding money to the trust fund is a band-aid solution and does not solve the long-term instability of the fund. The critical subset of that problem is that since the federal gas tax has not been raised since 1993 even to keep pace with inflation it is having less of an effect than it could.
—**Robert Puentes**, Senior Fellow and Director, Metropolitan Infrastructure Initiative, Brookings Institution

Big Picture

Currently, 90% of the Federal Highway Trust Fund comes from fuel taxes.[29] The present system of supporting transportation needs, research, and maintenance via state and federal fuel taxes is fundamentally flawed. For example, when oil prices go up, tax revenues go down because people travel fewer miles and purchase more fuel-efficient vehicles. We need to develop a process that adequately and reliably funds the many demands of our transportation system.

States like Kansas face a transportation funding shortfall over the next 20 years. The state would need to invest an additional $1.5 billion annually over projected revenues to meet estimated transportation needs.[30] The present system simply cannot pay for present and future costs.

The Treasury Department's mid-session budget review forecast for fiscal year 2008 reported that the programs operated or supported by the Federal Highway Administration face a serious funding crisis beginning in fiscal year 2009. Current Highway Account revenue projections for 2009 show a shortfall of $4.3 billion in revenue.[31]

The revenue gap for all modes of transportation is $155 billion to $200 billion per year. The cumulative national shortfall for transportation funding in relation to America's projected needs has been estimated at $1 trillion through 2015. Of this, $34 billion is the annual unmet need to maintain existing roads and transit facilities.[32]

Options for Action

Consider selectively phasing out national sales taxes on fuels and switching to user fees, toll roads, and other revenue enhancements that encourage energy conservation, fuel efficiency, and the use of alternative energies in transportation.

Create a transportation tax system for industry that encourages replacement of less fuel-efficient and high CO2-emitting engines and vehicles.

Consider the creation of one-time transportation taxes levied as part of car license renewal rather than fuel fees.

Create different tiers of fuel taxes depending on the efficiency of the engine (diesel vs. gasoline) or the point of origin of the fuel (North American vs. international).

Create incentives to move from gasoline- to diesel-powered vehicles that have better fuel efficiency, similar or lower emissions than European vehicles, and have better or similar power response to gasoline engines.

Create a special commission representing government, industry, advocacy groups, and scientists to study ways to link infrastructure repair and renewal, energy conservation and independence, and improved and streamlined revenue models.

DETERIORATING INFRASTRUCTURE AND CAPACITY

We have 3,000 bridges on the county road system in Kansas today in bad enough condition to be qualified for the federal bridge replacement fund. We could address them in 75 years…provided no more bridges get bad in the meantime. Few of them carry very heavy traffic volume but they are carrying very heavy agricultural loads.
—**Deb Miller**, Kansas Secretary of Transportation

The American Society of Civil Engineers (ASCE) estimates that the cost to eliminate bridge deficiencies will be $9.4 billion a year for 20 years. ASCE further estimates that the annual expenditure required to prevent the bridge investment backlog from increasing is $7.3 billion, bringing the total to $16.7 billion. But bridge expenditures by all levels of government only total about $9 billion per year. We clearly need new approaches to both financing bridge construction and enhancing bridge life."
—**David Darwin**, Distinguished Professor, University of Kansas

As an industry that relies on the ability to move commodities to market, our transportation infrastructure is critical. Many counties have resorted to closing local roads and bridges because they no longer have the resources to maintain them. These closings impede agricultural production and result in additional expense to bring crops to market. Rail service is also important for agriculture to provide products to feed the world. And, of course, rural highways provide a critical link to production facilities and urban markets. Obviously, the solution to a certain extent is money, but we need to continually assess how we spend those limited resources to ensure that our critical industries can continue to thrive.
—**Terry D. Holdren**, National Director - Governmental Relations, Kansas Farm Bureau

The costs of not maintaining our infrastructure for rail will be huge. For example, if short-line railroads are abandoned, the goods will go to freight trucks in the county road system. Last year (2007), short lines held 162,500 tons of freight. That translates to 650,000 carloads, 4 truckloads to 1 carload. That truck traffic would be huge and do incalculable damage to rural bridges and roads.
—**W. Robert Alderson**, Partner, Alderson, Alderson, Weiler, Conklin, Burghart & Crow, LLC

