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# Resolution

The United States Federal Government should substantially increase its investment in high-speed rail

# Background

## HSR Defined

#### HSR is rail that travels 120-160+ MPH

Richard Nunno, July 19, 2018, Transportation: Fact Sheet | High Speed Rail Development Worldwide, https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

**While there is no single international standard for high speed rail, new train lines having speeds in excess of 250 kilometers per hour (km/h), or 160 miles per hour (mph), and existing lines in excess of 200 km/h (120 mph) are generally considered to be high speed**. Many countries in Europe and Asia have developed high-speed rail for passenger travel, although some systems also offer freight service.

#### US definition

Audrey Henderson, 2017, Public Transit and the Benefits of High-Speed Rail, https://www.smartcitiesdive.com/ex/sustainablecitiescollective/benefits-high-speed-rail/151136/

**The definition for high-speed rail in the United States differs from the definition used in the rest of the world**, where high-speed rail is faster. For instance, the definition of high-speed rail in the European Union covers trains that travel up to 250 km/h (or 156 mph) on newly constructed lines. The EU defines high-speed rail on converted or upgraded lines as trains that travel up to 220 km/h (or 136 mph). **At this writing, only one rail line in the United States meets the EU standard for high-speed rail: the Acela Express, an Amtrak train that runs Between Boston, New York City, Philadelphia, Baltimore and Washington, D.C. The Acela Express averages 68 mph** (or 109 km/h) for its entire distance, **but reaches 150 mp**h (or 240 km/h) for brief stretches of its run.

By contrast**, the United States has designated three categories of high-speed rail: Emerging, Regional and Express. Emerging high-speed rail covers corridors ranging from 100 to 500 miles in distance** (or 160 to 800 kilometers) l**ong that have potential for supporting future high-speed rail development for trains traveling between 90 to 110 mph** (or 145 to 177 km/h) on shared track. **Regional high-speed rail is defined as service between population centers located between 100 and 500 miles apart (or 160 to 800 kilometers), and trains with top speeds ranging from 110 to 150 mph** (or 177 to 240 km/h) **with some dedicated track and some shared track. Express high-speed rail is used to define frequent service between major population centers located from 200 to 600 miles apart** (or 320 to 965 kilometers) **on trains that travel on dedicated tracks at speeds of at least 150 m**ph (or 240 km/h).

#### No HSR development in the US

Richard Nunno, July 19, 2018, Transportation: Fact Sheet | High Speed Rail Development Worldwide, https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

**In the United States, there is not yet a fully high-speed train line, and none are being built except in California.** The Acela Express, running between New York and Washington D.C., reaches a top speed of 150mph on limited portions of its route, but its average speed is only about 66 mph. California is in the process of building an HSR system, but the first phase, connecting San Francisco to Los Angeles and Anaheim, is not expected to be completed until 2029 (although some of the infrastructure is already being used). No other state or local jurisdiction has, at this time, allocated the funding to begin construction of high-speed rail. In Texas, studies are being conducted for a “Bullet Train” between Dallas and Houston, and advocates say that construction should begin in a year or so. In Florida, the Brightline service between Miami and Orlando is operational, but with an average speed of 80 mph, it does not meet the minimum speeds to be considered HSR (although plans for increased speeds are underway). In addition, Florida’s governor recently announced another potential HSR line between Orlando and Tampa.

## Investment

Adam Hayes, August 20, 2021, <https://www.investopedia.com/terms/i/investment.asp>, “Investment”

An investment is an asset or item acquired with the goal of generating income or appreciation. Appreciation refers to an increase in the value of an asset over time. When an individual purchases a good as an investment, the intent is not to consume the good but rather to use it in the future to create wealth.

An investment always concerns the outlay of some capital today—time, effort, money, or an asset—in hopes of a greater payoff in the future than what was originally put in.

For example, an investor may purchase a monetary asset now with the idea that the asset will provide income in the future or will later be sold at a higher price for a profit.

KEY TAKEAWAYS

An investment involves putting capital to use today in order to increase its value over time.

An investment requires putting capital to work, in the form of time, money, effort, etc., in hopes of a greater payoff in the future than what was originally put in.

An investment can refer to any medium or mechanism used for generating future income, including bonds, stocks, real estate property, or a business, among other examples.

# PRO

## Need Public Funding

#### HSR is empirically profitable but public funding is essential to getting the system up and running – New Jersey, France, and Spain prove

**American Public Transportation Association, ’12** – non-profit that advocates for the advancement of public transportation programs in the U.S. ( “An Inventory of the Criticisms of High-Speed Rail: with Suggested Responses and Counterpoints,” January 2012, https://www.apta.com/wp-content/uploads/Resources/resources/reportsandpublications/Documents/HSR-Defense.pdf

As to the French TGV and the Japanese Shinkansen, there have been many valuable lessons learned from which the United States will benefit as we go forward. The most important of these lessons that the critics acknowledge but refuse to accept is that passenger trains, if allowed to compete in an even environment with other modes, can cover their costs and in some instances even turn a profit. According to the New Jersey Public Interest Research Group, high-speed rail lines generally cover their operating costs with fare revenues. In the United States, a financially sustainable high-speed rail system will likely not require operating subsidies from taxpayers (although public funding is essential to getting the system up and running). High-speed rail service generates enough operating profit that it can subsidize other, less-profitable intercity rail lines in countries such as France and Spain, as well as in the U.S. Northeast. Two high-speed rail lines—the French TGV line between Paris and Lyon and the original Japanese Shinkansen line from Tokyo to Osaka—have covered their initial costs of construction through fares.

HSR will be vastly superior to Amtrak – and even its ridership numbers are on

#### Investment in HSR will jumpstart the development of HSR and provides the clearest and fastest way to long-term economic growth – studies prove

**Williams 11** (Mantil is a Writer and researcher for the APTA, or American Public Transportation Association. The American Public Transportation Association (APTA) is a nonprofit international association of 1,500 public and private member organizations, engaged in the areas of bus, paratransit, light rail, commuter rail, subways, waterborne services, and intercity and high-speed passenger rail “Federal Investment in High-Speed Rail Could Spur 1.3 Million Jobs ” https://www.masstransitmag.com/home/press-release/10251832/american-public-transportation-association-federal-investment-in-highspeed-rail-could-spur-13-million-jobs

The American Public Transportation Association (APTA) released a report detailing the enormous impact high-speed and intercity passenger rail projects will have in driving job development, while also rebuilding America’s manufacturing sector and generating billions of dollars in business sales. This report focuses on key issues critical to private investors as they consider investments or future expansion into businesses serving the growing passenger rail markets. The report, “The Case for Business Investment in High-Speed and Intercity Passenger Rail” reinforces the point that investments in high-speed and intercity rail will have many direct and indirect benefits. Nationally, due to proposed federal investment of high-speed rail over a six-year period, investment can result in supporting and creating more than 1.3 million jobs. This federal investment will be the catalyst for attracting state, local and private capital which will result in the support and creation of even more jobs. According to this new report, investments in building a 21st century rail system will not only lead to a large increase in construction jobs, but to the sustainable, long-term growth of new manufacturing and service jobs across the country. “It is evident that investing in high-speed and intercity rail projects presents one of the clearest and fastest ways to create green, American jobs and spur long-term economic growth,” said APTA President William Millar. “Investing in high-speed rail is essential for America as we work to build a sustainable, modern transportation system that meets the environmental and energy challenges of the future.” APTA noted for each $1 billion invested in high-speed rail projects, the analysis predicts the support and creation of 24,000 jobs. In addition to the thousands of new construction jobs, investments in high-speed rail will jumpstart the U.S. economy. The Economic Development Research Group for the U.S. Conference of Mayors studied the business impact of high-speed rail investment in different urban regions. For example, in Los Angeles, CA, high-speed rail investment generates $7.6 billion in business sales and $6.1 billion in Chicago, IL. “Federal high-speed rail investment is a strong driver in getting private companies to invest,” said Kevin McFall, Senior Vice President at Stacy and Witbeck Inc., a leading public transit construction firm. “This program can be a shot in the arm for the manufacturing industry. These high-speed rail projects will give us the opportunity to put people to work building the rail infrastructure this country desperately needs.” “U.S. businesses have been known for their cutting edge technologies and innovations, said Jeffrey Wharton, President of IMPulse NC. “We need to put this expertise to work, providing business and employment opportunities while catching up with the rest of the world in high-speed rail and its associated benefits.” “We are excited about the prospect of putting Americans to work building the rail tracks and equipment that will keep America’s economic recovery moving forward,” said Charles Wochele, Vice President for Industry and Government Relations at Alstom Transport. “We look forward to partnering with the federal and state governments to ensure these projects get off the ground.”

## Inadequate HSR Now

#### Little money is being invested in rail

Marily Waite, August 24, 2021, <https://www.greenbiz.com/article/why-us-needs-get-track-high-speed-rail>, Why the US needs to get on track with high-speed rail

**In the $1 trillion infrastructure bill passed by the U.S. Senate, just $66 billion was proposed for rail infrastructure over eight years and $39 billion for public transit over eight years.**

To get a sense of these numbers, Alphabet’s revenue in a single year, 2020, was over $180 billion. The American Society of Civil Engineers rates U.S. transit infrastructure at D-minus, with the backlog for transit projects at $176 billion and the backlog for passenger rail at $45 billion. This **public investment is vital for maintaining and upgrading the existing rail infrastructure, yet the allocations still fall short for building out a competitive high-speed rail network.** Even as corporate net-zero pledges and climate funds abound, there seems to be little attention paid to investing in electric rail. Shipping is having its moment with bankers pledging to help decarbonize the sector. Electric cars and trucks are viewed with increasing optimism by major automakers. Even aviation — one of the most difficult modes of transport to decarbonize — has seen breakthroughs in electrification and zero emissions efforts. **What about rail? As a soft indicator, since 2018, there has been literally one article per year on rail on GreenBiz.**

#### Infrastructure bill money did not go to HSR

Stephen Zetchik, November 18, 2021, Washington Post, All this money pouring into infrastructure should be a boon for high-speed rail, right? Not so fast, https://www.washingtonpost.com/technology/2021/11/18/infrastructure-bill-high-speed-rail/

On the surface, the federal government’s newfound commitment to infrastructure would seem like a boost for that grand elusive transit innovation of our time: high-speed rail. After all, among the trillion-plus dollars that will pour out of the bill President Biden signed into law Monday, **$65 billion is earmarked for rail**. Certainly **some of that money can help with** the transportation white whale; certainly it could help the benighted Los Angeles-San Francisco **high-speed line**, or the stalled Texas bullet, or even the in-progress One Florida dream of a Miami-Orlando-Tampa route. **It won’t.** “This package is not the silver bullet for the bullet,” said Colleen Callahan, deputy director of UCLA’s Luskin Center for Innovation. “**We won’t see much of it go to high-speed rail.”** **The new law contains no earmark for high-speed rail projects**, the globally popular but American also-ran of public-transit advancement that unites cities hundreds of miles apart without an airport hassle or carbon-spewing plane in sight. Instead**, the money is expected to go largely to the federally owned Amtrak, which doesn’t even own much of its tracks**. It’s conceivable Amtrak could gussy up its slightly brisker Northeast Acela route. But given how many problems on its traditional lines need addressing — and that owning the tracks is what allows you to jet

## Competitiveness

#### **HSR is key to maintaining global economic competitiveness – acting now is key to avoiding higher costs down the line**

Stern 5/14/2012 (Rachel, Junior fellow at the society of fellows at Harvard University, “High-Speed Rail Key to Job Creation, Supporters Say in Rally”, https://patch.com/california/santacruz/high-speed-rail-key-to-job-creation-supporters-say-in92193e6230

Still, "there are far more risks to not moving forward," said Daniel Krause, the co-founder and executive director of Californians for High-Speed Rail at the rally. "It will cost much more to expand airports and freeways to create the same amount of transportation capacity," said Krause, who pointed out that the project would in turn also lead to higher air pollution and risk of automotive deaths. The borrowing costs of the project, he continued, would be offset with the requirement than any of Prop 1A used must be matched with a non-state source of funds, "injecting billions of dollars into our state’s economy." The project’s supporters include San Jose Mayor Chuck Reed and San Francisco Mayor Ed Lee, who has stated that the project is necessary "to maintain our global economic competitiveness." San Francisco International Airport also counts itself as a project supporter, said Airport Director John Martin in a statement he issued earlier. "Passenger traffic at SFO is expected to grow to 50 million passengers by 2025," he said. "High-speed rail will reduce the need for short-haul commuter flights and provide greater ability for SFO to accommodate international and long-haul domestic flights." Now is the time to act on the rail before costs become higher, said Vance Pope a construction operating engineer from Redwood City, after the rally. "The longer you wait," he said, "the more it’s gonna cost so you might as well get it done." "The High-Speed Rail would create a lot of jobs for our members," said Alfredo Quintana, a Milpitas construction worker from Laborers Local 270.

