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The September 2022 Issue in Brief

Funding Roads

There was a time when the main problem with roads in the U.S. and Europe was that there were not enough of them to keep drivers from getting stuck in traffic. Then, environmentalism, NIMBYism, anti-federalism and anybody-with-a-beefism put the breaks on all infrastructure. They shifted the debate to how to pay, rather than what do we need to stay competitive with the countries where the rulers decide what gets built where and how. Is there a way forward for democracies to have a functioning infrastructure, or must we look on with envy at countries where totalitarian governments build infrastructure like it's the 1950s in the West?

Dispatch Central

A new city in the desert is an old idea - The de facto head of the Saudia Arabia government has designed a city with one stroke of the pencil. One very long stroke.

Aluminum: Another brick in the Wall of China – Governments required higher fuel efficiency. OEMs lowered car weights to comply. China cornered the market on the material that was needed to make it happen: aluminum. Sound familiar?

Some countries actually do something about Tesla – China (again) seems to be the only country that can tell Tesla to "Heel?", and Tesla heels. We don't wonder why this is so.

GM looking for money in all the wrong places – Making something like OnStar a 'standard option' is like telling parishoners they need to put money in the collection basket in order to get into mass.

Hood Ornaments

One year, hood ornaments were just gone. Once upon a time, every brand and model had them. Some were simply utilitarian, designed to function as a radiator cap, but luxury brands made them into works of art, like the Rolls-Royce Spirit of Ecstasy.



In the next issue of THE DISPATCHER, I will take a look at the evolution of these objects and discuss the reasons for their eventual demise. I will also take you to a place where examples of them are carefully preserved.

THE DISPATCHER

Telematics Industry Insights by Michael L. Sena
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Funding Roads: Pay for the Effect or Pay for the Cause

Read This First

We don't think about roads. They are just there. Someone built the road on which we live and gave it a name. Someone built the road we use to travel to work, and we count on it being kept in good repair so we don't have to find another route. Those of us who drive and own cars feel that we pay with our tax money and countless other fees for the right to use the roads, but are constantly reminded that there is a group of people supported by politicians who object to building and maintaining roads because they object to cars, even those cars that have no greenhouse gas emissions at the tailpipe. We understand that roads are needed, but building and maintaining them has become a political battleground in democratic countries where individual citizens, even a small minority of them, can influence decisions affecting everyone.

Is there a way forward for democracies to have a functioning infrastructure, or must we look on with envy at countries where totalitarian governments build infrastructure like it's the 1950s in the West?

Downtown Boston's Big Dig



A generation in the making to make sure all the Tees were crossed and all the Eyes were dotted.

How we think about roads affects our willingness to pay for them

ROADS ARE UTILITARIAN phenomena, but when it comes to deliberations on how to pay for building and maintaining them, discussions turn decidedly epistemological. Roads are used to deliver ambulances, police, soldiers, and fire trucks to where they are needed, goods to our shops, people to their jobs, friends and families to our homes. From a teleological perspective, according to Immanuel Kant, phenomena such as roads can be explained in terms of the purpose they serve, rather than the cause by which they arise. From an epistemological perspective, roads are neither good nor necessary, a priori. Their value is contingent on what caused them to be built, the combined effects of their existence and use, and how people “feel” about them. In some counties—the U.S., for one—some road-building projects, like Boston's ‘Big Dig’, take a generation to complete because there are so many checkpoints that must be passed where various interest groups have the possibility to express their views on how the building project affects them, the honor of those who went before and the well-being of those who will come after. Many don't survive after they've run the approvals gauntlet.

Building roads is a question of need, right and will

The Romans had a very good system for building their roads. Starting with the need, it was essential that the Roman generals were able to move their armies quickly to where they were required to defend against attackers and to ensure that their soldiers were adequately supplied with provisions. Roads that connected the furthest reaches of the realm to the seat of power in Rome meant that important messages could be delivered quickly to all subjects, and the outcomes of battles could be relayed to the Senate. Roads with sturdy, well-drained surfaces enabled the transport of people, raw materials, and finished products to reach markets everywhere during all seasons. Concerning will, when the objectives of those who had po-

litical power, including the emperor and senators, coincided with the interests of the land owning patricians, all the resources which were needed for a road building project would be made available. Finally, concerning right, land was owned both privately and by the state. Private land ownership was a tradition taken from the Greeks. Citizens owned land and paid a tribute to one or more levels of government.

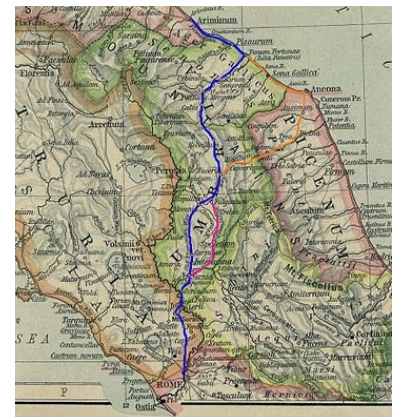
The Roman army was in charge of deciding where roads were needed, laying them out, and then constructing them, principally with soldiers, not slaves or hired hands. Road building required many skills, and once those skills were learned, they increased the value of the soldier who acquired them and the overall importance of the army. What better way to ensure that the roads would be built to last and require the minimum amount of maintenance than by having those who would depend on them for their lives and livelihoods build them. That the roads were built to last is beyond dispute. They exist to this day. My mother's mother grew up in a house along the *Via Flaminia*, built in 220 B.C., that passes through Umbria on its way from Rome to Rimini on the Adriatic Coast. That house is still there and it is the original *Via Flaminia*, not the overlaid *Strada Statale 3* which runs parallel to it through the town of Sigillo.

Costs for materials and the salaries of the soldiers were shared between the landowners over whose land the roads were built and the state. It is said that the soldiers/legionnaires would perform triple duty, collecting tolls from travelers and merchants. Talk about multi-tasking! Some of the money probably went into their own purses while the lion's share went to the patricians who paid a portion of the costs, and the rest to Rome.

Rome's road building business model ticked all the boxes. I can find no evidence that their model, in which a state-controlled corps of salaried engineers and tradesmen, and a combination of public and private money, have been applied to build roads anywhere else at any time—except possibly during times of war. Once the Western Roman Empire collapsed around 476 A.D., major road building and infrastructure projects took a very long break until the 18th century in Europe when the Industrial Revolution began, and in the beginning of the 19th century in America, when the new nation decided that roads were needed to unite the quickly expanding country.



Via Flaminia



Britain's 'turnpike' building boom started in 1706 when the first Turnpike Trust was established.¹ Between 1706 and 1840, 32,000 kilometers of roads were built. A Trust was responsible for constructing and maintaining a specific road segment. Capital for construction and maintenance was raised by selling shares, and revenues were generated for repaying the investors by charging tolls to the road's users. The poles were put on the roads to prevent scofflaws from avoiding paying. Although Britons were not used to paying for using roads, the turnpikes proved to be a success and accounted for 20% of all of Britain's road network in the middle of the 19th century when rail transport began. Between 1750 and 1800, the average time to travel between London and Edinburgh was reduced from twelve to four days.²

America's first highways were built using the turnpike concept borrowed from Britain. Local, State and the Federal governments did not have the funds to pay for roads, or their anti-federalist principles would not permit them to allocate funds for such purposes. Initially, building roads therefore fell to private interests. The first hard-surfaced private turnpike in the United States was the *Philadelphia and Lancaster Turnpike* in Pennsylvania that was chartered in 1792. The 62-mile road was built by the PHILADELPHIA AND LANCASTER TURNPIKE ROAD COMPANY, and tolls were collected along its entire length.