Big Picture

Infrastructure is the combination of fundamental systems that support a community, region, or country. It includes everything from water and sewer systems to road and rail networks to the national power and natural gas grids. The United States, once the world's leader in infrastructure for transportation and commerce, is witnessing the decay and collapse of our roads, bridges, and all other structures that support our lifestyle, our economy, and our society.[33] In 2005, for example, the American Society of Civil Engineers issued a report card grading various categories of U.S. infrastructure. The average grade was "D."[34]

The problem is particularly acute in urban areas, where growing populations stress society's support systems, and natural disasters, accidents, and terrorist attacks threaten infrastructure safety and security. Urban infrastructure is not just a U.S. issue; special challenges are posed by the problems of mega-cities, with populations exceeding 10 million, which are found mostly in Asia.

Maintaining infrastructure is not a new problem. For thousands of years, engineers have had to design systems for providing clean water and disposing of sewage. In recent centuries, systems for transmitting information and providing energy have expanded and complicated

the infrastructure network, beginning with telegraph and telephone lines and now encompassing all sorts of telecommunications systems. Cable TV, cell phones, and Internet access all depend on elaborate infrastructure installations. Development of remote wind and solar energy resources will add more.

Much of the existing infrastructure is buried, posing several problems for maintaining and upgrading it. For one thing, in many cases records of the locations of all the underground pipes and cables are unavailable or incomplete. One major challenge will be to devise methods for mapping and labeling buried infrastructure, both to assist in improving it and to help avoid damaging it.[35]

Some facts and figures:

As of 2007, about 12% of Kansas bridges were found to be "structurally deficient" (meaning that they needed significant maintenance attention, rehabilitation, or replacement); 9% were listed as "functionally obsolete" (meaning the bridges lack lane widths, shoulder widths, or vertical clearances adequate to serve traffic demand).[36]

Nationally, about 12% of America's bridges were found to be "structurally deficient"; 13% were listed as "functionally obsolete."[37]

Almost 31% of urban bus maintenance facilities were in unacceptable condition in 2004. About 51% of urban rail passenger stations were rated as substandard and 8% of railway transit track was found to be in substandard or poor condition (that is, with seriously damaged components in need of immediate repair).[38]

Natural disasters, such as Hurricanes Katrina, Gustav and Ike, sea level rise, flood, and wildfires also seriously impacted U.S. transportation. In 2007, there were 63 Presidential FEMA's Public Assistance Program declarations of a "major disaster" and 13 of an "emergency." There were 56 presidential disaster declarations in 2008 (as of September 17).[39]

The mass evacuations of people due to natural disaster or some other crisis event highlighted the need to plan and provide for transportation facilities adequate for responses to, and recovery from, terrorist attacks and natural disaster.

Options for Action

Help media and industry create a more defined link between infrastructure and national security. Offer a public education campaign about the threats to safety and economic sustainability when we allow our transportation infrastructure to deteriorate.

Create regional user fee systems based on maps of transit routes for personal commuting and the shipping of goods that emphasize repairs and restoration of key points that allow safe flow of traffic.

Reprioritize transportation funding toward repair and restoration rather than new construction. Within regional or national master plans, set goals toward reduction of traffic rather than simply accommodating new traffic flow in any way possible. Emphasize that one safe bridge is better than two poor ones.

Spend money—wisely. Admit that there is no getting around a massive investment in restoring America's road, rail, port, and air system. Put emphasis on new technology and efficiency rather than ever-increasing capacity.

Create guidelines for local governments that have incentives for smart growth and penalties for unrestricted growth. Emphasize models of growth that are sustainable and that maintain or improve community living standards.

Solutions must be sustainable. Pay proper attention to environmental and energy-use considerations (while cities take up just a small percentage of the Earth's surface, they disproportionately exhaust resources and generate pollution), along with concern for the aesthetic elements that contribute to the quality of life.