## 

## Health

#### HSR improves health care outcomes

Cai-Xia Song, Cui-Xia Qiao\* and Jing Luo, mSchool of Economics, Shandong Normal University, Jinan, China, 2021, Does High-Speed Rail Opening Affect the Health Care Environment?–Evidence From China, https://www.frontiersin.org/articles/10.3389/fpubh.2021.708527/full

Using the panel data of 280 prefecture-level cities in China from 2004 to 2014, this paper examines the effects of high-speed rail opening on health care environment based on Difference-in-Differences method (DID). **Through an empirical analysis, the results proved that high-speed rail opening can significantly promote the health care environment and this effect is different in regions with different levels of economic development**. Finally, we tested the mechanisms of how the high-speed rail opening affects the healthcare environment. High-speed rail opening improves the healthcare environment by increasing road accessibility and promoting economic development. Our results support the view that high-speed rail opening has an important contribution to the improvement of health care conditions.

Introduction

In response to the huge demand for cross-regional movement of people and materials brought about by economic development, China has placed a high priority on transport infrastructure development. High-speed railway, with its high speed and wide coverage, can meet the need for efficient and convenient transport. **As a transport infrastructure with large-scale investment, high-speed railways have a close relationship with economic development and national living standards, and also play an important role in improving the health care conditions of cities along the route** (1–3).

Road infrastructure is considered to be a key catalyst for regional economic growth and residential environment (4–7). Existing studies have categorized the impacts of road infrastructure into two types: direct and indirect. Direct impacts are about service and accessibility improvements, including market opening, foreign investment and urban expansion. Indirect impacts are related to regional responses and policy changes along road construction, including greater urban attractiveness, lower development costs and tax incentives. It's also the way in which high speed rail affects the health care environment (8). **Transport infrastructure can improve the healthcare environment by increasing the accessibility of healthcare resources and the use of healthcare services, thereby, improving the health of the population** (9–12).

Studies have proven that the opening of a high-speed railway will have an overall impact on the development of a region (13). In the specific area of healthcare, the question of how the high-speed railway will affect the medical environment and how the advantages of the high-speed railway can be transformed into development momentum to drive healthcare development needs to be carefully considered. To address these issues, **this paper uses the panel data of 280 prefecture-level cities in China from 2004 to 2014,** and examines the effects of high-speed rail opening on health care environment based on Difference–in– Differences method (DID). The results of the paper show that the opening of high-speed rail is conducive to improving the health care environment. As an important part of modern transport infrastructure, **high-speed rail can provide healthcare resources and health protection to regions by reducing time costs, increasing the mobility of healthcare resources and promoting economic development**. The health effects of the high-speed rail opening have already been demonstrated. In addition, the effect of the opening of the high-speed rail in improving the healthcare environment is different in different regions.

…

Conclusions

This paper explores the impact of high-speed railway opening on health care environment applying Difference-in-Differences method (DID) in China**. The empirical results highlight that high-speed railway opening has a significant positive effect on public health care environment**. And the performance of the eastern region is better than that of the central and western regions. Finally, the article examines the mechanisms by which the opening of high-speed rail affects the health care environment. High-speed rail enhances the health care environment by improving road accessibility and economic development.

The results of the article have important policy implications. Firstly, **the opening of the high-speed railway should be used as an opportunity to better 'bring in' and 'go out' medical resources. Specifically, we should strengthen exchanges with developed medical regions to learn about advanced medical technology and managem**ent. At the same time, we should also pay attention to the introduction and training of high-level medical talents and resources. **Secondly, as there are differences in the level of medical development in different regions, local governments should actively encourage medical cooperation between medical institutions to promote the spatial spillover of the health effects of the opening of the high-speed railway. Thirdly, in addition to directly improving health care conditions, the government should also work to improve the overall living environment in other areas such as economic development and financial development, thereby increasing the locational advantage and attracting the construction of the high-speed rail, which in turn will lead to improved medical condition**s. Ultimately, this will lead to a virtuous cycle of improving the health care environment.

## Economic Development

### Regional Economic Development

#### HSR benefits the entire region

Bella Lorenz, The Urbanist, July 20, 2020, The Urbanist, High-Speed Rail Benefits Small Towns and Large Cities, https://www.theurbanist.org/2020/07/30/high-speed-rail-benefits-small-towns-and-large-cities/

here are many ways a **high-speed rail system can benefit the urban hubs of a megaregion, but small towns along the alignment can also benefit and grow economicall**y. According to Representative Seth Moulton (D-Massachusetts), who authored a white paper on American High-Speed Rail, “**Economic development is not limited to the major city pairs that will likely serve as terminals in initial high-speed passenger rail corridors across megaregions: intermediate communities with access to HSR service will also benefit, perhaps even more dra**matically.” **Major cities and small towns within in a clustered network are characterized as a megaregion**; the Pacific Northwest megaregion stretches from Eugene, Oregon all the way up to Vancouver, British Columbia, encompassing Portland and Seattle as well as smaller cities along the I-5 corridor such as Bellingham, Olympia, and Surrey. **High-speed rail will provide a fast, affordable, and sustainable mode of transportation between larger cities and for commuters in smaller towns–optimizing travel times, boosting innovation opportunities, and providing economic growth to all cities in the region.**

#### HSR revitalizes cities and supports economic development

Andy Kunz, President and CEO of the US High Speed Rail Association (USHSR), sets their vision and direction. He brings 30 years of successful business experience to USHSR and provides senior leadership and an ambitious vision for sustainable transportation in America. This vision includes a 17,000-mile national high-speed rail network built in phases and slated for completion by 2030. Andy holds a Bachelor of Fine Arts degree and a Master of Architecture in Town Design from the University of Miami. He has served as an expert in a number of forums, speaking extensively at leading conferences and events on transportation and planning topics and providing keynote presentations on high-speed rail and sustainability at numerous international conferences., 2020, <https://www.globalrailwayreview.com/article/69858/10-reasons-america-needs-high-speed-rail/>, en reasons America needs high-speed rail

8. High-speed rail revitalises cities

**High-speed rail redirects regional land development patterns into TOD (Transit Oriented Development) – compact, walkable, mixed-use and focused around rail stations. Feeder rail systems spur additional corridors of redirected development into compact, walkable forms.**

9. Train stations are a tool for economic development

**High-speed rail has the power to attract major real estate development around its stations, while also creating whole new industries due to its extensive manufacturing needs. It will also initiate a nationwide construction boom, followed by a new travel boom that will continue for decades.**

#### HSR revitalizes cities, reduces sprawl

Derek Markham, no date, 8 Benefits of High-speed Trains, https://science.howstuffworks.com/transport/engines-equipment/8-benefits-high-speed-trains.htm

**High speed trains could reverse the current tendency for cities to sprawl as wide as they can, with lots of new growth on the fringes and a neglected city center.** A high speed rail network could revitalize America’s ‘Main Streets’.

### Job Creation

#### HSR creates jobs – 24,000 for every $1 billion spent

American Public Transportation Association, Benefits of High-Speed Rail for the United States, https://www.apta.com/research-technical-resources/high-speed-passenger-rail/benefits-of-high-speed-rail-for-the-united-states/

**Building high-speed rail will create hundreds of thousands of jobs. Every $1 billion in investment creates 24,000 jobs.** These are highly skilled jobs that will revitalize the domestic rail industries supplying transportation products and services. Many additional jobs are created through the commerce fostered through the economic activity and development which they spark.

#### Every job in transport creates 4.2 jobs elsewhere

Bella Lorenz, The Urbanist, July 20, 2020, The Urbanist, High-Speed Rail Benefits Small Towns and Large Cities, https://www.theurbanist.org/2020/07/30/high-speed-rail-benefits-small-towns-and-large-cities/

The Washington State Department of Transportation (WSDOT) [2019 business case study](https://www.wsdot.wa.gov/planning/studies/ultra-high-speed-travel/2019-business-case-analysis) estimates that a high-speed rail system in Cascadia would bring 200,000 skilled jobs to the region. In addition to labor needed for construction, operations, and maintenance, transit-oriented development will bring employment opportunities in other sectors. According to Rep. Moulton’s proposal, “**for every direct job in the railway supply sector,**[**4.2 jobs are supported in other industries**](https://moulton.house.gov/imo/media/doc/FINAL.American%20High-Speed%20Rail.pdf)**,” which would create positions for another 840,000 people in the Pacific Northwest.** In his blog, Brad Smith, president of Microsoft, explains why job creation is among the reasons why the tech giant has [invested a total of nearly $600,000](https://blogs.microsoft.com/on-the-issues/2018/05/10/next-generation-washington-spring-2018-update/) in the WSDOT high speed rail studies: **Job growth with high-speed rail is “a 4% increase over what Seattle and Vancouver can expect without the service…** Thousands of these new job opportunities would be spread between Bellingham and Everett, Tacoma and Olympia, and all along the rail corridor.”

#### HSR creates millions of jobs

USHSR, no date, ENEFITS -- Silver Bullet Transportation Solution, http://www.ushsr.com/benefits/

High speed rail creates millions of jobs across many different fields including construction, engineering, manufacturing, real estate development, plus operations and management of the new system.