British turnpikes were incorporated as non-profit organizations financed by bonds, while American turnpikes were stock-financed corporations organized to pay dividends, acting within narrow limits determined by the charter. This difference made the British trusts, which operated under the firm expectation of fulfilling bond obligations, more focused and therefore more successful. For investors in the American turnpikes, dividends were never a legal obligation and the possibility of earning them proved to be faint. Even though turnpikes promised little in the way of direct dividends and profits, they offered potentially large indirect benefits. They facilitated movement and trade, and nearby merchants, farmers, land owners, and ordinary residents all benefited. Alexis de Tocqueville observed that, "*excepting those in the South, Americans are infused with a spirit of public-mindedness. Their strong sense of community spirit results in the funding of schools, libraries, hospitals, churches, canals, dredging companies, wharves, and water companies, as well as turnpikes.*" Vibrant community and cooperation sprung, according to Tocqueville, from the fertile ground of liberty.³

1. Turnpike: a road (such as an expressway) for the use of which tolls are collected (Merriam-Webster). Another word for a turnstile, from which the term is derived. They were called turnpikes because they were barred by a pike (or pole) balanced and swinging on a post. When the traveler paid his toll, the pike was turned parallel with the road and the toll-payer passed through.

2. <https://transportgeography.org/contents/chapter1/emergence-of-mechanized-transportation-systems/uk-turnpike-19th-century/>

https://en.wikipedia.org/wiki/History_of_turnpikes_and_canal_in_the_United_States



3. <https://eh.net/encyclopedia/turnpikes-and-toll-roads-in-nineteenth-century-america/>

By 1800, 69 turnpike companies had been chartered throughout the United States, especially in Connecticut (23) and New York (13). Over the next decade, nearly six times as many turnpikes were incorporated (398).

The National Road: America's first publicly-funded highway

America's first major highway that was funded by the federal government was the *National Road*, also known as the *Cumberland Road*. It was initiated in 1811 during President James Madison's term of office (1809-1817). The 620-mile (1,000 kilometers) road connected Cumberland, Maryland on the Potomac River with Vandalia, Illinois, at the time the capital of Illinois, and served as the principal path west for the pioneering settlers to the interior, especially to the lands of the *Louisiana Purchase*. It was surfaced with the 'macadam' process that had been developed by Scotsman, John McAdam. Congress authorized funding for the road in 1806. A contract for constructing the road was awarded to a private construction company in May, 1811, and construction started the same year.

Funding public works projects of any kind was a cause of political debate from the very start of the new government in the United States. *Federalists*, led by the nation's second President, John Adams, believed the Federal government should be responsible for construction of roads and canals, as well as universities. *Anti-federalists* believed that the initial Constitution did not provide for such powers.⁴ Thomas Jefferson, an *Anti-Federalist* and the country's third President, supported the National Road idea and suggested amending the Constitution to allow for it to be built with public funds. *Federalists* argued successfully that the National Road was covered by the Constitution because it was a "Post Road".⁵ Jefferson authorized an Act to regulate a road running from Maryland to Ohio.

Construction continued until 1837, but Congress grew weary of financing it. The politicians who voted in favor of paying for the road wanted something in return, and that meant votes. The path of the road was decided by how many votes could be obtained, not the most efficient or direct route from A to B. Tolls started to be charged along some stretches in 1832 when it became clear that this would be the only way to raise money for maintenance. Finally, since the government was not in the road-owning business, there were no incentives for building the road well in the first place and then maintaining it.⁶ This first foray into funding roads would not be repeated anytime soon.



Diorama detail from the National Road Museum on US40 east of Zanesville shows a Conestoga wagon crossing one of the famous "S" bridges, several of which can still be seen today.

4. The Anti-Federalists were a group of Americans who objected to the creation of a stronger U.S. federal government and opposed final ratification of the U.S. Constitution as approved by the Constitutional Convention in 1787. The Anti-Federalists preferred a government as formed in 1781 by the Articles of Confederation, which had granted the predominance of power to the state governments. The Anti-Federalists feared, among other things, that the powers granted to the federal government by the Constitution could enable the President of the United States to function as a king. In 1789, most of the world's governments were still monarchies and the function of a "president" was largely an unknown quantity.

<https://www.thoughtco.com/anti-federalists-4129289>

5. U.S. Constitution. Section 8 Enumerated Powers - Clause 7 Post Offices: To establish Post Offices and Post Roads.

6. <https://fee.org/articles/why-did-the-national-road-fail/>

Meanwhile, not much was happening on the European Continent

Continental Europeans seemed to have been perfectly satisfied with plodding along the same roads built by the Romans. There is little written about similar major road construction projects to those in Britain and America in the 18th and 19th centuries. Trade revived in the 15th century, which created an increased demand for better roads and bridges, and Italian and French engineers like Guido Toglietta and Pierre-Marie Trésaguet began to study how to improve their construction, but it was men like Adam Smith, the Scottish political economist, who drove road building in Britain and its former colony across the Atlantic:⁷

Good roads, canals, and navigable rivers, by diminishing the expense of carriage, put the remote parts of the country more nearly upon a level with those in the neighbourhood of a town. They are upon that account the greatest of all improvements.

Then the steam trains and railroads came along, and roads for horse-drawn wagons became passé. The PENNSYLVANIA RAILROAD COMPANY, established in 1846 and headquartered in Philadelphia, built its western route to run alongside the National Road and eventually bought portions of the road to prevent streetcar lines from being built on its surface and competing with its mainline service. Road building didn't get going until the motorcar made them a necessity again.

Who decided roads had to be free?

It was cars and trucks that really got road building moving again, but it was a slow process. In 1893, brothers Charles and Frank Duryea built the first gasoline-powered vehicle to be operated in the U.S. It was in the same year that the U.S. OFFICE OF ROAD INQUIRY (ORI) was established within the DEPARTMENT OF AGRICULTURE.⁸ It had a paltry budget to promote new rural road development. When Henry Ford's *Model T* started to be produced in 1908, real pressure began to be exerted to build more paved roads. The *Federal-Aid Road Act* of 1916 created the *Federal-Aid Highway Program* to fund State highway agencies in order for them to make road improvements. America's entry and engagement in World War I put most building plans on hold until the early 1920s. The *Federal Highway Act of 1921* converted the ORI to the BUREAU OF PUBLIC ROADS, and delivered funding for a system of two-lane highways crossing State lines that would be built by the State highway agencies. When the Great Depression hit in the late '20s and early '30s, road-building was an excellent way to create jobs.

7. <https://www.britannica.com/technology/road>

8. U.S. Federal Road Authorities

In the Department of Agriculture:

- *Office of Road Inquiry (1893-99)*
- *Office of Public Road Inquiries (1899-1905)*
- *Office of Public Roads (1905-15)*
- *Office of Public Roads and Rural Engineering (1915-18)*
- *Bureau of Public Roads (1918-39)*

In the Federal Works Agency (FWA):

- *Public Roads Administration (PRA, 1939-49). Abolished: Functions absorbed by Federal Highway Administration, August 10, 1970.*

Successor Agencies: Federal Highway Administration (FHWA).

In Great Britain, it was the cyclists who had the greatest influence on public financing of road construction. Two cycling clubs joined forces in 1886 to form the ROADS IMPROVEMENT ASSOCIATION (RIA). One result of their efforts was the *Local Government Act 1888* which created borough and county councils with responsibility for maintaining major roads. The bicycle clubs evolved into automobile clubs, the first being the ROYAL AUTOMOBILE CLUB OF GREAT BRITAIN AND IRELAND which was founded in 1897. The *Roads Act 1920* was the start of the *Road Fund*, which brought in revenue to the Government for road building from excise duty on the sale of road vehicles and licenses for both horse-drawn and motorized vehicles.⁹

Counter to what is often thought about the German *Autobahns*, that they were the brainchild of the Nazis, their construction actually began in 1913 and continued through the years of the Weimar Republic (1918-1933). During the Nazi era, construction of the two east-west and north-south roads was completed. It was the first modern expressway system in the world, and has always been free for passenger cars.

While both the need and will to build roads in the U.S. and Europe were developing, a new model was being created to finance them. Federal legislation in the U.S. was not being used to funnel funds directly into construction, as was the case with the National Road, and there were no national road construction and operation organizations being established. However, according to the way the country was set up to work, with States having the principal authority for services within their borders, Federal legislation provided funds to the States that would then contract to build and maintain the roads. Why didn't a magnate emerge in the U.S. to do for roads what they did for railroads, steel, coal, automobiles and other industries? Apparently, they learned from the experience of the turnpikes that they could not mint money by charging tolls, and from the National Road initiative that they could not generate acceptable returns unless they had a monopoly on all ways of getting from A to B.