An integrated approach combining energy, water, and wastes (liquid and solid) into "neighborhood" systems could be considered in certain urban areas. Increase sustainability while relieving the pressure to meet all citizens' needs through city-scaled infrastructures. It would be best to introduce such systems in new development areas (e.g., urban revitalization areas) and new cities, which will spring up over the next few decades in places like China and India.[40]

Novel construction materials may help address some of these challenges but dramatic progress may be possible only by developing entirely new construction methods. Most of the basic methods of manual construction have been around for centuries, even millennia. Advances in robotics computer science and new materials should make more automation possible in construction, for instance, greatly speeding up construction times, lowering costs and prolonging time until replacement.

HUMAN CAPITAL

If the current R&D enterprise in the nation is not broken, it is certainly frayed beyond patching. It is especially true for aeronautics research for transportation applications and it is probably true for surface transportation.
--Bruce J. Holmes, D.E., NASA (Retired); President, Holmes Consulting LLC

The energy engineering community is aging. This is at the time when more R&D is needed than ever before, not only in the areas of new energy generation and energy conversion systems (e.g., internal combustion engines for transportation), but in improving antiquated engineering concepts and the wide introduction of engineering standards. Technical education has become more specialized, producing graduates who excel in small areas but lack a broad understanding of the field. This is counterproductive from the perspective of the required sweeping changes in energy conversion and generation methods.
—**Erno Sajo**, Louisiana State University

My research assistants are happy to do my work and take my money, but they have no plans to continue on to do research or work in the transportation sector or on transportation problems. The field is not considered cutting-edge enough for them. We need to change that perception.
—**Sandra Rosenbloom**, University of Arizona

Big Picture

There is a severe shortage of transportation researchers, innovators and even white-collar workers interested in working at state DOT offices. Transportation engineering, for example, is in decline as an intellectual interest and a career objective at America's universities and government agencies. We need to invest in recruiting for and reinvigorating the field.

Public investment to stimulate innovation in transportation services and products has been declining for years (0.015% of GDP in 2005, but near 0.07% in 1970s) in real terms and as a share of agency budgets.[41] Fortunately, foreign students have taken up some of the slack in transportation engineering and related disciplines, but this trend may not last as many are returning to their native countries to assist in their development.

Research and development funding supports university graduate programs, which are the training pool for the next generation of professionals and researchers. The best students have little incentive for a career in transportation if the sector is not viewed as part of the leading edge of research.[42]

Options for Action

Create a federally-supported education entity for transportation research in association with the Transportation Research Board, with grant and scholarship disbursing sub-entities aimed at encouraging transportation research toward the solution of all the major problems listed here, with an emphasis on energy independence and lessening carbon emissions.

Create an industry, government, and academic alliance to encourage students from K-12 onward to consider and be supported in careers in transportation engineering. Especially encourage and create support for outreach by engineering researchers to high schools. The goal should be to change the image of the engineer from "Dilbert" to dynamic producers of cutting-edge solutions for the great problems facing humanity.[43]

Create retraining programs for middle-career professionals with engineering-friendly skills who want to retool from their own industries toward transportation professions or research.

Create a post-Sputnik-like public awareness campaign of reemphasis on math and science linked to crisis in energy and climate.

DRIVER DISTRACTION

The cell phone can be a deadly weapon, to ourselves and others, when used while driving a car, truck, plane, boat, or train. In some circumstances you are better off driving drunk than talking on a cell phone or text messaging. Otherwise competent younger drivers when on a cell phone have the attention profile of a senior citizen with attention impairment.
—**Dr. Paul Atchley**, University of Kansas Professor & KU TRI Researcher

Big Picture

Recent headlines are focusing national attention on the newest safety threat on the roadways:

- 2007, New York State: Five Rochester teenagers die in a crash. Police reports indicate that the driver's cell phone was used to send and receive text messages just before the moment of impact.

- 2008, California: The engineer driving a Los Angeles Metro commuter train that crashed, killing 25 people including himself, was alleged to have been distracted by text messaging. He received one message a minute and twenty seconds before the crash time and sent a message 22 seconds before the event.