#### A small HSR project created 8,000 jobs

Gold Rush, 8-13, 2022, <https://goldrushcam.com/sierrasuntimes/index.php/news/local-news/40180-25-million-in-federal-funding-awarded-to-advance-high-speed-rail-in-california-funding-for-madera-to-merced-design-contract>, 25 Million in Federal Funding Awarded to Advance High-Speed Rail in California – Funding for Madera to Merced Design Contract

August 13, 2022 - SACRAMENTO, Calif. – On Thursday, the California High-Speed Rail Authority (Authority) was notified that it has been awarded $25 million in federal grant funding to advance the project beyond the 119-miles under construction and into downtown Merced. This grant was awarded through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program, and $25 million is the maximum grant award. “This grant is vital for the Authority to advance its initial electrified service between Downtown Merced and Bakersfield. It reflects the strong state-federal partnership now in place to see the nation’s first true high speed rail service commence right here in California,” said Authority CEO Brian Kelly. “Next week, our Board will consider awarding the contract to advance the design work for this transformative project.” The funding from the U.S. Department of Transportation will provide more than half of the expected $41 million cost for the Madera to Merced design contract. That contract will be brought before the Authority’s Board of Directors during their two-day Board meeting next week for consideration. This is the second grant the high-speed rail program has received under the Biden Administration since November 2021. Last fall, California’s high-speed rail project was awarded $24 million for crucial safety, efficiency and construction projects in and around the City of Wasco and State Route 46. Construction in the region will build safe, multimodal connectivity projects around Wasco to prepare for future high-speed rail service. The Authority is also pursuing $1.3 billion in federal grant funding to double-track the 119 miles currently under construction and purchase new, clean, electric train sets capable of speeds in excess of 200 miles per hour. The funding requested by the Authority will help accelerate construction for electrified high-speed between Merced and Bakersfield by the end of the decade. **Since the start of construction, the California high-speed rail project has created more than 8,000 construction jobs, a majority of which go directly to those living in the Central Valley. There are currently 119 miles under construction** in the Central Valley with more than 30 active construction sites. Source: CA. HSR

#### HSR increases engineering jobs

IOT Marketing, February 16, 2022, <https://iotmktg.com/advantages-of-high-speed-rail-systems/>, Advantages of High-Speed Rail Systems

**More Skilled Labor Opportunities - High-speed rail creates thousands of jobs for professionals with construction, engineering, and urban planning backgrounds. It further opens the door to tourism and maintenance jobs**.

#### HSR produces jobs in manufacturing and construction

Andy Kunz, President and CEO of the US High Speed Rail Association (USHSR), sets their vision and direction. He brings 30 years of successful business experience to USHSR and provides senior leadership and an ambitious vision for sustainable transportation in America. This vision includes a 17,000-mile national high-speed rail network built in phases and slated for completion by 2030. Andy holds a Bachelor of Fine Arts degree and a Master of Architecture in Town Design from the University of Miami. He has served as an expert in a number of forums, speaking extensively at leading conferences and events on transportation and planning topics and providing keynote presentations on high-speed rail and sustainability at numerous international conferences., 2020, <https://www.globalrailwayreview.com/article/69858/10-reasons-america-needs-high-speed-rail/>, en reasons America needs high-speed rail

Jobs are created in manufacturing and construction

**A national high-speed rail system in America will create millions of well paid jobs building the infrastructure and system components, managing the rail systems and operating the stations and related real estate development.**

Given all these incredible benefits, high-speed rail represents a truly transformative proposition, worthy of major federal and state investment in America’s bright future. Proof of such is evident all around the world where high-speed rail has been solving problems and providing great mobility and access to billions of people. Now its America’s turn to modernise its transportation system for the 21st century.

#### HSR strengthens worker flexibility

Marily Waite, August 24, 2021, <https://www.greenbiz.com/article/why-us-needs-get-track-high-speed-rail>, Why the US needs to get on track with high-speed rail

In the era of COVID-19 and the corresponding re-working of many workplaces, **high-speed rail provides an additional benefit: worker flexibility. With many companies deciding that a full remote working or twice-a-week in-the-office policy is not only feasible but better for a number of well-being and productivity outcomes, high-speed rail could offer more choice and options for workers, and more access to talent for employers**. Imagine employers in California that can have equal access to Oakland and Los Angeles employees; likewise for Dallas-Austin-Houston; Atlanta-Nashville-Birmingham; Chicago-Detroit.

### General Economic Growth

#### HSR strengthens the economy

Audrey Henderson, 2017, Public Transit and the Benefits of High-Speed Rail, https://www.smartcitiesdive.com/ex/sustainablecitiescollective/benefits-high-speed-rail/151136/

**High-speed rail has proven to be an *engine of economic development*, resulting in immediate job creation not only from the construction of the rails and related infrastructure and stations. High-speed rail also stimulates long term economic benefits generally and job growth specifically from commercial, residential and industrial developments that spring up along rail lines**. In addition, the addition of high-speed rail can be a boon to tourism. While many airports, by necessity, are located far from the city center, it’s possible for high-speed rail to run right into the heart of a city’s downtown, with stations located near cultural amenities, restaurants, hotels and shopping.Union Station Many passenger railway stations, such as Union Station in Chicago, are conveniently located near downtown jobs, shopping and cultural attractions. Photo credit: Audrey F. Henderson, all rights reserved.

#### HSR generates economic activity

American Public Transportation Association, Benefits of High-Speed Rail for the United States, https://www.apta.com/research-technical-resources/high-speed-passenger-rail/benefits-of-high-speed-rail-for-the-united-states/

**Every $1 invested creates $4 in economic benefits. Upgrading passenger operations on newly revitalized tracks, bridges and rights of way is spurring business productivity along corridors.** The rail services will connect America’s economically vital mega-regions and help keep them mobile, productive, efficient and internationally competitive.

#### HSR creates more demand in the economy

Josef, Lifelong Rail Enthusiast and Owner of Worldwide Rails, https://worldwiderails.com/what-are-the-benefits-of-high-speed-rail/

Whenever **a city constructs and starts using high-speed trains, you should expect its economy to go through the roofs. For starters, there’s increased revenue from the train ticket sales that goes up with the growing demand. Secondly, the demand for housing goes up due to the availability of a reliable mode of transportation, which brings in more money to the local government**.

Additionally**, businesses open up in local centers, such as restaurants and coffee shops, which help to stimulate the local economy and hire more people. As the standard of living goes up, the income level goes up with it, helping to improve people’s lives.**

#### HSR increases employment and property values

Sakdirat Kaewunruen et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 471 102006, Urbanisation Through the Benefits of High-Speed Rail System, https://iopscience.iop.org/article/10.1088/1757-899X/471/10/102006

High-speed rail (HSR) acts as a prominent role in society, particularly in urban areas. It implied on socio-economic dynamics and economic growth due to the connectivity. This study conducts the successful case studies of HSR service to analysis on the accessibility of a region and, its effects on urbanisation. Based on the positive impacts of HSR, the land pricing and population dynamic are concerned with primary factors. This research aims to examine the significance of HSR impacts and its roles in reforming urban areas. **Therefore, the study brings out a case study of HSR in China (Shanghai and Minhang district) to analysis via the analysis of variance (ANOVA) methods to find a correlation of HSR services with population dynamics and property prices. The Durblin-Watson statistic and Remedial measurement method are also applied to eliminate the disturbance of auto-correlation. As a result, the research found that HSR significantly increased an employment rate and it also leads to enhancing property prices especially within 5 km radius from HSR stations**.

#### HSR has significant economic benefits and a direct correlation with GDP – first thorough statistical study proves

Ahlfeldt 10 ( Gabriel M Ahlfeldt, the Department of Geography and Environment at LSE, “New research shows that high-speed rail does deliver economic growth”, The London School of Economics and Political Science, http://ipezone.blogspot.com/2010/09/gravy-train-high-speed-rails-economic.html

High-speed rail lines bring clear and significant economic benefits to the communities they serve, the first thorough statistical study of the subject has discovered. Economists discovered that towns connected to a new high-speed line saw their GDP rise by at least 2.7 per cent compared to neighbours not on the route. Their study also found that increased market access through high-speed rail has a direct correlation with a rise in GDP – for each one per cent increase in market access, there is a 0.25 per cent rise in GDP. The findings, from the London School of Economics and Political Science and the University of Hamburg, may be used to support arguments for high-speed networks which are already being planned in the UK, US and across the world. Until now, no one has demonstrated that high-speed rail brings clear economic gains along its routes. Authors Gabriel Ahlfeld and Arne Feddersen presented their findings at the conference of the German Economic Association. The paper, From Periphery to Core: economic adjustments to high-speed rail, also points to advantages in employment and GDP per capita for towns on the high-speed network. Their research focused on the line between Cologne and Frankfurt, which opened in 2002 and runs trains at almost 185mph (300 kmh). The authors looked at the prosperity and growth of two towns with stations on the new line – Limburg and Montabaur – and compared them with more than 3,000 other municipalities in the surrounding regions. The new line brought Limburg and Montabaur within a 40-minute journey of both Cologne and Frankfurt. Over a four-year period, the researchers found that both towns and the area immediately around them saw their economies grow by at least 2.7 per cent more than their unconnected neighbours. This effect, say the authors, is entirely attributable to the improved access to markets for Limburg and Montabaur and not to any external factors or inherent growth. They chose the two towns for the study because both were included on the high-speed route due to lobbying by regional government and not because their economies were powerful or expanding. Dr Ahlfeldt, from the Department of Geography and Environment at LSE, said: 'One of the problems with identifying the impact of high-speed rail has been that lines tend to get built first between areas with strong and growing economies so that it's difficult for economists to be sure which effects are attributable to the new rail line and which to existing factors. But because there was no economic rationale for building the line to Limburg and Montabaur, they provided the perfect "laboratory" conditions for us to measure the effect of high-speed trains. 'It is quite clear that the line itself brought significant and lasting benefits in access to markets, growth, employment and individual prosperity. One of our key findings is a positive market access elasticity, which means that improvements in accessibility to other towns, cities and regions, will be reflected in economic growth. We believe this research develops a new framework for predicting the economic effects of large-scale infrastructure projects and will help governments to define future spending priorities.'

#### HSR investment will spill over into other infrastructure investment

The DPost, September 29,2021, Pros and Cons of High-Speed Rail in the U.S., https://thedpost.com/pros-and-cons-of-high-speed-rail-in-the-u-s/

The high-speed rail in the United States would create many jobs and aid in stimulating the economy in the short run. This is all economics here**. The high-speed rail would also aid in creating benefits that are similar to those from other infrastructure projects, which are quite uncertain. History has suggested that there might be a great chance these would help fund those projects because of the amount of money this high-speed rail would gene**rate.

#### HSR increases productivity

IOT Marketing, February 16, 2022, <https://iotmktg.com/advantages-of-high-speed-rail-systems/>, Advantages of High-Speed Rail Systems

**Greater productivity - Employees are able to get to work on time without worrying about trying to find a parking space. More efficient transportation gives people time to focus on work and other productive activities during their journey.**

#### HSR reduces congestion and increases productivity

American Public Transportation Association, Benefits of High-Speed Rail for the United States, https://www.apta.com/research-technical-resources/high-speed-passenger-rail/benefits-of-high-speed-rail-for-the-united-states/

**Congestion on our nation’s roads costs $140 billion in lost time and productivity. The U.S. population is projected to grow by another 100 million people in the next 40 years. The population growth is creating mega-regions that will not prosper unless they can be freed from the stranglehold of highway and airport congestion.** At the same time, the United States cannot build enough highway capacity or airport runways to meet demand.

#### HSR benefits the economy in many ways

Derek Markham, no date, 8 Benefits of High-speed Trains, https://science.howstuffworks.com/transport/engines-equipment/8-benefits-high-speed-trains.htm

**The economic benefits of a high speed train system come from a variety of angles. From the jobs created to build the network, to the increased productivity which would come from more efficient use of time** (less sitting in traffic jams), to the increased access to transportation of goods and people for local businesses, high speed trains make economic sense.

#### HRS benefits the economy in multiple ways – expands job markets, boosts worker productivity, increases tourism

**Todorovich and Shned 11** (Petra, Dan September 27 Regional Plan Association https://ctl.mit.edu/events/fri-11042011-0845/distinguished-speaker-series-high-speed-rail-international-lessons-us

We found that in more than a dozen countries across the globe, high-speed rail has created new capacity and balance in regional transportation systems by providing passengers with safe, efficient, and reliable ways to travel between urban population and employment centers. By increasing access to markets, high-speed rail services bring the cities within megaregions closer together, which boosts worker productivity, expands labor and job markets, and makes industries more specialized and competitive due to the agglomeration effects afforded by the "virtual proximity" provided by high-speed rail. High-speed rail also promotes urban regeneration, increases tourism and visitor spending, and operates with greater energy efficiency than other competing modes.