The U.S. States didn't seem to have the stomach for setting up toll booths on all the roads they were now building, but there needed to be a way for the States to supplement the funding that was coming from the Federal government. The Federal government also needed a way to cover its financing, and pulling money out of the other budget categories wasn't the way to do it. The situation appears to have been the same in Europe. One exception was

9. <https://transportgeography.org/contents/chapter1/emergence-of-mechanized-transportation-systems/uk-turnpike-19th-century/>

in Italy where in 1924 a 50-kilometer stretch of road was built near Milan where tolls were charged. Another was Greece, where the government began charging for motorway use in 1927.

They'll never notice if we add a penny to price of the lemonade

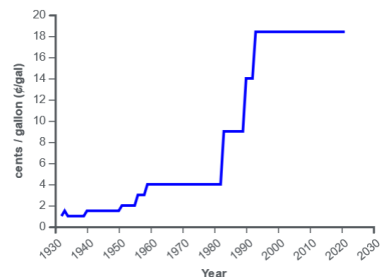
The solution to the financing problem was to extract money from those who would use the roads, but to do it in ways that did not affect their journeys (i.e., not through tolls). This was accomplished with a combination of taxes and fees. For starters, an excise tax was added to the purchase price of the vehicle. Driver's licenses and license plates were made mandatory to put a motorized vehicle on the road, and fees were charged for each, both as an initial charge and when they had to be renewed. But the big change was enabled by the introduction of fuel that was needed to power the vehicles. A tax could be added to the gasoline or diesel fuel that was pumped into each vehicle. The customer paid the price listed on the pump, and the service station paid the portion that was tax to the Federal and State governments. Simple. A new business model was born which has lasted to this day.

The first federal gasoline tax in the United States was created on June 6, 1932 while a Republican, Herbert Hoover, was President. The *Revenue Act of 1932* established a tax of one penny per gallon at the pump. The money went to the General Fund of the DEPARTMENT OF THE TREASURY until the passage of the *Federal Aid Highway Act of 1956* which established the Highway Trust Fund. This was intended to finance the Interstate Highway System. The *1982 Surface Transportation Assistance Act*, approved by President Ronald Reagan in January 1983, increased the tax to nine cents with one cent going into a new Mass Transit Account to support public transport. President George H.W. Bush raised it by 5 cents in 1990 with half of the increase going to deficit reduction. President Clinton raised it by 4.4 cents in 1993 with all of the increase going to deficit reduction. It has stayed at 18.4 cents since then, with only 10.5 cents earmarked for roads.

On top of the Federal fuel tax there are individual State gasoline and diesel fuel taxes which range for gasoline from 8.95 cents in Alaska to 57.6 cents in California. The first U.S. State fuel tax was levied in Oregon in February 1919.¹⁰

Following WWII, the US had the will to build

In 1944, with World War II still raging, President Franklin D. Roosevelt signed legislation authorizing a 40,000-mile network of ru-



Federal gasoline fuel taxes. Taxes on diesel fuel are higher.

10. https://en.wikipedia.org/wiki/Fuel_taxes_in_the_United_States

ral and urban express highways called the “National System of Interstate Highways”. He had commissioned a report in 1938 to study the feasibility of a six-route toll network for the entire nation. It was titled Toll Roads and Free Roads when it was completed, and had two parts. In the first part, the authors explained that a toll road system would not generate sufficient funds to repay construction costs and to pay for maintenance. There was just not enough demand. The second part of the report provided a master plan for a free highway network comprising 25,800 miles (43,000 kilometers) of a non-tolled interregional highway network. The 1944 legislation was not funded, and new road building would have to wait another twelve years when President Dwight D. Eisenhower signed the *Federal-Aid Highway Act of 1956*.¹¹

As the Supreme Commander of the Allied Expeditionary Force in Europe during World War II, Eisenhower had seen what a motorway system like the one in Germany, the *Autobahn*, meant for moving people, goods and armies. The Roman Roads light bulb went on. It took him a few years to settle into his new job as President, but he turned to highways as quickly as he could. The *Federal-Aid Highway act of 1952*, signed by his predecessor, Harry S. Truman, was a first step. It provided only \$550 million for an interstate system with a 50% Federal-50% State matching formula. Eisenhower knew it was not enough. He assembled a Dream Team to set the bigger strategy. It was led by retired General Lucius D. Clay and had Steve Bechtel of BECHTEL CORP., Bill Roberts of ALLIS-CHALMERS, and Dave Beck of the TEAMSTERS. Frank Turner from the BUREAU OF PUBLIC ROADS served as an advisor.

The Clay Committee, as it was called, recommended a \$101 billion program with the Federal share being 30%. The Gas Tax would remain in force (there had been calls by some states to turn it over to them) and help to fund the additional \$23 billion needed for a ten-year maintenance program of the proposed 36,400 miles (60,670 kilometers) of roads to be built. The Committee proposed the establishment of a *FEDERAL HIGHWAY CORPORATION* that would issue bonds worth \$25 billion, and the Federal government should pay the majority of the costs of building the roads, 90%. Eisenhower wanted to have a toll road system, but the Clay Committee convinced him that this was not feasible outside of heavily populated areas.

President Eisenhower said in support of the proposed highway system:

11. I found a detailed and well-written document on the U.S. Department of Transportation, Federal Highway Administration website titled *Public Roads – Summer of 1996: Federal-Aid Highway Act of 1956: Creating the Interstate System*. It is worth reading the entire document to fully appreciate what went on to get the Interstate highway bill passed, and to understand why it is mostly free, not tolled.

<https://highways.dot.gov/public-roads/summer-1996/federal-aid-highway-act-1956-creating-interstate-system>

Additional sources:

<https://www.thoughtco.com/history-of-american-roads-4077442>

<https://www.urban.org/policy-centers/cross-center-initiatives/state-and-local-finance-initiative/state-and-local-backgrounders/highway-and-road-expenditures>

https://en.wikipedia.org/wiki/Evolution_of_motorway_construction_in_European_nations#Countries_by_motorways_built_before_1952

<https://www.webuildvalue.com/en/infrastructure-news/first-italian-motorway.html>

“Our unity as a nation is sustained by free communication of thought and by easy transportation of people and goods. The ceaseless flow of information throughout the republic is matched by individual and commercial movement over a vast system of interconnected highways crisscrossing the country and joining at our national borders with friendly neighbors to the north and south.”

House and Senate versions of the 1956 bill were proposed, voted on, debated and finally combined into a single bill that was passed by the Senate on the 26th of June 1956 by a vote of 89 to 1. Senator Russell Long of Louisiana, who was the one dissenting vote, opposed the gas tax increase that would help to fund it. There would be no bonds or *FEDERAL HIGHWAY CORPORATION*. In his 1963 memoir, Mandate for Change 1953-1956, President Eisenhower said of the Interstate Highway program:

“More than any single action by the government since the end of the war, this one would change the face of America...its impact on the American economy—the jobs it would produce in manufacturing and construction, the rural areas it would open up—was beyond calculation.”¹²

Not everyone was of the same opinion, for various reasons. There were still plenty of Non-federalists among the ranks of Americans, a branch of which is known as ‘libertarians’.¹³ They believe the Federal government should not be doing anything in the states, including building roads. Those who were being displaced or inconvenienced by road building, whether they lived in run-down city areas that were viewed as ripe for ‘urban renewal’, or in the rolling hills of Bedminster where the Interstate planners thought they found the perfect right-of-way for Route 78, they called their comrades to arms. Along with the environmental movement that had built up a very large reserve of steam in connection with the protests against the Vietnam war, a group of strange bedfellows was ready to take on the bulldozers by the time the Interstate program was at its half-way mark in the mid-1970s.