- 2008, Kansas: An off-duty Douglas County sheriff's deputy on his bicycle was struck and killed by a young driver who, according to police, was distracted by his radio and his cell phone.

Despite the many safety features and improvements in modern vehicular transport and roadways, about ten times more Americans die each year in car accidents than have been killed in the entire Iraq war. Many causes of roadway mayhem, such as drunk driving, are well publicized. But impairment due to alcohol or drugs is actually a subset of a much larger problem that is becoming a crisis that can affect the lives of any of us and cost the country immense sums in accidents and damage: *driver distraction*. A wave of research conducted at KU and other universities shows that our gadgets are, when used while driving, killing us. Cell phone distraction—which likely is severely under-measured or recorded—officially causes some 2,600 deaths and 330,000 injuries in the United States each year.

Driver distraction from other factors, both long-standing (children in the car) and recent (video screens in the driver's view) are also a factor in roadway accidents. For example, cell phone users have been found to be 5.36 times more likely to get in an accident than undistracted drivers. The risk is about the same as for drivers with a 0.08% blood-alcohol level.[44] In other words, the distractions associated with talking on a cell phone while driving are as or more debilitating than driving legally drunk.[45]

Talking on a cell phone while driving a car reduces attention in younger adults so that they have an average increase in accident risk of between 200 and 700%.[46]

The act of driving while talking on a cell phone is a classic example of a dual task.[47] While on a cell phone, especially in the initial minutes of a conversation, a driver will be almost completely unaware of surrounding traffic.[48]

Driver distraction due to communications devices can be broken into two components: physical distraction and cognitive distraction. The physical distraction of holding the phone while driving has been shown to have very little effect on driving performance.[49] Cognitive

distractions, on the other hand—caused by the conversation rather than the physical factors—have been found to be the primary source of driver distraction.[50] Even with these findings, drivers and legislators tend to focus primarily on physical distraction.[51]

Younger, inexperienced drivers are of great concern since they are high adopters of new electronic communication gadgets—with near 100% adoption rate in some samples—and have a higher existing risk of accidents.[52] (In a KU study now underway, some 90% of teen drivers say they text and drive.)

Right now, state laws restricting cell phone use are scattershot and their effectiveness has been called into question. Moreover, the aging Baby Boomer population, which will be entering the senior driving ranks over the next 20 years, are also regular cell phoners.

Options for Action

Work with private industries such as insurance companies to create incentives for drivers to avoid gadget distraction.

Work with state departments of transportation and local law enforcement agencies to create more comprehensive guidelines for recording accurately the causes of car accidents that allow for a true measure of the influence of in-car or on-person technological gadgetry.

Following the model of national incentives to states to increase seatbelt use, create national standards and policies to discourage driver distraction and work with states to implement laws and codes that penalize drivers for infractions.

Create a national "pay attention" education campaign integrated with the state departments of transportation towards educating the public about the many dangers of driver distraction due to use of communications gadgetry.

Create a national commission on driver distraction that funds basic research on how people interface with the many new technologies, from GPS to text messaging to video to cell phones.

Develop driver awareness programs, particularly for younger drivers, modeled on drunk driver awareness programs to encourage distraction-free driving.

AGING DRIVERS

Government and industry are often accused of tackling only the concerns of the present and failing to plan ahead for problems that we will face in the future. We have a golden opportunity to correct that error in relation to the graying of the American driver. We know that within 10 years we are going to have a crisis stemming from a very large number of elderly drivers dependent on their cars for access to medical services, food, social connections and even mental well-being but also posing greater dangers to themselves and others on the road. Will we wait for the worst to happen or will we anticipate and plan for it?
—**David D. Perlmutter**, Professor, University of Kansas

Big Picture

Within the next decade, America will realize a crisis on our nation's roadways as the percentage of older drivers rapidly increases. Research has shown that the elderly driver is much more likely to get into accidents and needs much more infrastructure support than his or her middle-aged counterpart. The problem will be exacerbated because the "new old" will be Baby Boomers, a group that historically values the autonomy of driving more than any other age cohort in American history. In rural areas, particularly, rising older populations find that medical services and other social support venues are becoming rarer and farther away.