#### HSR expands the economy across a large area

HSRA 12 ( US High Speed Rail Association, “High speed rail delivers many layers of economic benefits”, <http://www.ushsr.com/benefits/economic.html>, 2012,

High speed rail delivers fast, efficient transportation so riders can save time, energy, and money. HSR is extremely reliable and operates in all weather conditions. HSR is not subject to congestion, so it operates on schedule every day without delay - especially during rush hour and peak travel times. HSR spurs the revitalization of cities by encouraging high density, mixed-use real estate development around the stations. HSR also fosters economic development in second-tier cities along train routes. HSR links cities together into integrated regions that can then function as a single stronger economy. HSR broadens labor markets and offers workers a wider network of employers to choose from. HSR encourages and enables the development of technology clusters with fast easy access between locations. HSR also expands visitor markets and tourism while increasing visitor spending. The many benefits HSR delivers spread throughout regions that have HSR, encouraging economic development across a large area.

#### Delay and waste costs $100 billion per year

Thomas Hart, 2012, High-speed rail's many benefits, https://www.politico.com/story/2012/05/the-many-benefits-of-high-speed-rail-076682

Even as Congress looks into a new surface transportation bill, **U.S. transportation systems confront daunting challenges of overcrowding and disrepair. Delays and waste cost the nation more than $100 billion per year in lost time, productivity and energy.**

#### HSR reduces congestion

Derek Markham, no date, 8 Benefits of High-speed Trains, https://science.howstuffworks.com/transport/engines-equipment/8-benefits-high-speed-trains.htm

**What price do we put on the time we’re stuck in traffic? How about $87.2 billion a year lost in automotive gridlock? If you live in a city with horribly congested freeways, you may be spending more time sitting than you do actually driving. But since a single train track can carry the same amount of people as a 10 lane highway** (and at a fraction of the cost), **high speed trains could help relieve some of that traffic jam angst.**

## Urban Development

#### HSR improves urban development

Yue Lu,Siying Yang ,Jian Li, March 4, 2022, The influence of high-speed rails on urban innovation and the underlying mechanism, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0264779

Innovation is intrinsically dependent on the construction of local infrastructure. Using panel data on 285 cities in China, we empirically examined the impact of high-speed rails on urban innovation and the mechanism underlying this effect. We found that high-speed rails significantly increase urban innovation. In our analysis, high-speed rails were found to increase the agglomeration of innovation factors, including population and investment, which in turn increase urban technological innovation. The agglomeration of investment factors brought about by high-speed rails is the main source of the improvement in urban innovation. Through the use of a spatial panel model, we found that high-speed rails promote knowledge dissemination and technology spillovers among the cities along high-speed railways, thus improving their innovation levels. However, the existing effects of high-speed rails on innovation exhibit spatial heterogeneity. We confirmed the effect of high-speed rails on innovation and explored the mechanism underlying this effect by considering the effects of factor agglomeration and knowledge spillovers. Our conclusions can be used as a resource by policymakers to stimulate knowledge and technology diffusion, which in turn cultivates and stimulates urban innovation.

## Tourism

#### HSR promotes tourism

IOT Marketing, February 16, 2022, <https://iotmktg.com/advantages-of-high-speed-rail-systems/>, Advantages of High-Speed Rail Systems

Promotes Tourism - **Bullet trains** bring global attention to megaregions. They **provide safe, fast, and reliable transportation for tourists new to the region, helping them get to their destinations with ease.**

#### HSR increases US tourism

IOT Marketing, February 16, 2022, <https://iotmktg.com/advantages-of-high-speed-rail-systems/>, Advantages of High-Speed Rail Systems

Building a **high-speed rail system can accelerate the growth and development of new cities and tourism. It can potentially turn American cities into global tourist destinations, but more immediately will provide a more efficient travel option for local residents**. Increasing regional mobility while reducing traffic congestion is an important issue for numerous American cities, and bullet trains have become the modern solution.

#### HSR strengthens travel

American Public Transportation Association, Benefits of High-Speed Rail for the United States, https://www.apta.com/research-technical-resources/high-speed-passenger-rail/benefits-of-high-speed-rail-for-the-united-states/

High-speed rail can deliver people from one downtown to another as fast as or faster than air travel. The addition of HSR as an integrated part of America’s transportation system will help airports work better and highways work better. It will also expand options for citizens in rural and small urban communities with increased transfer points and feeder services that connect with new HSR corridors.

#### HSR will create hundreds of millions in domestic tourism

**EDRG, ’10** - a firm established in 1997 by alumni of the Massachusetts Institute of Technology to provide research and consulting on measuring economic performance, impacts and opportunities (Economic Development Research Group, “The Economic Impacts of High-Speed Rail on Cities and their Metropolitan Areas”, The United Conference of Mayors, 6/15/2010, http://www.usmayors.org/highspeedrail/documents/report.pdf)//AY

Third, HSR service can help expand visitor markets and generate additional spending. In all four cities, ridership increases are projected by implementing HSR service. A portion of the riders will be local residents traveling to outside locations. Another includes outsiders who already come to these cities via car or airplane but will shift to use of new high-speed rail. An additional portion represents new tourism, conference, and business trips to the case study cities. These travelers will generate spending at local hotels, restaurants, and retail stores. That new spending will grow over time. Projections show that by 2035, HSR can annually add roughly $255 million in the Orlando area; $360 million in the Los Angeles area; $50 million in the Chicago area; and more than $100 million in the greater Albany area.

## Poverty

### HSR Reduces Poverty

#### HSR means the poor can access job opportunities

Marily Waite, August 24, 2021, <https://www.greenbiz.com/article/why-us-needs-get-track-high-speed-rail>, Why the US needs to get on track with high-speed rail

The barriers to high-speed rail (and rail at lower speeds) are numerous in the U.S. The obstacles include local NIMBY-ism, construction cost overruns of previous rail plans and laws that disadvantage the majority public interest and place small municipalities at the center of power of what are state or multi-state level infrastructure decisions.

#### HSR creates more affordable housing opportunities

Andy Kunz, President and CEO of the US High Speed Rail Association (USHSR), sets their vision and direction. He brings 30 years of successful business experience to USHSR and provides senior leadership and an ambitious vision for sustainable transportation in America. This vision includes a 17,000-mile national high-speed rail network built in phases and slated for completion by 2030. Andy holds a Bachelor of Fine Arts degree and a Master of Architecture in Town Design from the University of Miami. He has served as an expert in a number of forums, speaking extensively at leading conferences and events on transportation and planning topics and providing keynote presentations on high-speed rail and sustainability at numerous international conferences., 2020, <https://www.globalrailwayreview.com/article/69858/10-reasons-america-needs-high-speed-rail/>, en reasons America needs high-speed rail

**High-speed rail helps solve the affordable housing crisis by providing access to a wider housing market and taking pressure off the high price ‘hot spots’ by levelling out pricing at the regional scale**. High-speed rail also spurs the development of additional rail systems including light-rail and streetcars, thereby opening up additional possibilities for affordable living and the ability to live without a car or less cars per household – saving the huge expense of car ownership.

## Carbon/Climate Change

### HSR Reduces Carbon

what will give us real energy independence,” says the Environmental Defense Fund’s Mark Brownstein.

#### Oil drives climate change, which causes environmental catastrophe

Lindsay Maizland and Anshu Siripurapu, Council Foreign Relations, August 11, 2022, How the U.S. Oil and Gas Industry Works, https://www.cfr.org/backgrounder/how-us-oil-and-gas-industry-works

**Producing and burning oil and gas create almost half of the world’s greenhouse gas emissions**, mainly carbon dioxide and methane. **Greenhouse gases trap heat and cause temperatures to rise, which contributes to stronger storms; increasingly extreme heatwaves, droughts, and floods; and other environmental catastrophes. The United States is the world’s largest emitter historically and second-largest emitter today,** behind China. Oil and gas account for nearly 80 percent of the country’s total carbon dioxide emissions and more than a quarter of total methane emissions [PDF]. **According to a 2018 report by a panel of top climate researchers**, **global emissions need to decline by 45 percent by 2030 to limit warming to 1.5°C** (2.7°F) above preindustrial levels, which is the aim of the Paris Agreement on climate. **Surpassing that limit will cause irreparable harm, and every additional tenth of a degree of warming worsens the damage.** In 2022, the same panel said that some regions are already seeing irreversible damage and that the 1.5°C goal is almost out of reach. The Biden administration has pledged that the United States will halve its emissions, compared to 2005 levels, by 2030 and achieve net-zero emissions by 2050. But to have a shot at achieving those goals, the oil and gas industry, as well as electricity providers and automotive firms, needs to reduce emissions immediately. Oil and gas consumption has to decline by at least 56 percent by 2050 compared to 2020 levels, according to Princeton University’s Net-Zero America study. Actions that companies can take include increasing energy efficiency; improving methane leak detection; developing carbon capture, utilization, and storage (CCUS) technology; investing in renewables; and, ultimately, leaving hydrocarbons in the ground.

#### HSR will decarbonize the transit system

USHSR, no date, ENEFITS -- Silver Bullet Transportation Solution, http://www.ushsr.com/benefits/

**High speed rail is the single largest climate solution that can *decarbonize the majority of our entire national transportation* network, and** can be scaled up quickly by making the project a top national priority.

#### HSR reduces climate change

Marily Waite, August 24, 2021, <https://www.greenbiz.com/article/why-us-needs-get-track-high-speed-rail>, Why the US needs to get on track with high-speed rail

***Transportation represents the largest source of climate-harming greenhouse gas emissions in the U.S***., and the climate benefits of high-speed rail are clear. **According to Project Drawdown, high-speed rail reduces carbon emissions up to 90 percent compared to driving, flying or riding conventional rail, and is the fastest way to travel between two points that are a few hundred miles apart**. High-speed rail also helps build in resiliency and needed redundancy to face the impacts of climate change, such as when planes are grounded due to severe weather. There are future plans to build high-speed rail in the U.S., and they have been plans for a long time. **Without adequate public investment, better accounting of benefits and changes to the laws that impede progress, they will remain just plans, depriving the economy of the low-carbon infrastructure that’s needed to connect communities, create jobs and mitigate climate change**.

#### HSR reduces CO2 production

Audrey Henderson, 2017, Public Transit and the Benefits of High-Speed Rail, https://www.smartcitiesdive.com/ex/sustainablecitiescollective/benefits-high-speed-rail/151136/

Although high-speed rail cars generally burn fossil fuels, they are still more environmentally friendly than private cars, for two reasons. First, t**rains produce less carbon dioxide than would be produced by the number of private automobiles required to transport the same number of people over a given distance. Second, because rail traffic is a form of public transportation, more rail traffic translates to less automobile traffic, and by extension, less highway and city street traffic congestion.** In addition, less congestion means less wear and tear on the roadways, which means that they require fewer repairs.

#### HSR lowers the shipping carbon footprint

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**High-speed rail offers an alternative light freight shipping infrastructure** in combination with its passenger transport, lowering the cost (and increasing reliability) of shipping light freight goods and perishables throughout the country. This would replace our inefficient light freight shipping network – consisting mainly of long-distance trucks and airplanes – which has an enormous carbon footprint and clogs our highway **Transportation is the single largest source of carbon causing climate change.** The American transportation system is the most inefficient on earth, with most of the country driving gas-guzzling, single-occupant SUVs hundreds of miles a day around sprawling communities. Whereas, on the other hand, high-speed rail can be zero carbon transportation.