A question of who owned the rights broke the model

The collective will to build roads began to waiver when both the need and right came into question in the late ‘60s, when everything the government—and all authorities—did was being challenged. The starting shot between those who wished to build infrastructure and those who did not was the passage of the *National Environmental Policy Act (NEPA)* in 1969, signed into law by then-President Richard M. Nixon. *Environmental Impact Statements (EISs)* were required by *NEPA* for actions “significantly affecting the quality of the human environment”. The *EIS* describes

12. In the August 2022 issue of *Surface Transportation Innovations*, by Robert W. Poole, Jr., Searle Freedom Trust Transportation Fellow and Director of Transportation Policy for Reason Foundation, there is a reference to a National Bureau of Economic Research article titled *Highways and Globalization* by Taylor Jaworski, Carl Kitchens and Sergey Nigai. (Oct. 2020, Revised April 2022). The authors, economists, have calculated the annual economic value of the Interstates for goods movement. \$742 billion. **Annually**. Just goods, not people. The cost of building the Interstates was \$114 billion, which is \$535 billion in 2020 dollars. President Eisenhower’s statement was prescient.

13. You can divide the methods humans use to acquire goods and services and accumulate wealth into two broad categories. Sociologist Franz Oppenheimer called them “the economic means” and “the political means.” The economic means encompasses production and exchange—that is, making things yourself out of what you already own or are able to harvest from nature, and trading with other people or giving and receiving gifts. The political means covers all the various ways of taking things that belong to other people by force or fraud, including the organized force of the state. It may seem odd at first to think of stealing as “political”—but keep in mind where states come from. When Oppenheimer called taking goods by force the “political means” of acquiring wealth, he had in mind the historical origins of states as extractive institutions with the purpose of enriching a conquering class at the expense of a conquered class as smoothly and efficiently as possible. Source: <https://www.libertarianism.org/what-is-a-libertarian>

the positive and negative environmental effects of a proposed action, and usually lists alternatives that may be chosen instead of the proposed action. *NEPA* was the first piece of legislation that created a comprehensive method to assess potential and existing environmental risks at once. It also encouraged communication and cooperation between all the actors involved in environmental decisions, including government officials, private businesses, and citizens.¹⁴

Environmental Impact Statements were meant to function as an enforcement mechanism to ensure that the Federal government (or the State government in those States where *EISs* were also mandated for State-financed projects) adheres to the goals and policies outlined in *NEPA*. It was intended that *EISs* should be prepared in a timely manner, that they should be prepared with interdisciplinary teams, should address both physical and social consequences of actions, and that their outcome should not be predetermined before they were completed. If *NEPA* had been passed before the start of the *Interstate Highway System*, it is unlikely that most of the roads would exist today. A study performed by independent researchers using data released by 53 Federal executive branch entities on 2,236 final *EISs* for the period between January 1, 1998 and December 31, 2006, of which 51% were for the *U.S. FOREST SERVICE*, the *FEDERAL HIGHWAY ADMINISTRATION* and the *U.S. ARMY CORPS OF ENGINEERS*, showed that the time to prepare an *EIS* ranged from 51 days to 18.4 years. The average time was 3.4 years.¹⁵ Who is paying for the time it is taking to prepare these *EISs*, what is the opportunity cost of not having the proposed infrastructure, and what is the cost in economic and social development if a needed piece of infrastructure is not built?

One person's disturbance is another person's way to work

Non-Libertarian NIMBYists in Bedminster, NJ will be perfectly happy to have a new road built by the government, just as long as it's not anywhere near their property where it has the possibility to reduce its resale value. The NYMBYist is concerned about the effect, not the cause. A Libertarian in the 'Live Free or Die State' of New Hampshire will presumably be fulfilled if he knows that the road on which he is travelling has definitely not been built with tax money and at the behest of any government whatsoever. He is concerned about the cause first and effect later. A Native American may view any infrastructure project as the continuation of the appropriation and misuse of lands which he feels are rightfully theirs, while any apology from any level of government is viewed

14. <https://frojeostern.com/environmental-impact-statement-vs-environmental-assessment>

15. <https://www.tandfonline.com/doi/abs/10.1017/S146604660808037X?journalCode=uevp20>

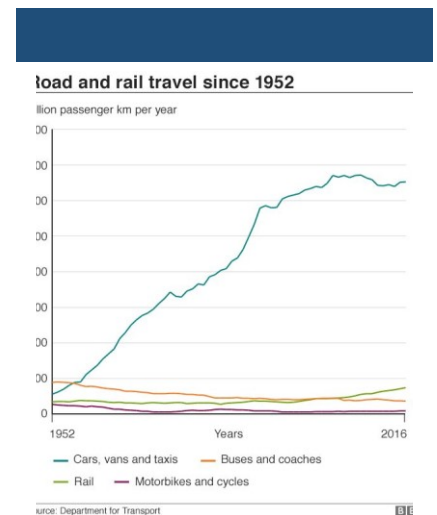
as admission that the war waged against Native Americans was waged unfairly or was not won. A SIERRA CLUB member probably is going to be against all road construction wherever they are built and however they are financed. The cause of roads is cars, and if your entire *raison d'être* is getting rid of cars because of their secondary effects (the primary effect is getting people and goods quickly and easily from A to B), then you don't support any road building. As a SIERRA CLUB member, you look at the chart to the right and organize your life around getting that green line to zero.

To toll or not to toll isn't the question

We have been distracted away from the purpose of building and maintaining roads by discussions on the fairness and effectiveness of road tolls and so-called congestion charging in cities. I include myself in the "we". This piece is intended to reorient the discussion and my own thinking on it. The history of road building has been marked by constant challenges to make self-financing through tolls actually work after the need to build roads and keep them in good working order was clearly established. Individual and business interests have worked against tolls because tolls work to restrict demand no matter how low they are or how friction-free they are to pay. If the business case for building infrastructure is based on generating income to cover the costs, you want as many people as possible to use the roads, and you don't build toll roads where there aren't enough people to pay the tolls, just like charging people to drive into the center of dying cities would be their final death knell. If the business case for building infrastructure is based on the unity and growth of the nation, as Eisenhower believed, you want as many people as possible to be able to use them by making their use affordable for all.

Tolls are a tool to enable roads to be built, and *Environmental Impact Statements* are (or were intended to be) tools to ensure that roads are built in the most environmentally sensitive manner as possible. Tolls and *EISs* are also tools that can be used to ensure that road pavements will never see the reflection of headlights. This is the paradox of democracies. The good of the many can be sacrificed for the satisfaction of the few. Those of us who live in democracies pride ourselves on this fact. But we are driving on roads, over bridges, and through tunnels that were built when *Vox Populi* referred to the opinion of the majority of people, not to the opinion of every individual.

There has to be a better way. With increased fuel efficiency of cars that was brought about by CAFE legislation, increased driving has

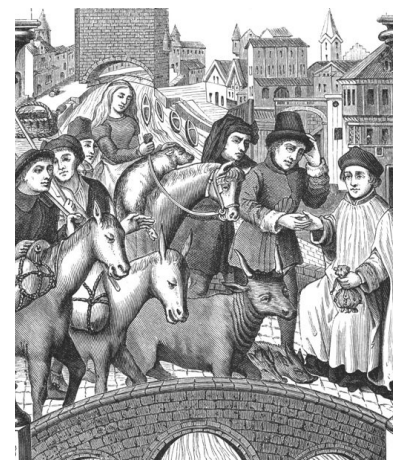


not resulted in increased money in the fuel tax coffers. Spending money on promoting battery electric vehicles which are not contributing anything to the road building and maintenance fund because they don't burn gasoline or diesel fuel and they are being exempted from purchase taxes—before you have put in place a way for the owners of these cars pay their share—is counter-productive at best. These cars may not have tailpipe emissions, but they darn well use the roads.

There's a world full of inventive minds who have given us ways to measure the distance we have walked each day and the number of stairs we have climbed. Would it not be possible to program our cars (whether or not a human is driving them) so that we subscribe to a certain number of miles per month or per year, and we pay for that amount in advance? So that this does not favor the rich, payment amounts could be progressive, based on income, and for those who are just making ends meet with jobs that are impossible to get to without a car, there could be ways to top up their distances. I'm also sure that these bright minds could figure out how to make sure we don't reach the end of our paid-up miles before we reach the end of our trip.

