This law is a social document that applies a mixture of biological and engineering principles to protect a part of the environment. It illustrates that the public wants to maintain a quality environment and will pay for it. Yet this success has been achieved without economically penalizing the road-building effort. The myth that this law would scuttle the road-building program in Montana apparently has vanished. The largest public works program ever conceived and founded by Congress continues in Montana and elsewhere. But there is a difference. We have a legal document that has helped us and the road builders minimize some of the destructive forces in that massive program.

THE ECOLOGY OF TRANSPORTATION: A HIGHWAY ENGINEER SPEAKS OUT

Jacob Dekema*

Our present transportation system has come under virulent attack by the Jeremiahs who seem totally unable to comprehend that, in the words of General Billy Mitchell, "Transportation is the essence of civilization."

We are today engaged in modernizing and improving an already magnificent transportation system that some seem to take for granted as a natural phenomenon. Our task is quite similar to that of Baron Hausman, who was instructed by Emperor Napoleon III 100 years ago to modernize the city of Paris. The transformation of the medieval town into today's great modern city was accomplished in the face of the same public attack that accompanies our struggle today.

Hausman carved the great boulevards through the heart of Paris, "uprooting people, removing valuable property from the tax rolls, splitting communities, separating families, and dividing the city into isolated islands." Compared to Hausman's meat-axe approach, we are using the patience and precision of a neurosurgeon in restoring adequate flow through our urban arterial system.

As Edmund Burke pointed out: "Those who would carry on the great public schemes must be proof against the most fatiguing delays, the most mortifying disappointments, the most shocking insults, and worst of all, the presumptuous judgement of the ignorant upon their design."

These "ignorant" gloatingly quote statistics proving that the area devoted to transportation in downtown Los Angeles is over half the total ground area. Little do they know that our downtown San Diego, laid out before the automobile was even a dream, had 42 percent devoted to city streets. Pierre L'Enfant, in laying out Washington, D.C., proposed 59 percent of the total area in streets. The Los Angeles and San Diego freeway systems will occupy about 2 percent of the land and carry about 60 percent of the traffic.

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*Excerpted from an address to the American Road Builders' Association at Los Angeles on February 22, 1971. Mr. Dekema is District Engineer, District 15 (San Diego), California Division of Highways.

A caustic Boston critic wrote, "The necessities of transportation have forced new uses upon the streets for which they were never designed and to which they are not adapted at all. Boston's primitive lanes were traced by cows and worn by foot passengers and an occasional cart. They are now traversed by monsters which would have astonished our ancestors, and which now render the old-time ways almost impassable by their descendants." The year was 1892. The "monster" was the streetcar. The first automobile had not yet been built in the United States.

An additional benefit caused by our conversion to high-speed mechanized transportation has been the elimination of the need for 90 million acres of pasture land to feed all the horses and mules that were necessary to serve our transport needs of the early 20th Century. This is twice the total area of all the rights-of-way of all the public roads in the United States including all the 3 million miles of roads that existed before World War I. Incidentally, the increase of about 25 percent in road mileage was accompanied by a 100 percent increase in population. Even today, less than half the mileage is paved and, of course, nowhere near the total width of right-of-way is paved. In addition, over 1.5 million trees and seedlings are being set out along highway rights-of-way each year.

Our concern with the environment is nothing new. In 1300 English noblemen petitioned King Edward I to do something about the pollution of air in London, and in 1306 he issued a proclamation prohibiting the pollution of air. As Edward may have discovered, and as we are all aware today, improvement of the environment comes about through economic growth, not through edict.

In 1400 Henry V established a commission of nobles to restrict and control the movement of coal into London in recognition of the fact that smoke was resulting from coal burning. The corrective technology was not available and London suffered a number of "killer smogs" over the centuries, the last but not the greatest being in 1952.

The greatness of the Roman Empire was based largely on its magnificent system of roads, 53,000 miles of superhighways connecting all the borders of the far-flung empire. Nevertheless, they too had their problems, and because of urban congestion Julius Caesar prohibited wheeled carts from coming into downtown Rome.

In 1635 Charles I issued a proclamation pointing out the exceedingly high cost of living in London caused by extreme congestion and the costly delays in bringing hay and provender into the city. He did not live to see the day, but in 1666 the Great Fire of London solved the problem. Today our fire departments are too efficient to permit this instant form of urban renewal, and many of our urban problems are caused by slow deterioration that can be reversed only by economic growth and profits that will spin off such fringe benefits as parks, museums, literature, and education.

In 1909 about 26 million horses traveled some 13 billion miles and 3,850 people were killed in accidents involving horse-drawn vehicles. This gives a mileage death rate of over 30 per 100 million vehicle-miles, more than ten times as high as the rate on California's freeways, and further improvements are on the way.

A study by the American Medical Association in a rural county in Illinois showed that 16 physicians take better medical care of more people than 42 doctors could 40 years ago. The reason is, of course, faster, safer, more convenient transportation that enables patients to come to the doctor or hospital in a matter of minutes and at frequent intervals. The savings in lives resulting from better medical care brought about by modern transportation far exceed the number of lives lost in the process of moving people and goods.

A similar transformation has occurred in the field of education. Better transportation has made it possible to consolidate tiny schools and upgrade teaching and physical facilities.

A return to the horse and mule is obviously out of the question. Already we have a problem of disposing of 2.3 billion tons of steer manure a year, out of a total waste of 4.4 billion tons. If we were to maintain our present standard of living by means of live instead of mechanical horses, there would be 1 ton of solid waste and ½ ton of liquid per person per day. Viewed in this light, our pollution problem has already been solved.

A similar development has taken place in water pollution. When we discovered that the outhouse was polluting the well, we began to dispose of sewage into rivers and lakes, polluting them instead, but still a tremendous forward leap. In 1810 the Thames River in London at a low flow was so polluted that birds could walk across from one bank to the other. The Thames also is finally being restored to clean flowing water because of increasing wealth that makes it financially possible to employ the improving technology that is available.

Man-made pollution is gradually being legislated out of existence and our Jeremiahs should turn their attention to natural pollution. W. T. Pecora, Director of the U. S. Geological Survey, cites as an example the fact that three volcanic eruptions alone—Krakatoa in 1883, Mount Katmai in 1912, and Hekla in 1947—ejected more dust, ash, and gases into the atmosphere than all mankind's activity throughout history.

Transportation improvements increase mobility, and the best transportation system gives the greatest freedom in choosing where to live, expands the area where people can sell their labor, and gives them a greater choice in selecting shops and educational, religious, cultural, and recreational facilities.

For the employer there is a greater ease in recruiting and retaining a suitable supply of labor. For the employee there is a greater likelihood that he will be able to find a job at a level corresponding to his maximum ability.

Frank Herring of the Port of New York Authority in a study of the New York metropolitan region concludes that the decline in use of mass transportation and the rise in the use of automobiles are parallel phenomena, rather than cause and effect. They result from a common cause, the changes in form and structure of the metropolis due to changes in power installations, production techniques, and communication methods, as well as transportation.

The purpose of transportation is not merely to achieve the most economical and efficient vehicles conceivable. The purpose of transportation is civilization itself. From the dawn of civilization those cities and states having the best transportation systems have achieved the highest standards of living, have advanced their culture ahead of their time, and have been able to maintain themselves militarily against envious and aggressive neighbors.

Transportation is the most vital, the primary input to the ecology of human civilizations. If we jointly continue toward our goal of building a better America, we will achieve the vision of one of the Hebrew prophets who, peering into the future, said, "Every man shall sit under his own vine and under his fig tree, and none shall make them afraid."