#### HSR reduces CO2 emissions (fewer cars)

Richard Nunno, July 19, 2018, Transportation: Fact Sheet | High Speed Rail Development Worldwide, https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

Environmental considerations. **High-speed rail clearly offers a path to lower greenhouse gas emissions than other modes of transportatio**n. If HSR services can entice people out of their cars by offering convenience and speed at a low cost, this would significantly reduce societal energy consumption and carbon emissions. The California High-Speed Rail Authority (CHSRA), for example, estimates that by 2040, California’s HSR system will reduce vehicle miles of travel in the state by 10 million miles each day; over a 58-year period, the system will reduce auto traffic on the state’s highways by over 400 billion miles of travel. In addition, CHSRA estimates that starting in 2030, the state will see a reduction of 93 to 171 flights daily, which translates into improved air quality and improved health, along with the economic benefits of a more energy-efficient transportation system In many countries, laws and policies are already in place requiring businesses and consumers to reduce their emissions, and a consensus toward those trends is emerging over time. **High-speed rail can offer the triple bottom line (economic, social and environmental sustainability) that many policymakers have called for over the years**

#### HSR saves energy

Andy Kunz, President and CEO of the US High Speed Rail Association (USHSR), sets their vision and direction. He brings 30 years of successful business experience to USHSR and provides senior leadership and an ambitious vision for sustainable transportation in America. This vision includes a 17,000-mile national high-speed rail network built in phases and slated for completion by 2030. Andy holds a Bachelor of Fine Arts degree and a Master of Architecture in Town Design from the University of Miami. He has served as an expert in a number of forums, speaking extensively at leading conferences and events on transportation and planning topics and providing keynote presentations on high-speed rail and sustainability at numerous international conferences., 2020, <https://www.globalrailwayreview.com/article/69858/10-reasons-america-needs-high-speed-rail/>, en reasons America needs high-speed rail

**America is in deep trouble due to our extreme oil dependency for 98 per cent of our transportation; consuming some 20 million barrels of oil every day, 70 per cent of which is for transportation. Maintaining this enormous flow of oil requires America to dig up oceans, protected national forests and the arctic tundra; risking our clean drinking water, our health and our safety** – without forgetting the expensive consequential wars. None of this is sustainable or desirable.

**High-speed rail is the world’s greenest form of transportation and can be 100 per cent powered by renewable energy, bypassing the entire global-oil-military-supply chain. The California HSR system under construction in the Central Valley will be powered 100 per cent by renewables.**

#### Europe proves trains emit less carbon than planes

Hindustan Times, July 17, 2022, <https://www.hindustantimes.com/lifestyle/travel/high-speed-rail-to-displace-flights-amid-airport-chaos-101658041327613.html>, High speed rail to displace flights amid airport chaos?

**A typical rail journey between European cities emits up to 90% less CO2 than an equivalent flig**ht. Meanwhile, the aviation industry has the fastest-growing greenhouse gas emissions in the EU, rising 29% between 2009 and 2019, according to Greenpeace. **Despite the airline business's post-pandemic crisis, flights are expected to burn up over a quarter of the allotted carbon budget for holding global heating to 1.5 degree Celsius (2.7 F) by 2050. With the industry planning to return to pre-COVID capacity by 2024, air traffic is set to double worldwide by 2037.**

#### HSR means a net reduction carbon emissions

Aby Kikenberg, July 17, 2022, <https://www.fairplanet.org/editors-pick/europe-dreams-of-high-speed-rail/>, EUROPE DREAMS OF HIGH-SPEED RAIL

The EU’s transportation sector accounts for around a quarter of the 3.8 billion tonnes of CO2 emitted by the bloc annually. The acclaimed (and ambitious) European Green Deal “seeks a 90 percent reduction in these emissions by 2050.” In 2019 (pre-pandemic), road transport (71.7 percent) and civil aviation (13.9 percent) accounted for 84.6 percent of greenhouse gas emissions in the transportation sector. **High-speed rail has emerged as a more climate-friendly alternative to driving or flying** and leaders in the European rail industry believe its future is bright: at the same June event in Lyon, they announced plans to double high-speed rail usage across Europe by 2030 and triple it by 2050. While **China is far-and-away the global leader in the domain of high-speed rail with over 40,000 kilometres of active tracks** (and another 30,000 on the way), **Europe is laying down its own networks with an eye towards reducing emission**s. Spain, France, Germany, Italy and Finland round out the top five EU countries in terms of kilometres of active high-speed rail networks. In terms of bolstering these systems, Germany has shown the most initiative: its 3,322 kilometres of track currently under construction surpass the total of the other top five members of the EU combined. However, it is exactly this country-specific nature of European high-speed rail development that presents such a large obstacle to realisation of bloc-wide goals. Thus far, domestic networks have gained the most traction (and received the most funding) given the clear-cut nature of these projects: all costs are borne and all benefits reaped by the country in question. When crossing international borders, these calculations get messy, but a little success goes a long way: the London-Paris route via the Channel Tunnel and the Paris-Brussels-Amsterdam/Cologne route have proven both popular and essential. The opening of longer routes like those of Paris-Milan (6 hours, 49 minutes) and Paris-Barcelona (6 hours, 15 minutes) have also been hailed as victories despite the fact that air travel is a considerably faster alternative. Jean-Pierre Farandou, the CEO of France’s national railway operator SNCF, has indicated that, perhaps in part due to increased climate consciousness, “people are accepting longer and longer journeys. There are really people who are willing to spend five hours, six hours, seven hours on a train.” **High-speed rail is seen as the “most sustainable and efficient transport for distances between 300 and 750 kilometres**” and, according to EU statistics, 17 of the 20 busiest air routes on the continent fall in this range. The market and, supposedly, the patience for high-speed rail travel is there – it just remains to be seen whether the funding will be. On 29 June, the EU issued €5.4 billion in grants to fund 135 transport projects across the bloc, including a set of cross-border high-speed rail initiatives related to the Trans-European Transport Network (TEN-T). As rail companies and systems continue to struggle in the wake of the pandemic, such grants are even more critical to ensure that Europe does not fall back into dirty, carbon-emitting habits (as is being seen in the domain of energy). Among the more innovative proposals for financing Europe’s high-speed rail network is that of reinvesting money derived from carbon taxes into the continent’s rail infrastructure. Without sustainable alternatives in the transportation sector, Europe will never meet its climate goals. If the EU intends to move towards a green future at all, it will have to do so along tracks laid in the name of high-speed rail.

#### HSR removes 6 billion pounds of CO2 per year and helps meet the 2020 emissions standards even at only partial capacity

**APTA 12** – American Public Transportation Association, non-profit organization which serves as an advocate for the advancement of public transportation programs and initiatives in the United States; educated the public about the benefits of public transportation through organized bus, light rail, rapid transit and other programs; lobbies the U.S. Congress and local government bodies in favor of public transportation improvements and new developments. (January, An Inventory of the Criticisms ofHigh-Speed Rail, <http://www.apta.com/resources/reportsandpublications/Documents/HSR-Defense.pdf>) // AG

The issue of the carbon footprint is a collateral benefit. Emissions from trains, be they conventional or high-speed, are about two thirds that of airplanes, and one third less that automobiles. And the higher the passenger load, the greater the greenhouse benefit. Overall, environmental analysts estimate that between 12 billion and 6 billion pounds of CO2 can be eliminated by diverting passengers from air and auto travel in passenger rail corridors ranging from 100 to 600 miles in length. Regarding the “green nature” of high-speed rail, the U.S. Department of Transportation believes they have sufficient data to demonstrate that the administration’s passenger rail improvement initiative promotes economic expansion (including new manufacturing jobs), creates new choices for travelers in addition to flying or driving, reduces national dependence on oil, and fosters urban and rural community development. Further, the Department contends that today’s intercity passenger rail service consumes one-third less energy per passenger-mile than cars, and estimates that if high-speed rail lines are ultimately built on all federally-designated corridors, it could result in an annual reduction of 6 billion pounds of CO2 . For its part, Amtrak forecasts, based on EPA and Department of Energy evaluation factors, that travel-related emissions and energy consumption savings in the Northeast Corridor alone would be approximately $400 million over the initial 30 years of its Northeast Corridor passenger rail improvement program. The California High-speed Rail Authority in 2008 issued a draft environmental impact review/ environmental impact study (EIR/EIS) that among other impacts addressed air pollution issues including greenhouse gasses. The draft EIR/EIS noted that it only calculated CO2 for alignment alternatives that reflected emissions from electrical power stations, planes, and onroad vehicles miles traveled (VMT). The highway component was based on potential daily VMT reductions of 32.691 million miles. The air travel component was based on potential reductions of 52,876 daily trips. Additionally, the Climate Change Scoping Plan produced by the California Air Resources Board (CARB) (pursuant to AB 32) in 2008 includes the HST system as one of the state’s fundamental strategies in meeting the 2020 emissions reduction goals. By 2020, the HST system is expected to have just started operations between San Francisco and Anaheim and is estimated to be only at 26% of the full ridership levels— resulting in a reduction of one million metric tons of CO2 equivalent.

#### Europe proves trains emit less carbon than planes

Hindustan Times, July 17, 2022, <https://www.hindustantimes.com/lifestyle/travel/high-speed-rail-to-displace-flights-amid-airport-chaos-101658041327613.html>, High speed rail to displace flights amid airport chaos?

**A typical rail journey between European cities emits up to 90% less CO2 than an equivalent flig**ht. Meanwhile, the aviation industry has the fastest-growing greenhouse gas emissions in the EU, rising 29% between 2009 and 2019, according to Greenpeace. **Despite the airline business's post-pandemic crisis, flights are expected to burn up over a quarter of the allotted carbon budget for holding global heating to 1.5 degree Celsius (2.7 F) by 2050. With the industry planning to return to pre-COVID capacity by 2024, air traffic is set to double worldwide by 2037.**

#### HSR means a net reduction carbon emissions

Aby Kikenberg, July 17, 2022, <https://www.fairplanet.org/editors-pick/europe-dreams-of-high-speed-rail/>, EUROPE DREAMS OF HIGH-SPEED RAIL

The EU’s transportation sector accounts for around a quarter of the 3.8 billion tonnes of CO2 emitted by the bloc annually. The acclaimed (and ambitious) European Green Deal “seeks a 90 percent reduction in these emissions by 2050.” In 2019 (pre-pandemic), road transport (71.7 percent) and civil aviation (13.9 percent) accounted for 84.6 percent of greenhouse gas emissions in the transportation sector. **High-speed rail has emerged as a more climate-friendly alternative to driving or flying** and leaders in the European rail industry believe its future is bright: at the same June event in Lyon, they announced plans to double high-speed rail usage across Europe by 2030 and triple it by 2050. While **China is far-and-away the global leader in the domain of high-speed rail with over 40,000 kilometres of active tracks** (and another 30,000 on the way), **Europe is laying down its own networks with an eye towards reducing emission**s. Spain, France, Germany, Italy and Finland round out the top five EU countries in terms of kilometres of active high-speed rail networks. In terms of bolstering these systems, Germany has shown the most initiative: its 3,322 kilometres of track currently under construction surpass the total of the other top five members of the EU combined. However, it is exactly this country-specific nature of European high-speed rail development that presents such a large obstacle to realisation of bloc-wide goals. Thus far, domestic networks have gained the most traction (and received the most funding) given the clear-cut nature of these projects: all costs are borne and all benefits reaped by the country in question. When crossing international borders, these calculations get messy, but a little success goes a long way: the London-Paris route via the Channel Tunnel and the Paris-Brussels-Amsterdam/Cologne route have proven both popular and essential. The opening of longer routes like those of Paris-Milan (6 hours, 49 minutes) and Paris-Barcelona (6 hours, 15 minutes) have also been hailed as victories despite the fact that air travel is a considerably faster alternative. Jean-Pierre Farandou, the CEO of France’s national railway operator SNCF, has indicated that, perhaps in part due to increased climate consciousness, “people are accepting longer and longer journeys. There are really people who are willing to spend five hours, six hours, seven hours on a train.” **High-speed rail is seen as the “most sustainable and efficient transport for distances between 300 and 750 kilometres**” and, according to EU statistics, 17 of the 20 busiest air routes on the continent fall in this range. The market and, supposedly, the patience for high-speed rail travel is there – it just remains to be seen whether the funding will be. On 29 June, the EU issued €5.4 billion in grants to fund 135 transport projects across the bloc, including a set of cross-border high-speed rail initiatives related to the Trans-European Transport Network (TEN-T). As rail companies and systems continue to struggle in the wake of the pandemic, such grants are even more critical to ensure that Europe does not fall back into dirty, carbon-emitting habits (as is being seen in the domain of energy). Among the more innovative proposals for financing Europe’s high-speed rail network is that of reinvesting money derived from carbon taxes into the continent’s rail infrastructure. Without sustainable alternatives in the transportation sector, Europe will never meet its climate goals. If the EU intends to move towards a green future at all, it will have to do so along tracks laid in the name of high-speed rail.