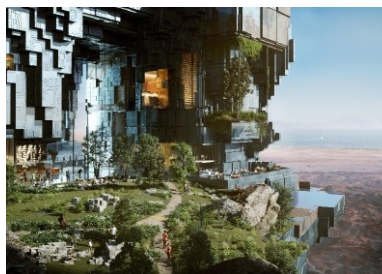
Cities like London, Stockholm and others are using tolls to stop commuters, shoppers, fun-seekers, and visiting friends and relatives from driving into them. New York City is about to join their ranks. They claim they are taking these measures to reduce congestion on their streets and improve their air quality. What they are actually doing is filtering out those who cannot afford to pay their tolls and allowing only those who can inside their gates. This is a trick that has been played on the poor since the first fence was put around a settlement. Why not address the cause of the problem, which is that the city has not provided safe places for people to park their cars before they enter the city and safe and dependable transport to and from their destinations within the city?

I wonder what Alexis de Tocqueville would write about the United States and other Western democracies if he were documenting his travels through these countries today. Would he find a spirit of public-mindedness and a strong sense of community, or would he be overwhelmed by a cacophony of conflicting voices promoting their vision on how others should behave? Have we lost the will to recognize the need and acknowledge the collective right to build a working infrastructure? The anti-democracies have surely not.



16. LIV is the Roman number for 54, and is the lowest score you could shoot if you birdied every hole on a par-72 course (Uh-huh?). LIV is the name of the league or tour that has been commonly referred to as the Saudi Golf League, for which Greg Norman was named commissioner in October, 2021. The PGA informed players that they would not be authorized to participate in LIV. The league is part of LIV Golf Investments, which says its mission is to “make strategic investments in golf to enhance the global golf ecosystem and unlock the sport’s untapped worldwide potential.” The Public Investment Fund, an autonomous wealth fund administered by the government of Saudi Arabia, is the main shareholder.

17. There are actually some people on the planet who still remember that it is the same Saudi prince who is accused of ordering the murder of journalist Jamal Khashoggi, but I guess oil is thicker than blood.



There ain't nothin' new under the sun

SAUDI ARABIA HAS been pushing lots of PR buttons lately. It convinced President Joe Biden to pay it a visit, where his fist bump with Prince MBS caused a negative stir among the Republican patriots at home—although the ‘former guy’, the Republican in Chief, raked in the Saudi cash at his golf club in Bedminster, NJ which hosted the third tournament for the alternative to the PGA, called LIV.¹⁶ Then there was the long handshake with French President Macron at the Élyses Palace during the prince’s rehabilitation tour in Europe.¹⁷ It’s latest attempt at gaining international attention, and this time for burnishing its environmentalist credentials, is the proposal for a ‘city of the future’, called ‘*The Line*’ or ‘NEOM’. Apparently, whoever was paid gazillions of dollars to develop this ‘innovative’ design did not tell the prince that they plagiarized it. The names of the designers have not been divulged.



NEOM is planned to be a 105-mile-long (168 kilometers), 200-meter-wide and 500-meter-high (1,640 feet) linear city containing 9 million residents. It is advertised as having “zero cars, zero streets, and zero emissions”. It will be built atop a high-speed rail line that will deliver passengers entering at one end to the other end in under 30 minutes. It three-ups Paris’s (also not new) idea of a 15-minute city by claiming that wherever one is along The Line, he (or she, if accompanied by a he) is only five minutes away from everything.

Why would 9 million people want to live there?

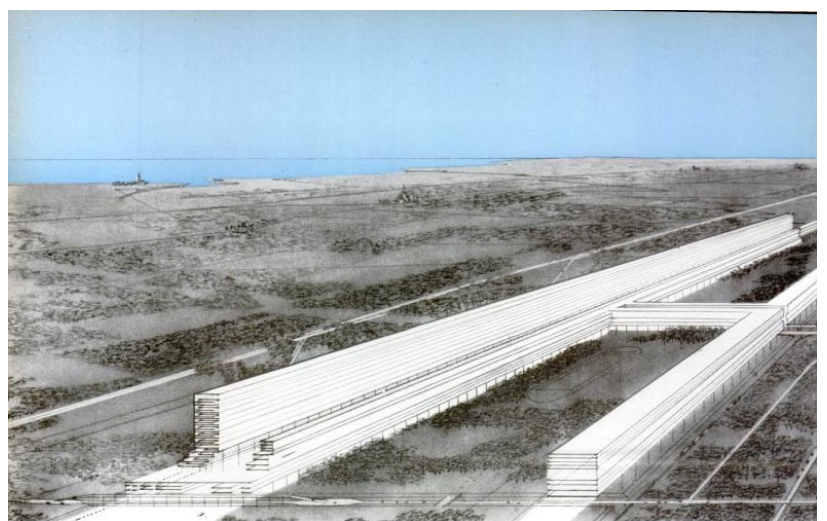
Maybe saying that the design was ‘plagiarized’ is a bit harsh. After all, it’s just a tall, thin building snaking through the desert. It’s not as if the concept is patentable. There is

plenty of prior art. The first reference we find to a linear city concept is for Arturo Soria y Mata's *Ciudad Lineal* which he proposed in 1882. It would consist of five parallel sectors, one for railway lines, one for industrial, educational, scientific and communal activities, one for residences, one for a park, and a final one for agriculture. It would be built along a river. Expansion would occur by adding these five zones to each end.

In 1910, Edgar Chambless published his book, *Roadtown*, a proposal for a linear city. He wrote: "a line of city ... projected through the country ... in the form of a continuous house. In the basement ... are to be placed means of transporting passengers, freights, parcels and all utilities...." In the basement there would be trains and roads to carry passengers, freight and all utilities. It would run from New York to San Francisco. The city would be a road. Thomas Edison liked the idea and donated his patents for molded-cement housing to the project. Promoting his idea became his life, and when his urgings fell on deaf ears, he ended that life in his New York City apartment.

Mata's ideas influenced Bolshevik architect and Constructivist Nikolay Alexandrovich Milyutin. He explained his concept for what he called *Sotsgorod*, Socialist City, in his 1930 book of the same name. He proposed to build manufacturing facilities in a thin zone along a railroad line, rather than in concentrated centers. A second zone consisting of housing would be separated from industry by a park. People would live across from their work so there would be no need for any form of transportation, either public or private. The housing form was low-density, in Milyutin's concept.

Thirty-five years later, two young PRINCETON UNIVERSITY architecture professors, Peter Eisenman and Michael Graves, presented a proposal for a linear city, their *Jersey Corridor Project*. A large model of the project filling the floor of the lobby, and carefully rendered drawings covering the display walls, greeted me when I entered the *SCHOOL OF ARCHITECTURE* for the very first time as a freshman in September 1965. Is this what we would be learning, I thought, how to stuff everybody into "living cells" marching through the landscape. I was sure I would not be interested in living in such a place.



The name NEOM

NEOM is the name of a proposed linear city that is proposed to be built in Saudi Arabia. The idea for NEOM credited to Crown Prince Mohammed bin Salman, who is the eldest of six sons and heir apparent to the current king, Salman bin Abdulaziz Al Saud. Mohammed bin Salman controls his father's government and is considered the de facto ruler of Saudi Arabia.

Names for the new city were proposed by board members who suggested that the project be named after Saudi's royal highness, or that it incorporate his name within the project name. The two suggestions were Neovia MBS and NMBS. Then there was a further brainstorming session where various other combinations of initials were proposed. This resulted in the name NEO MSTACBEL (?). This was then abbreviated to M (hmmm), reflecting two words, the first letter of the Arabic word for future (mustaqbal) and the first letter of the name of the prince (Mohammed). Then in the final stage, the letter 'M' was merged with the word NEO, which we all know means 'new' in Greek, to make NEOM.

Neither were Professors Eisenman nor Graves. Graves continued to teach and practice in pastoral Princeton where he passed away in 2015. Eisenman has been a New Yorker for most of his long life. There are no traces of the linear city in their works after their attention-grabbing project.

Will people willingly flock to NEOM to bask in the artificial moonlight that will be one of its attractions, or to be able to dine every week at a different Michelin five-star restaurant within a maximum of twenty minutes from their elevator's bottom stop? So far, linear city concepts have remained just concepts. This is the first time someone who has the money to get all manner things done is putting up the money to see it built.