Aging drivers are of great interest for several reasons. First, it is estimated that by the year 2020, over 15% of drivers will be older than 65. Second, Baby Boomers comprise a group that values driving as a right and not a privilege and does not respond positively to messages implying "you are getting old."[53] In addition, the Boomers have financial and political power beyond their numbers: What they think about transportation issues in general and roadway safety and driving in particular will be the single greatest influence on government policy and real-world events.

Finally, from a physiological point of view, *preventive* measures are called for. Although they represent the safest driving cohort, aging drivers will undergo an acute, rapid, unnoticed deterioration of their driving abilities (including reduced attention, muscular force, peripheral vision, etc.), often enhanced by associated chronic pathology. These phenomena trigger conscious and/or compensatory mechanisms that may benefit from dedicated training, thus decreasing or preventing driving ability decay with increasing age.

Some facts and figures:

In Kansas, the state population is projected to increase by 9% in the next 20 years. Kansas population age 65 and older is expected to grow by almost 50% by 2030.[54]

In 2006, there were 468 fatalities on Kansas roads. Nineteen percent (90) of the drivers and passengers involved were more than 65 years old. That is higher than the national average (14%).[55]

Younger drivers and older drivers tend to get into more accidents than do those in the middle years: Elderly drivers are a particularly high accident rate group.[56] As the massive Baby Boomer cohort ages, states will need to prepare for increased roadway challenges, especially in light of Boomers' known attachment to cars and the "freedom to drive."[57]

Rural medical and emergency service demand will increase as smaller counties face graying populations.[58]

Options for Action

Coordinate national and state efforts to create local centers of medical and social services for aging and elderly drivers to reduce the amount of time and length of distance they have to drive.

Conduct surveys of the aging Boomer population to try to understand ways to persuade them to consider other options besides retaining a personal car throughout their entire life span.

Create an education campaign that calls attention to the need for senior drivers to get new training such as that offered by insurance companies or public advocacy groups like the AARP or create new programs sponsored by state DOTs.

Create an education campaign that convinces late Boomers that they should start "training" now for the challenges of later-year driving.

Increase research on how cognitive training can help aging drivers prolong the years of safe vehicle operation.

Engage community organizations such as churches, civic organizations, and senior service groups to focus on building a planned transition for phasing out personal car use as people age to the point of posing a danger for themselves and others.

Conduct research to create national standards of driver capability that, while not being tied simply to someone's chronological age, create cognitive tests that go beyond the present standard "eye chart."

Work with industry to create more senior-safe cars that are easier to operate and have more clearly distinguished mechanisms. Research improved technology for increasing safety of all passengers but especially the more fragile elderly.

Work with highway administration and state DOTs to study changes in signage coloring, size, number, and placement that make it more readable for elderly drivers.

APPENDIX: SUMMIT PARTICIPANTS (OUTSIDE KU)

W. Robert Alderson
Partner
Alderson, Alderson, Weiler, Conklin, Burghart & Crow, LLC

Bruce J. Holmes, D.E., NASA (Retired);
President, Holmes Consulting LLC

Mike Kelley
Chief Sustainability Officer
YRC Worldwide Inc.

Deb Miller
Secretary of Transportation
Kansas Department of Transportation

Terry D. Holdren
National Director - Governmental Relations
Kansas Farm Bureau

James P. LaRusch
Chief Counsel and Vice President – Corporate Affairs
American Public Transportation Association

John Heimlich
VP and Chief Economist
Air Transport Association of America

Robert Puentes
Senior Fellow and Director
Metropolitan Infrastructure Initiative
Brookings Institution

Peter J. Rickershauser
VP, Network Development
BNSF Railway

Sandra Rosenbloom, Ph.D.
Professor
University of Arizona

Kathy Ruffalo
Transportation Consultant

Erno Sajo, Ph.D.
Associate Professor of Physics
Department of Physics & The Nuclear Science Center
Louisiana State University

Brett Williams, Ph.D.
Postdoctoral Scholar
Transportation Sustainability Research Center
University of California-Berkeley

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