### Climate Impacts

#### Temp has increased 1.1 degrees, most limit to 1.5 to avoid impacts

Lisa Friedman, January 4, 2022, The New York Times, Biden ‘Over-Promised and Under-Delivered’ on Climate. Now, Trouble Looms in 2022., https://www.nytimes.com/2022/01/04/climate/biden-climate-change.html

“If they can’t pull this off, then we failed; the country has failed the climate test,” said John Podesta, a former senior counselor to President Barack Obama and founder of the Center for American Progress, a left-leaning think tank. Mr. Podesta praised the Biden administration for making global warming a priority, creating a White House office of domestic climate policy, appointing an international climate envoy to reassert U.S. leadership on the global stage, moving forward a handful of regulations and proposing major investments in clean energy. But he also noted that the physics of climate change is unforgiving. **The planet has already warmed an average of about 1.1 degrees Celsius compared with temperatures before the Industrial Revolution. If temperatures continue to rise past 1.5 degrees Celsius, the likelihood of increasingly deadly wildfires, floods, heat waves and other disasters becomes unavoidable**, scientists have warned. **Countries must immediately and drastically reduce greenhouse gase**s caused by burning oil, gas and coal **if the world is to avert the most catastrophic impacts**, experts have said.

#### Each tenth of a degree matters and saves millions of lives

Aronoff & Denvir 21 [Kate, staff writer at the New Republic, writing fellow at In These Times, Daniel, visiting fellow in International and Public Affairs at Brown Univ, “Capitalism Can’t Fix the Climate Crisis,” *Jacobin*, 08/25/21, <https://jacobinmag.com/2021/08/capitalism-climate-crisis-global-green-new-deal-clean-energy-fossil-fuel-industry>

The text of the Paris Agreement says that warming should be constrained to well below two degrees Celsius. 1.5 degrees is an aspiration. It’s good to understand where that demand comes from; it has been a standing call from the folks in climate-vulnerable countries in the Global South, for whom the difference between 1.5 and 2 degrees is huge. The folks talking about 1.5 degrees have been marching through the halls of UN climate talks, chanting “1.5 to survive,” because for low-lying island states, warming of 1.5 degrees represents an existential threat. Currently we are on track for about 1.1 degrees Celsius of warming. That gives us a punishingly short window in which to meet even two degrees, which is a bit of a fabrication; there’s some debate about where the two-degree target came from. Some people credit that to the economist William Nordhaus, who is not the most reliable source on a lot of these things. But there’s something comforting about a target. There’s something comforting about saying that this thing that is happening is far-off, and that we can potentially avoid it. We have a bit of time, and two degrees gives us more time than 1.5 degrees. Reaching targets has been the popular goal. That’s what you see in the fossil fuel industry assessments. But the conversation about targets can sometimes obscure what’s actually happening. It’s not as if somebody who is living through a hurricane or a natural disaster will say, “Oh no, we’ve hit two degrees Celsius.” The climate crisis is playing out all around us. There’s not a point at which we cross the boundary toward a disastrous future. Every tenth of a degree of warming that we avoid makes an enormous amount of difference, saving on the order of tens of thousands of lives. If we cross 1.5 or even two degrees of warming, it’s not that we should all pack up, go home, and wait to die. There are still millions of lives that can be saved by preventing each additional tenth of a degree of warming.

#### Every ½ degree beyond 1.5 degrees puts hundreds of millions at-risk

Gallagher, January-February 2022, KELLY SIMS GALLAGHER is Academic Dean, Professor of Energy and Environmental Policy, and Director of the Climate Policy Lab at Tuft University’s Fletcher School. She served as Senior Policy Adviser in the White House’s Office of Science and Technology Policy during the Obama administration, The Coming Carbon Tsunami, Developing Countries Need a New Growth Model—Before It’s Too Late, https://www.foreignaffairs.com/articles/world/2021-12-14/coming-carbon-tsunami

Although **world leaders have announced their intention to limit the global temperature rise to 1.5 degrees Celsius, the planet is currently on track to experience warming far in excess of that level**. The consequences of this will be devastating: according to the latest report by the UN’s Intergovernmental Panel on Climate Change, **every additional 0.5 degrees Celsius of warming beyond 1.5 degrees Celsius will cause “clearly discernible increases in the intensity and frequency of hot extremes . . . as well as agricultural and ecological droughts.” In the event of two degrees Celsius warming, extreme heat waves that normally would have occurred only once in 50 years will likely occur 14 times during the same time frame. Three hundred and fifty million more people risk being be exposed to deadly heat**: residents of Karachi, Pakistan, and Kolkata, India, for example, could experience, on an annual basis, conditions like those of the heat wave that struck the Indian subcontinent in 2015, which killed thousands. These changes will afflict the developed and the developing world alike; there is no alternative but to collaborate to avoid the worst effects of climate change.

#### Every new degree of warming increases the risk of a mega storm

**Caroline Vakil, 8-13, 22, C**limate change doubles likelihood of ‘megastorms,’ extreme flooding in California: study, https://ktla.com/news/california/climate-change-doubles-likelihood-of-megastorms-extreme-flooding-in-california-study/

**The likelihood of a “megastorm” occurring in California has doubled due to climate change,** according to a new study published on Friday. The study, published in the Science Advances journal, found an increased likelihood of runoff water occurring from harsher storms, creating the threat of debris flows and landslides later, according to a press release from the University of California, Los Angeles. **With every degree that the Earth gets warmer, the likelihood for a “megastorm” increases, too,** the study found. ADVERTISING Researchers looked at two different scenarios using present climate models and high-resolution weather modeling. One scenario involved a long series of storms taking place during what scientists predicted climate conditions would be like between 2081 and 2100. The other scenario predicted what it would be like if those storms took place in the current climate, according to the release. In the Sierra Nevada Mountains, storms that took place toward the end of the century would see between 200 percent and 400 percent more runoff because of higher precipitation. “There are localized spots that get over 100 liquid-equivalent inches of water in the month,” UCLA climate scientist and co-author of the research David Swain said in a statement regarding the end-of-the-century scenario. “On 10,000-foot peaks, which are still somewhat below freezing even with warming, you get 20-foot-plus snow accumulations. But once you get down to South Lake Tahoe level and lower in elevation, it’s all rain. There would be much more runoff.” **The researchers also noted that the state risks a $1 trillion disaster**. In addition, parts of major cities like Los Angeles and Sacramento would be underwater if the state endured the kind of flooding that took place during the Great Flood of 1862 in the current climate. “Modeling extreme weather behavior is crucial to helping all communities understand flood risk even during periods of drought like the one we’re experiencing right now,” Karla Nemeth, director of the California Department of Water Resources, said in a statement. “The department will use this report to identify the risks, seek resources, support the Central Valley Flood Protection Plan, and help educate all Californians so we can understand the risk of flooding in our communities and be prepared.” The department contributed some funding toward the study.

#### Extreme heat creates a loss of $100 billion in worker productivity

Washington Post Editorial Board, July 16, 2022, The global heat waves should be a warning for the future, https://www.washingtonpost.com/opinions/2022/07/16/global-heat-waves-climate-change-warning/

In Yosemite National Park’s famed Mariposa Grove, giant sequoias have grown for millennia. As some of the largest and oldest living things in the world, their preservation — which was first given legal protection under Abraham Lincoln — predates the National Park Service. This month, they were threatened by a nearby wildfire that was exacerbated by dry, hot conditions. That is just one of many dramatic weather events taking place around the country and world. In Texas, record-breaking temperatures forced the state’s power grid operator to warn residents to cut back on energy use or face the risk of blackouts. Around 35 million Americans were placed under heat advisories or excessive heat warnings. Western Europe is also experiencing extreme heat waves — Spain is experiencing its second in less than a month, while the United Kingdom issued its first-ever “extreme heat” warning. Italy has faced prolonged heat and drought, and a glacier collapse officials attributed to climate change resulted in the deaths of 11 people earlier this month. In China, at least 86 cities released heat alerts; in the city of Nanjing, officials opened air-raid shelters for locals to escape the heat. These cases should not be viewed in isolation. While links between individual weather events and global warming cannot be determined immediately, studies have found that concurrent heat waves affecting parts of North America, Europe and Asia have become more intense and frequent over the past few decades. An analysis by World Weather Attribution, a group of scientists who analyze whether extreme events are connected to climate change, found that last year’s devastating heat wave in the Pacific Northwest was “virtually impossible without human-caused climate change.” Such patterns have disastrous, far-reaching effects. Heat waves pose a particular threat to global food supplies, already under pressure from Russia’s invasion of Ukraine. They are linked with a range of health problems and correlate with higher rates of crime, anxiety and depression. A 2021 analysis from the Atlantic Council estimated that the drop in worker productivity due to extreme heat costs the U.S. **economy $100 billion annually** — a figure that could double by 2030. As President Biden and congressional Democrats struggle to find enough support for their climate agenda, the ongoing heat waves offer a small window into what the future could look like if global warming continues unabated. Even if we keep the global temperature rise under 1.5 degrees Celsius — the threshold scientists believe should not be exceeded — the number of extreme weather events a person will experience would nearly quadruple, according to the United Nations Intergovernmental Panel on Climate Change. A greater rise in temperature would be even more calamitous, with unthinkable consequences for global hunger, disease, migration, productivity and standards of living. Slashing greenhouse gas emissions and transitioning to a greener economy at the scale and pace needed would require creativity, innovation and political courage. But the cost if we fail is far more daunting: a future in which climate disasters, and all the damage and instability that come with them, become the new normal everywhere.