Aluminum makes cars; China makes aluminum

THE STORY OF Chinese dominance in global aluminum production is similar to other stories of the country's rise in most of those areas of production where it has achieved supremacy. In 1999, two years before China joined the WORLD TRADE ORGANIZATION, the United States was the global leader in primary aluminum production with 3.8 million metric tons (mmt). It had a capacity of 4.26 mmt. Primary aluminum is production from raw materials, principally bauxite, while secondary production is from scraps, either the leftovers from making an aluminum product or recycled products made of aluminum. In 1999, China produced 2.2 million metric tons with a capacity of 2.64 mmt. It was fourth after Russia and Canada. Twenty years later, in 2019, the U.S. produced 1.1 million metric tons of primary aluminum and had a capacity of 1.78 mmt. China had become the global leader with 36 mmt (not a typo) produced and 44.4 mmt capacity. India was second with 3.7 mmt, Russia was third with 3.6 mmt, and Canada was fourth with 2.9 mmt. The U.S. was in ninth place after UAR, Australia, Bahrain, and Norway. In Europe, Iceland (0.850 mmt) produced more than Germany (529 mmt) and France (380 mmt).

In twenty years, when the world total of primary aluminum production increased from 22.7 mmt to 64.0 mmt, China went from producing 10% of the total to 56%. Impressive, or was it another unforced error?^{U,C}

Economists and management consultants say that production needs to move to low-cost countries for companies to remain competitive. If production plus transport combined is lower than production in the current producing country, then the obvious move is to move, they say. It was principally labor costs that



Aluminum and Automobiles

Aluminum can absorb twice the crash energy of steel.

Aluminum-intensive automobiles save 44 million tons of CO₂ emissions.

Nearly 75% of all aluminum ever produced is still in use today.

Recycling aluminum saves more than 90% of the energy needed to make new aluminum.

U. <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-aluminum.pdf>

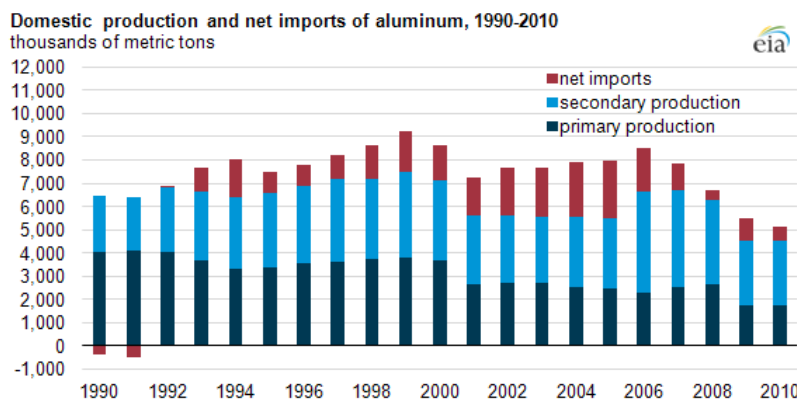
C. <https://investing-news.com/daily/resource-investing/industrial-metals-investing/aluminum-investing/aluminum-producing-countries/>

caused the textile industry to follow the new immigrants around the U.S. and then into Mexico, Hong Kong, China and now Bangladesh. But it is not labor that is the major cost of primary aluminum production: it is energy, principally in the form of electricity. Electricity accounts for up to 40% of the cost of primary unwrought aluminum production.

Because primary aluminum production is energy-intensive, production capacity has always tended to stay away from developed areas where energy generation is expensive, and to locate in areas where energy is cheap and is secure for the long-term. In other words, the region has plentiful power sources and the country is not going to shut down nuclear power plants and shutter coal mines. It is not going to depend on the wind blowing and undammed rivers flowing. It is not going to depend on its supply of electricity-producing fuel coming from a country that invades its neighbors and threatens nuclear war. In China, coal is cheap and both power plants and aluminum smelters are owned by local governments that have a strong interest in keeping the fires burning.

There's more than one way to peel an orange

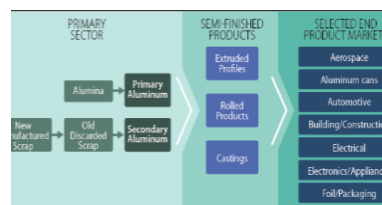
So it was high energy and the resulting electricity-generation costs that pushed primary aluminum production into the waiting arms of China. But something else was happening in the countries that produced the most aluminum before 2000. They were not using as much aluminum because the products that used the aluminum were being produced in China as well. As primary production in the U.S. decreased, imports and secondary production from old and new scrap increased up to 2006 to meet the internal production demands. Then imports and primary production collapsed as manufacturing collapsed



Source: U.S. Energy Information Administration, based on Department of Interior, U.S. Geological Survey, Data Series 140, Historical Statistics for Minerals and Mineral Commodities in the United States for Aluminum.

Primary Aluminum Production

Primary production starts with bauxite ore. Bauxite is then converted into aluminum oxide, or alumina, using natural gas at plants located in places where electricity is inexpensive relative to other areas. In the U.S. and Canada, that has been in areas where hydroelectric power is available. After alumina is extracted from bauxite ore, further processing called 'smelting' is necessary to convert it into aluminum. In this process, alumina is dissolved in a solution and a strong electric current is applied. This process has generally remained unchanged since its invention in 1886.



Secondary production is the process of recycling aluminum scrap into aluminum that can be used again. It is an environmentally sound process that is around 95% more energy efficient than primary production. U.S. and global secondary production of aluminum has held steady since the 1990s at around 33% of total production.

China used to be the number one destination for U.S. scrap aluminum before 2018. Then China decided it had enough of its own scrap and didn't need to pay for anyone else's.⁵ In 2019, the U.S. produced three times the amount of aluminum from old and new scrap as from primary production methods. In 1999, it was reversed and it was only old scrap aluminum that was recycled.



Aluminum has been embraced by the automotive producers

Aluminum content in cars has been increasing steadily since 1975. Why? To make cars lighter. According to JD POWER, aluminum is a fast-growing rival of steel in vehicle manufacture. It is an element, and it is lighter than steel and by weight stronger as well.¹⁸ The material's lightweight characteristics have made it popular with auto engineers who want to remove mass from cars for fuel economy and emissions reasons. Ten years ago, aluminum was only used in expensive limited production and luxury cars, but now many mainstream cars have aluminum hoods, doors, and trunk lids. Aluminum is also gaining favor as an engine block material, taking the place cast iron in many vehicles.

In the wake of the first Arab oil embargo in 1973-74, the U.S. Congress passed the *Energy Policy and Conservation Act of 1975*. This established a set of fuel economy requirements for new passenger cars and light-duty trucks starting with model year 1978. These requirements were called *Corporate Average Fuel Economy (CAFE) Standards*.¹⁹ They were intended to essentially double the

Secondary Aluminum Production

Once the scrap is collected and sorted, it is placed into a melting furnace and turned into molten aluminum at temperatures ranging from 1300 to 1400 degrees Fahrenheit. This molten aluminum may be kept in its liquid state or cast into large slabs called ingots or billets. In some cases, alloying elements are added to the liquid aluminum in order to produce the desired metal for a specific product type. Aluminum ingots may be rolled back into a sheet product (like can or auto body sheet) while billets can be extruded into a shaped product, such as window frames or an Apple computer case .

5. <https://www.isri.org/news-publications/news-details/2020/02/10/u.s.-scrap-exports-by-commodity>

18. <https://www.jdpower.com/cars/s hopping-guides/what-are-cars-made-out-of>

19. The term 'standard' is a misnomer in this instance. These fuel economy numbers were goals to be met, more criteria that could change. In the case of fuel economy, the criterion became a moving target.