#### Emissions disproportionately impact vulnerable and marginalized populations – causes hunger, disease, and increased physiological violence

Parncutt 19 (Richard Parncutt, Professor @ the Centre for Systematic Musicology, University of Graz, “The Human Cost of Anthropogenic Global Warming: Semi-Quantitative Prediction and the 1,000-Tonne Rule,” Front. Psychol., 10/16/19, <https://doi.org/10.3389/fpsyg.2019.02323>

Greenhouse-gas emissions are indirectly causing future deaths by multiple mechanisms. For example, reduced food and water supplies will exacerbate hunger, disease, violence, and migration. How will anthropogenic global warming (AGW) affect global mortality due to poverty around and beyond 2100? Roughly, how much burned fossil carbon corresponds to one future death? What are the psychological, medical, political, and economic implications? Predicted death tolls are crucial for policy formulation, but uncertainty increases with temporal distance from the present and estimates may be biased. Order-of-magnitude estimates should refer to literature from diverse relevant disciplines. The carbon budget for 2°C AGW (roughly 1012 tonnes carbon) will indirectly cause roughly 109 future premature deaths (10% of projected maximum global population), spread over one to two centuries. This zeroth-order prediction is relative and in addition to existing preventable death rates. It lies between likely best- and worst-case scenarios of roughly 3 × 108 and 3 × 109, corresponding to plus/minus one standard deviation on a logarithmic scale in a Gaussian probability distribution. It implies that one future premature death is caused every time roughly 1,000 (300–3,000) tonnes of carbon are burned. Therefore, any fossil-fuel project that burns millions of tons of carbon is probably indirectly killing thousands of future people. The prediction may be considered valid, accounting for multiple indirect links between AGW and death rates in a top-down approach, but unreliable due to the uncertainty of climate change feedback and interactions between physical, biological, social, and political climate impacts (e.g., ecological cascade effects and co-extinction). Given universal agreement on the value of human lives, a death toll of this unprecedented magnitude must be avoided at all costs. As a clear political message, the “1,000-tonne rule” can be used to defend human rights, especially in developing countries, and to clarify that climate change is primarily a human rights issue. Introduction Anthropogenic global warming (AGW) is a human rights issue (Amnesty International, n.d.; Caney, 2010). It is violating the rights of future people—especially, in developing countries that will suffer the most. Lancet Countdown on health and climate change has warned that “A rapidly changing climate has dire implications for every aspect of human life, exposing vulnerable populations to extremes of weather, altering patterns of infectious disease, and compromising food security, safe drinking water, and clean air” (Watts et al., 2018). UN Environment (2019) found that “nearly one quarter of all deaths globally in 2012 could be attributed to modifiable environmental risks, with a greater portion occurring in populations in a vulnerable situation and in developing countries” (p. 22). From a legal perspective, “a right to a healthy environment in various formulations is recognized by the constitutions of 118 nations around the world” (Kravchenko, 2007, p. 539). Progress toward global emissions reductions has been consistently slow (Ge et al., 2019). Contrary to the primary aim of the United Nations Climate Change Conferences held yearly since 1995, emissions increased by 2.2% per year on average between 2005 and 2015 (Le Quéré et al., 2018) and peaked again in 2018 (International Energy Agency, 2019). The current rate of carbon emissions is some 10 times greater than the last time global mean surface temperature (GMST) was relatively high, 56 million years ago (Gingerich, 2019). AGW has therefore become a global emergency (Ripple et al., 2017). In responding to this challenge, it may help to express the urgency in new terms by shifting attention from economic to human costs, which are incomparably greater (Nolt, 2011a, 2015). The aim of this contribution is to defend the human rights of present and future people from the fatal indirect consequences of AGW caused by greenhouse gas (GHG) emissions and AGW by addressing the quantitative relationship between fossil carbon burned now and future deaths attributable to AGW. The broader context involves interculturality and anti-racism research. The failure of rich countries and corporations to adequately mitigate AGW is racist in the sense that the protagonists are mainly white and the victims are mainly black (cf. Kaijser and Kronsell, 2014). AGW may also be considered sexist, given known gender differences in effects of AGW on health and life expectancy (World Health Organisation, 2011). AGW is ageist in that the emissions of today’s older people will disproportionately affect today’s young people (Page, 1999). How much fossil carbon must be burned to cause a future human death? Despite the inherent uncertainties, it is interesting to attempt a zeroth-order estimate, based on semi-quantitative considerations of the current state of global climate, the current global rate of emissions, and the complex, non-linear relationships among the amount of carbon burned, corresponding changes in GMST, current mortality in connection with poverty, and future death tolls. The question is explicitly interdisciplinary: it involves humanities (e.g., philosophy, history), sciences (e.g., physics, mathematics, statistics, psychology), practically oriented disciplines (e.g., law, medicine, international development), and disciplines that mix these groups (economics, sociology). “The greatest potential for contributions from psychology comes not from direct application of psychological concepts but from integrating psychological knowledge and methods with knowledge from other fields of science and technology” (Stern, 2011, p. 314). Of all the living and non-living things that humans encounter in their everyday lives, human lives are usually considered the most valuable (Harris, 2006)—regardless of the assumed value of non-human life (Kellert, 1997). Moreover, people are universally considered inherently more important than money (cf. Sayer, 2011); this general idea holds even if a human life can be assigned monetary value corresponding to the amount that others are willing to pay to save it. The value of a quality-adjusted life year (QALY) according to this criterion may effectively be of the order of $100,000 (Hirth et al., 2000). Can the continued use of fossil fuels be justified after comparing today’s health and longevity benefits with future health and longevity deficits due to AGW? The following text begins with a summary of ways in which AGW will shorten human lives in the future. The idea of a human life as a mathematical unit of value is then introduced. After a consideration of the use of numbers and words in public discourse on AGW, and the psychological mechanisms that might distort estimates of future death tolls, an approximate top-down estimate is presented for the relationship between carbon burned now and deaths caused in the future. Ethical and political implications are addressed. How Anthropogenic Global Warming will Cause Premature Deaths Historically, burning carbon has had a large positive effect on human life expectancy and quality of life (Steinberger and Roberts, 2010; Jorgenson, 2014). Without explicitly considering AGW, United Nations (2017b) estimated that from 1960 to 2100, global mean life expectancy will have increased from 46 to 83 years, among other things due to increasing availability of energy for agriculture, heating, cooking, transport, manufacture, and construction. But carbon-based economies are also causing life-years to be lost in the future. The political challenge, therefore, is to maintain increases in life expectancy due to industrialization while minimizing losses in life expectancy due to AGW by replacing carbon-based power sources by sustainable ones. The following brief summary of widely accepted climate impact predictions illustrates the magnitude of the problem: 1. Rising seas will threaten coastal homes and cities. Salination of agricultural soils will destroy farming land. 2. Dry areas will become drier with longer droughts, loss of ground water, and deglaciation. Agriculture will be seriously affected. 3. Serious storms (hurricanes, cyclones, and tornadoes) will become more frequent and dangerous (Knutson et al., 2015), destroying crops and buildings, and causing floods and epidemics (cf. the cholera outbreak that followed Cyclone Idai in Mozambique in 2019; Nguyen et al., 2019). 4. Heat waves will become more frequent and intense. When wet-bulb temperatures approach human skin temperature, body temperature can no longer be regulated by perspiration—with fatal consequences. 5. The current rate of species extinction (biodiversity loss)—already 100–1,000 times faster than without humans—will continue to increase (sixth mass extinction event). Each of these points will affect supplies of food and fresh water, increasing current death rates due to hunger and disease. In addition, AGW will affect the nutritional content of staple crops such as rice and wheat; when carbon dioxide (CO2) levels double relative to pre-industrial levels, an additional 175 million people may be zinc deficient; 122 million, protein deficient (Smith and Myers, 2018). These points may interact with each other, causing ecological cascade effects and co-extinctions. AGW will also increase the incidence and magnitude of international conflicts including water wars (Petersen-Perlman et al., 2017). There is an additional risk of “runaway” AGW, in which GMST continues to rise after anthropogenic emissions stop—driven by natural positive feedback processes that are not canceled by negative ones: 1. When ice melts, less radiated heat from the sun is reflected back into space, so more is absorbed, causing more ice to melt (Albedo). 2. As the carbon content of oceans and soils increases, their ability to absorb CO2 falls (Gattuso et al., 2015). 3. When permafrost (tundra) peat thaws, it releases CO2, methane (CH4), and nitrous oxide (N2O), causing more warming and melting (Voigt et al., 2017). Permafrost peat contains about 1,700 Pg carbon—about twice as much as the entire atmosphere—of which 30% (68–508 Pg) could be released by 2100 (MacDougall et al., 2012). Atmospheric CH4 concentration has unexpectedly accelerated in recent years (Nisbet et al., 2018). 4. Forests will dry out at the same time as weather conditions that cause fires (dry soil, high temperature, low humidity, and high winds) become more frequent. Fires produce CO2, causing more warming and drying (Gabbert, 2018; Reidmiller, 2018). Forest dieback can be caused by a combination of drought and bark-beetle infestation, caused in turn by AGW (Sangüesa-Barreda et al., 2015). Beetle-caused dieback can switch a forest from a carbon sink to a carbon source (Hansen et al., 2013a). Between 1984 and 2016, the European forest area affected by mortality doubled—largely due to AGW and land-use changes (Senf et al., 2018). 5. Extreme temperatures caused by climate change will increase human energy consumption for heating and cooling (International Energy Agency, 2019). When feedbacks are taken into account, the global carbon budget for limiting AGW to 2 or 1.5°C is reduced by “several years of anthropogenic carbon dioxide emissions at present rates” (Lowe and Bernie, 2018, abstract).

#### Climate change causes extinction

Alexander-Sears 21, PhD Candidate in Political Science at The University of Toronto, former Professor of International Relations at the Universidad de Las Américas (Nathan, “Great Powers, Polarity, and Existential Threats to Humanity: An Analysis of the Distribution of the Forces of Total Destruction in International Security,” Conference Paper: *International Studies Association, 2021 Annual Conference*, Research Gate)

Humanity faces existential risks from the large-scale destruction of Earth’s natural environment making the planet less hospitable for humankind (Wallace-Wells 2019). The decline of some of Earth’s natural systems may already exceed the “planetary boundaries” that represent a “safe operating space for humanity” (Rockstrom et al. 2009). Humanity has become one of the driving forces behind Earth’s climate system (Crutzen 2002). The major anthropogenic drivers of climate change are the burning of fossil fuels (e.g., coal, oil, and gas), combined with the degradation of Earth’s natural systems for absorbing carbon dioxide, such as deforestation for agriculture (e.g., livestock and monocultures) and resource extraction (e.g., mining and oil), and the warming of the oceans (Kump et al. 2003). While humanity has influenced Earth’s climate since at least the Industrial Revolution, the dramatic increase in greenhouse gas emissions since the mid-twentieth century—the “Great Acceleration” (Steffen et al. 2007; 2015; McNeill & Engelke 2016)— is responsible for contemporary climate change, which has reached approximately 1°C above preindustrial levels (IPCC 2018). Climate change could become an existential threat to humanity if the planet’s climate reaches a “Hothouse Earth” state (Ripple et al. 2020). What are the dangers? There are two mechanisms of climate change that threaten humankind. The direct threat is extreme heat. While human societies possesses some capacity for adaptation and resilience to climate change, the physiological response of humans to heat stress imposes physical limits—with a hard limit at roughly 35°C wet-bulb temperature (Sherwood et al. 2010). A rise in global average temperatures by 3–4°C would increase the risk of heat stress, while 7°C could render some regions uninhabitable, and 11–12°C would leave much of the planet too hot for human habitation (Sherwood et al. 2010). The indirect effects of climate change could include, inter alia, rising sea levels affecting coastal regions (e.g., Miami and Shanghai), or even swallowing entire countries (e.g., Bangladesh and the Maldives); extreme and unpredictable weather and natural disasters (e.g., hurricanes and forest fires); environmental pressures on water and food scarcity (e.g., droughts from less-dispersed rainfall, and lower wheat-yields at higher temperatures); the possible inception of new bacteria and viruses; and, of course, large-scale human migration (World Bank 2012; Wallace-Well 2019; Richards, Lupton & Allywood 2001). While it is difficult to determine the existential implications of extreme environmental conditions, there are historic precedents for the collapse of human societies under environmental pressures (Diamond 2005). Earth’s “big five” mass extinction events have been linked to dramatic shifts in Earth’s climate (Ward 2008; Payne & Clapham 2012; Kolbert 2014; Brannen 2017), and a Hothouse Earth climate would represent terra incognita for humanity. Thus, the assumption here is that a Hothouse Earth climate could pose an existential threat to the habitability of the planet for humanity (Steffen et al. 2018., 5). At what point could climate change cross the threshold of an existential threat to humankind? The complexity of Earth’s natural systems makes it extremely difficult to give a precise figure (Rockstrom et al. 2009; ). However, much of the concern about climate change is over the danger of crossing “tipping points,” whereby positive feedback loops in Earth’s climate system could lead to potentially irreversible and self-reinforcing “runaway” climate change. For example, the melting of Arctic “permafrost” could produce additional warming, as glacial retreat reduces the refractory effect of the ice and releases huge quantities of methane currently trapped beneath it. A recent study suggests that a “planetary threshold” could exist at global average temperature of 2°C above preindustrial levels (Steffen et al. 2018; also IPCC 2018). Therefore, the analysis here takes the 2°C rise in global average temperatures as representing the lower-boundary of an existential threat to humanity, with higher temperatures increasing the risk of runaway climate change leading to a Hothouse Earth. The Paris Agreement on Climate Change set the goal of limiting the increase in global average temperatures to “well below” 2°C and to pursue efforts to limit the increase to 1.5°C. If the Paris Agreement goals are met, then nations would likely keep climate change below the threshold of an existential threat to humanity. According to Climate Action Tracker (2020), however, current policies of states are expected to produce global average temperatures of 2.9°C above preindustrial levels by 2100 (range between +2.1 and +3.9°C), while if states succeed in meeting their pledges and targets, global average temperatures are still projected to increase by 2.6°C (range between +2.1 and +3.3°C). Thus, while the Paris Agreements sets a goal that would reduce the exis 6 - tential risk of climate change, the actual policies of states could easily cross the threshold that would constitute an existential threat to humanity (CAT 2020)