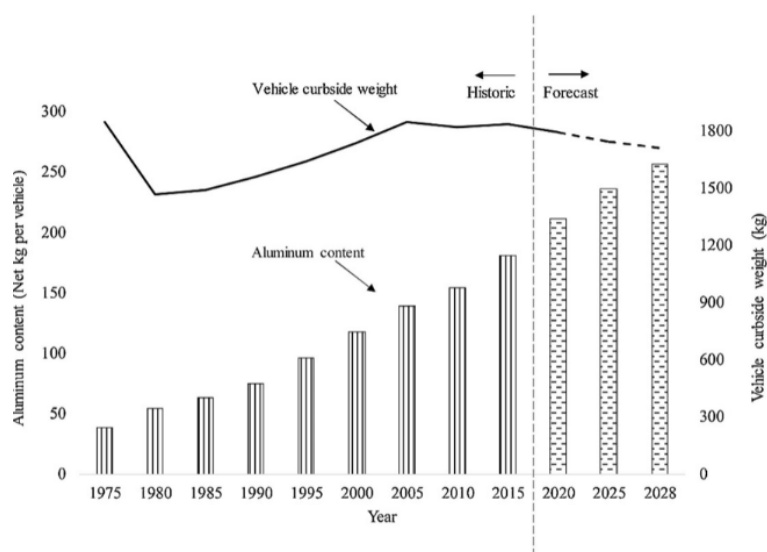
average fuel economy of the new car fleet to 27.5 miles per gallon (mpg) by model year 1985. CAFE is now up to 49.7 mpg by 2025.

Paraphrasing a *Policy Brief* written by Thomas Klier and Joshua Linn, the regulatory goals of emissions and fuel economy in the European Union were addressed in reverse order from those in the U.S.: fuel consumption came first.²⁰ Many European countries responded to the oil embargos of the 1970s by substantially raising fuel taxes to lower fuel consumption. Consequently, fuel taxes in European countries, especially those who are members of the EU, are much higher than those in the United States. In addition, many EU countries decided to tax diesel at a lower rate than gasoline. Partly because of fuel taxes and partly because of vehicle performance, diesel's share among passenger cars in Western Europe rose from 14% in 1990 to 52% in 2015.

Vehicle size and weight are two of the many variables that influence fuel usage of passenger vehicles and light-duty trucks. A 10% reduction in vehicle weight can lead to an 8% improvement in fuel economy. Other variables include the price of fuel, vehicle efficiency, driving behavior, alternative fuels, and the amount miles driven. When CAFE first went into effect in the U.S. and fuel taxes increased in the EU, cars became smaller and lighter with smaller engines. Fuel economy increased during the '70s and '80s at the same time as fuel prices decreased.²¹ Then, vehicles started getting heavier again with the popularity of pick-up trucks and SUVs—and also as a result of lower fuel prices. The average weight of passenger vehicles has been increasing for the past 40 years, according to a report from the ENVIRONMENTAL PROTECTION AGENCY, from an average of about 3,200 pounds to nearly 4,200

20. Comparing US and EU Approaches to Regulation Automotive Emissions and Fuel Economy. <https://media.rff.org/archive/files/document/file/RFF-PB-16-03.pdf>

21. <https://reader.elsevier.com/reader/sd/pii/S1877705816300224?to-ken=F23B1D181F141A34D5CDA7CAB10CF6BD769E0C97836ADA5B4A89DA55EB1E6D93B40AC84E9F7329F5C96246A84464D275&originRegion=eu-west-1&originCreation=20220812045848>



. Average vehicle curbside weight and the aluminum content in cars in North America. Reprinted with permission from [72].

pounds. That's largely due to consumer preferences shifting towards trucks and SUVs, and those vehicles, themselves, getting heavier.

In 2005, light vehicles started to get lighter again, partly as a result of the increased use of aluminum which became more attractive as fuel prices began to dramatically increase again. The chart above shows the relationship between curbside weight and amount of aluminum used in vehicles. While aluminum's share of vehicle curb weight is expected to climb to 16% by 2028, average vehicle mass is projected to drop from 3,835 pounds in 2015 to 3,565 pounds by 2025. According to a 2020 study produced by DUCKERFRONTIER for the ALUMINUM ASSOCIATION, over 50% of that mass reduction will come from increased use of aluminum.²²

Curbside weight would be heading down even faster if it were not for more battery electric cars being produced and sold. For example, the *Ford F-150 Lightning* will weigh about 1,600 pounds more than a similar gasoline-powered F-150 truck. Similarly, the electric *Volvo XC40 Recharge* weighs about 1,000 pounds more than a gas-powered *Volvo XC40*.

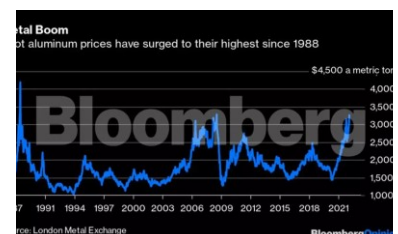
The future of aluminum and cars and their end-of-life

Today, on average, cars that are 14 years old or newer have approximately 4-6% aluminum content. This figure is around 10% for premium cars. In the future, the level of aluminum in end-of-life vehicles is expected to grow, with cars currently being produced having an aluminum content of 7-20%. Today, in modern plants, 95% of the aluminum in an end-of-life vehicle is successfully and profitably reused or recycled into new products, substituting the need for primary aluminum production.

This is predicated on the belief that there will be aluminum available to meet demand. Two events are working against this outcome. First, Russia's invasion of Ukraine has caused buyers to cancel orders for Russia's aluminum, or at least to consider doing so. TESLA is a major buyer of aluminum from Russia's RUSAL, owned by one of the sanctioned oligarchs. Second, China is not growing its aluminum smelting capacity anymore because it is trying to reduce both energy consumption and carbon dioxide emissions. It forced many of its smelters to cut output in 2020. If it continues to constrict production there will be less supply feeding more demand, and we know what that means: prices will go up. Affordability is the third problem. In 2017, the price of a ton of aluminum



22. file:///C:/Users/MLSENA/Documents/MitsubishiResearchInstitute/Aisin/Report%2014_Recycled%20Aluminum/DuckerFrontier-Aluminum-Association-2020-Content-Study-Summary-Report-FINAL.pdf



was \$1800. It is currently around \$2500. It was up to \$3700 in March 2022.

China is not an exporter of primary or secondary aluminum, and it is not an exporter or importer of scrap aluminum. It produces enough of its own scrap, and it uses it to increase production of aluminum that it uses to produce products that it sells internally and to the world markets. The more scrap it uses, the less coal it needs to fire the primary production furnaces and the lower are its emissions. That means it can control the price of its products in ways that are not available to countries like the U.S. and those in Europe who gave up producing their own aluminum. Forced or unforced, the chickens are coming home to roost.

Not everyone likes Teslas collecting data

OUT OF CONCERN for being seen or heard, the Chinese Communist Party has banned all TESLAS from Beidaihe during the two months it hosts the Party's annual summer retreat, which includes a two-week-long meeting. Beidaihe is nicknamed the "summer capital". It started in the '50s with Mao and continued until 1965. The gathering was discontinued at the start of the Cultural Revolution and was not re-started until the summer of 1984. It was halted again in 2003 when Hu Jintao took over, and taken up again when Xi Jinping called everyone to the seaside resort in 2013. Here's how one China source describes the security surrounding the event:

"The most salient is the noticeable increase in security around Beidaihe prior to the meeting. Sniffer dogs are seen patrolling public transit and other facilities. Paramilitary officers stand by the metal mesh fence — which separates the quiet exclusive oceanside villas from the crowded public beach — and warn off onlookers. Hawk-eyed plainclothes officers disguised as tourists carefully watch the waterfront with binoculars. A good number of limos with dark tinted windows discreetly whiz through the streets."

Why have TESLAS been given *cars non grata* status? It's all those cameras that can snap photos as they cruise the streets, photos that can then be fed back to the mother ship in the U.S. that causes *acita* among the Chinese leaders. An article in *IEEE SPECTRUM* sent to me by a faithful reader of *THE DISPATCHER* tipped me on the Beidaihe activities.²³ *SPECTRUM* has decided to investigate exactly what data TESLA vehicles are collecting, doing this as a service to *IEEE* members. Thus far, it reports, there is no evidence that TESLA collects any data beyond what customers agree to in



You would be forgiven for thinking this is an aerial view of Mar a Lago, Florida. It is another resort. It is called Beidaihe and is on the Bohai Sea close to Beijing.

23. <https://sup-china.com/2021/08/11/what-happens-at-beidaihe-an-explainer/>

their terms of service, but opting out of data collection appears to be extremely difficult. Most car companies today have integrated their vehicles into the wireless communications network and both collect and send data to their vehicles, but TESLA leads the pack in terms of the amount of data it stores in their vehicles and the regularity with which it sends back huge volumes of data to TESLA's servers.

Quoting from *SPECTRUM*: *"Spectrum has used expert analyses, NTSB²⁴ crash investigations, NHTSA reports, and Tesla's own documents to build up as complete a picture as possible of the data Tesla vehicles collect and what the company does with them. To start with, Teslas, like over 99% of new vehicles, have event data recorders (EDRs). These "black box" recorders are triggered by a crash and collect a scant 5 seconds of information, including speed, acceleration, brake use, steering input, and automatic brake and stability controls, to assist in crash investigations.*

"But Tesla also makes a permanent record of these data—and many more—on a 4-gigabyte SD or 8-GB microSD card located in the car's Media Control Unit (MCU) Linux infotainment computer. These time-stamped "gateway log" files also include seatbelt, Autopilot, and cruise-control settings, and whether drivers had their hands on the steering wheel. They are normally recorded at a relatively low resolution, such as 5 hertz, allowing the cards to store months' or years' worth of data, even up to the lifetime of the vehicle."

TESLA used the historic data it collected from one of its vehicles in Florida that was involved in a crash in which two young men in the vehicle died. TESLA was sued by the father of one of the victims for negligence. TESLA submitted a chart showing the speed at which the car had been driven during a period of months prior to the accident. It showed that the car had been driven with a daily top speed averaging over 90 miles per hour (145 kph). TESLA was found by the jury to be just 1% negligent.

TESLA has had its so-called 'Shadow Mode' operating on all of its vehicles since 2016, revealed Andrey Karpathy, head of AI for Tesla before he left the company in July.²⁵ It is based on Autopilot. *IEEE SPECTRUM* found that when Autopilot is not controlling the car, it is in a mode that simulates the driving process in parallel with the human driver. When Autopilot's predictions don't match what the driver does, a snapshot of all the car's various sensors is taken,



24. NTSB - The National Transportation Safety Board is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation — highway, marine, pipeline, and railroad.

25. <https://spectrum.ieee.org/tesla-autopilot-data-deluge>

stored and eventually sent to TESLA. Such snapshots are also triggered when a crash occurs. These data are reviewed by a TESLA team (the one Karpathy headed) to identify human responses that the Autopilot system should mimic and to upload as training data for the company's neural networks.

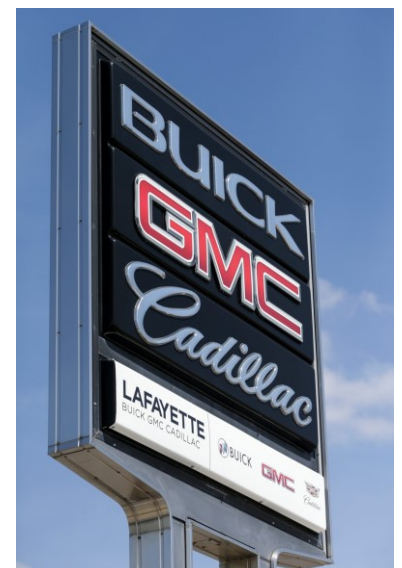
Is all of this data collection and analysis helping TESLA get closer to full self-driving? It's expensive, and in June of this year TESLA laid off 195 data analytics staff working in their San Francisco office. Serious accidents continue to occur. Is the problem that TESLA is relying too heavily on just cameras? NHTSA has not (yet) recalled TESLAS as a result of its ongoing investigations into Autopilot and its Full Self-driving software, and in the meantime, data keeps flowing in to Tesla's servers.

I have a few questions. How can the EU allow what is obviously a breach of its *General Data Protection Regulation*, with data being sent from EU countries to the U.S. that is clearly not anonymized. What will TESLA do when (not if) the EU makes the end point of data sharing the choice of the consumer. Will TESLA simply allow the data to be sent to all of its competitors? And is Shadow Mode and other data collecting operation even in China, and if it is, why is China allowing it?

GM makes OnStar a "mandatory option" (sic)

THERE WAS DISSONANCE in the headline that was displayed on the August 9th *AUTOMOTIVE NEWS* article that appeared on my screen: *GM requires Buick, GMC buyers to buy \$1,500 OnStar subscription*. It opened with "GM now requires all *Buick, GMC and Cadillac Escalade* buyers to pay \$1,500 for a 3-year subscription to **OnStar**". They now call it a "mandatory option". **OnStar** has gone well beyond the safety and security service that GM was first on the market with in 1996, before BMW and Volvo. Those emergency features are still part an important part of the service, but it now includes using your phone as a key fob, data-enabled navigation, audio streaming, AMAZON's Alexa's virtual assistant and more. It is still a real option on other models, with the premium package selling for \$49.99 per month.

One would think that after 26 years, GM would have figured out what to do with **OnStar**, but it hasn't. GM is not alone. All of the OEMs have struggled with the question of whether to make their telematics system standard, factory fit and the services free for either the warranty period or the vehicle's lifetime. The arguments for making it standard are mainly that the unit costs for



both installed equipment and services are lower because they are spread across all models. There are also no costs for selling the services and administering payments, and no confusion on the part of customers who wonder why the button in their vehicle no longer works. (See the [November 2020 issue of The Dispatcher](#).) GM OnStar started life as a standalone unit that would eventually show its bottom line contribution to the company's profits, but would have the advantage of not bearing the cost for sourcing and installing the equipment that GM decided would be factory fit in all of its vehicles.

Obviously, there are no English dictionaries on the GM premises. An 'option' is "the power or liberty of choosing; right of freedom of choice; something which may be or is chosen; choice," according to my [American College Dictionary](#).²⁶ 'Mandatory option' is an oxymoron. It's either mandatory, or it's an option; it cannot be both. GM wants to show that it has a revenue stream that will add up to at least 20% of its total turnover and is not directly related to pushing metal or servicing its parts. This is supposedly what stock analysts want to see in order for them to promote it to punters (aka stock buyers). If GM buries the payments for OnStar in the price of the car, it cannot show it in its new Internet services revenue stream. If it continues to make it an option, which customers can reject—even if the equipment is installed in every car—the total will not be significant enough to move the stock price needle.

What's an OEM to do? Make customers pay for turning on their heat-warming function, as BMW did, or pay-walling the key fob to start the vehicle as Toyota has done? What happens to the customer who decides not to pay AND who demands that it be turned off, which every customer has the right to do. GM will not reduce the sticker price of the vehicle. At least that's what they are saying. Naturally, the dealer has discretion to deal, and they may well end up eating the \$1,500 in order to close the sale. The folks in Renaissance Center in Detroit are probably banking on that.



26. My copy of [The American College Dictionary](#) was a gift that I received from the CHRYSLER CORPORATION FUND, 1965 SCHOLARSHIP PROGRAM which provided the funds for my National Merit Scholarship. It has been a trusty companion through all these years.

About Michael L. Sena

Through my writing, speaking and client work, I have attempted to bring clarity to an often opaque world of highly automated and connected vehicles. I have not just studied the technologies and analyzed the services. I have developed and implemented them, and have worked to shape visions and followed through to delivering them. What drives me—why do what I do—is my desire to move the industry forward: to see accident statistics fall because of safety improvements related to advanced driver assistance systems; to see congestion on all roads reduced because of better traffic information and improved route selection; to see global emissions from transport eliminated because of designing the most fuel efficient vehicles.

This newsletter touches on the principal themes of the industry, highlighting what, how and why developments are occurring so that you can develop your own strategies for the future. Most importantly, I put vehicles into their context. It's not just roads; it's communities, large and small. Vehicles are tools, and people use these tools to make their lives and the lives of their family members easier, more enjoyable and safer. Businesses and services use these tools to deliver what people need. Transport is intertwined with the environment in which it operates, and the two must be developed in concert.



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