#### Climate change warms lakes, increasing species extinction

Clean Technica, January 4, 2022, Warming Lakes Are Losing Oxygen. Climate Change & Pollution Are To Blame, https://cleantechnica.com/2022/01/03/warming-lakes-are-losing-oxygen-climate-change-pollution-are-to-blame/

In a sweltering morning last July, thousands of dead fish washed onto the northeastern shores of Pokegama Lake, 60 miles north of Minneapolis. Deb Vermeersch, an official with the Minnesota Department of Natural Resources, was called in to investigate. When she arrived, she saw a quarter-mile stretch of sand covered with the rotting carcass of walleye and Northern pike, which thrive in deep, cool waters, as well as crappies, sunfish and suckers — all warm water dwellers. “They were already pretty decomposed because of the warm water,” Vermeersch recalled. Because **so many different types of fish had died**, Vermeersch and her colleagues knew it wasn’t a species-specific parasite, a common cause of fish kills. They zeroed in on **the culprit: dangerously low oxygen levels. Oxygen is disappearing in freshwater lakes at a rate nine times that of oceans due to a combination of pollution and warming waters,** according to a study published in Nature earlier this year**. Lakes like Pokegama are warming earlier in the spring and staying warm into autumn, fueling algae blooms, which thrive in warm waters, and threaten native fish.** Minnesota, with its 14,380 lakes and temperatures that have risen faster than the national average, is a unique laboratory for studying how climate change is affecting temperate-zone lakes around the world. The state sits at the intersection of four biomes — two distinct prairie ecosystems and two ecologically different forest systems. This means scientists here are able to study how lakes in different ecosystems fare on a warming planet, and look for ways to stave off the worst effects of climate change. **“If you start losing oxygen, you start losing species.”** “**What’s going on at the surface is that warmer water holds less oxygen than cool water,**” said Lesley Knoll, a University of Minnesota limnologist and one of the authors of the Nature report. She said that longer, **hotter summers are interfering with two key processes that have historically kept lakes’ oxygen levels in check: mixing and stratification. In temperate climates, water at the surface of lakes mixes with deep waters in the spring and the fall, when both layers are similar in temperature. As the surface water warms during the summer, the water forms distinct layers based on temperature — cool water at the bottom, warm at the top. This is known as stratification. In the fall, when the surface waters cool again, the water mixes for a second time, replenishing oxygen in deeper waters. But as climate change makes surface water warmer, and keeps it warmer for longer, that mixing doesn’t happen when it should.** “As you have that stronger stratification, the water in the deep part of the lake is cut off from the oxygen at the top part of the lake. If you start losing oxygen, you start losing species,” says Kevin Rose, a biologist at Rensselaer Polytechnic Institute in New York and a coauthor of the Nature study. Knoll, Rose and a team of 43 other researchers studied 400 temperate lakes from around the world. They found that, on average, surface waters warmed by 7 degrees Fahrenheit and have lost roughly 5 percent of oxygen since 1980; deep waters, which haven’t warmed much, have still lost an average of almost 20 percent of their oxygen. (Thanks to the state’s long-held lake monitoring programs, almost a quarter the lakes in the study were in Minnesota.) Warming lakes emit methane Fish kills aren’t the only reason scientists are concerned about lakes losing oxygen. In extreme cases**, when deep waters go completely void of oxygen, something else happens: Methane-emitting bacteria begin to thrive. “As lakes warm, they will produce more methane and most of that has to do with stratification,” s**aid James Cotner, a limnologist at the University of Minnesota. Lakes normally emit carbon dioxide as a natural part of breaking down the trees, plants and animals that decay in them, but plants in and around fresh water also absorb it, making healthy lakes carbon sinks. Lakes have historically emitted methane, too — about 10 to 20 percent of the world’s emissions — but the prospect of them releasing more of the greenhouse gas has Cotner and his colleagues alarmed. Methane is about 25 times more potent than CO2 when it comes to trapping heat in Earth’s atmosphere. Cotner is leading a team of researchers who are studying what conditions allow methane-emitting bacteria to prosper in lakes and how conservationists can respond. “The key questions are understanding how much and when carbon dioxide and methane are emitted from lakes, and what are the key variables that can tell how much will be emitted. Certainly, oxygen is a big part of that, but stratification and warming also plays a role,” says Cotner.

#### Indicators demonstrate that catastrophic climate change can be averted. The momentum exists, but capitalizing on it is key.

Wallace-Wells 21, \*David Wallace-Wells is deputy editor of New York magazine, where he also writes frequently about climate change and the near future of science and technology; (January 18th, 2021, “After Alarmism”, https://nymag.com/intelligencer/article/climate-change-after-pandemic.html)

The change is much bigger than the turnover of American leadership. By the time the Biden presidency finds its footing in a vaccinated world, the bounds of climate possibility will have been remade. Just a half-decade ago, it was widely believed that a “business as usual” emissions path would bring the planet four or five degrees of warming — enough to make large parts of Earth effectively uninhabitable. Now, thanks to the rapid death of coal, the revolution in the price of renewable energy, and a global climate politics forged by a generational awakening, the [expectation](https://climateactiontracker.org/global/temperatures/) is for about three degrees. Recent pledges [could bring us closer to two](https://climateactiontracker.org/publications/global-update-paris-agreement-turning-point/). All of these projections sketch a hazardous and unequal future, and all are clouded with uncertainties — about the climate system, about technology, about the dexterity and intensity of human response, about how inequitably the most punishing impacts will be distributed. Yet if each half-degree of warming marks an entirely different level of suffering, we appear to have shaved a few of them off our likeliest end stage in not much time at all. The next half-degrees will be harder to shave off, and the most crucial increment — getting from two degrees to 1.5 — perhaps impossible, dashing the dream of avoiding what was long described as “catastrophic” change. But for a climate alarmist like me, seeing clearly the state of the planet’s future now requires a conspicuous kind of double vision, in which a guarded optimism seems perhaps as reasonable as panic. Given how long we’ve waited to move, what counts now as a best-case outcome remains grim. It also appears, miraculously, within reach. In December, a month after Biden was elected promising to return the U.S. to the Paris agreement, the U.N. celebrated five years since the signing of those accords. They were five of the six hottest on record. (The sixth was 2015, the year the agreement was signed.) They were also the years with the highest levels of carbon output in the history of humanity — with emissions equivalent to what was produced by all human and industrial activity from the speciation of Homo sapiens to the start of World War II. They have also been the five years in which the nations of the world — and cities and regions, individuals and institutions, corporations and central banks — have made the most ambitious pledges of future climate action. Most of them were made in the past 12 months, in the face of the pandemic. Or, perhaps, to some degree, because of it — because the pandemic demanded a full-body jolt to the global political economy, provoking much more aggressive government spending, a much more accommodating perspective on debt, and a much greater openness to large-scale actions and investments of the kind that might plausibly reshape the world. And because decarbonization has come to seem, even to those economists and policy-makers blinded for decades to the moral and humanitarian cases for reform, a rational investment. “When I think about climate change,” Biden is fond of saying, “the word I think of is jobs.” There are two ways of looking at these seemingly contradictory sets of facts. The first is that the distance between what is being done and what needs to be done is only growing. This is the finding of, among others, the U.N.’s comprehensive [“Emissions Gap” report](https://www.unenvironment.org/emissions-gap-report-2020), issued in December, which found that staying below two degrees of warming would require a tripling of stated ambitions. To bring the planet in reach of the 1.5-degree target — favored by activists, most scientists, and really anyone reading their work with open eyes — would require a quintupling. It is also the perspective of Greta Thunberg, who has spent the pandemic year castigating global leaders for paying mere lip service to far-off decarbonization targets and who called the E.U.’s new net-zero emissions law “surrender.” The second is that all of the relevant curves are bending — too slowly but nevertheless in the right direction. The International Energy Agency, a notoriously conservative forecaster, recently [called](https://www.carbonbrief.org/solar-is-now-cheapest-electricity-in-history-confirms-iea#:~:text=Source%3A%20IEA%20World%20Energy%20Outlook%202020.&text=Together%2C%20low%2Dcarbon%20sources%20would,up%20from%2019%25%20in%202019.) solar power “the cheapest electricity in history” and projected that India will build 86 percent less new coal power capacity than it thought just one year ago. Today, business as usual no longer means a fivefold increase of coal use this century, as was once expected. It means pretty rapid decarbonization, at least by the standards of history, in which hardly any has ever taken place before. Both of these perspectives are true. The gap is real, and the world risks tumbling into it, subjecting much of the global South to unconscionable punishments all the way down. But in the months since the pandemic wiped climate strikers off the streets, their concerns have seeped into not just public-opinion surveys but parliaments and presidencies, trade deals and the advertising business, finance and insurance — in short, all the citadels presiding over the ancien régime of fossil capital. This is not exactly a climate revolution; the strikers and their allies didn’t win in the way they wanted to, at least not yet. But they did win something. Environmental anxieties haven’t toppled neoliberalism. Instead, to an unprecedented degree, they infiltrated it. (Or perhaps they were appropriated by it. It’s an open question.) Climate change isn’t an issue just for die-hards anymore — it’s for normies, sellouts, and anyone with their finger in the wind. It will take time, of course, for voters to see empty rhetoric for what it is, and for consumers to learn to distinguish, say, between the claims of guiltless airline tickets, or between carbon-free foods in the supermarket aisle. Harder still will be sorting through the differences between real corporate commitments like Microsoft’s and more evasive ones, like BP’s. Already, there is considerable consternation among climate activists that the public doesn’t understand the tricky math of “net-zero” on which so many of these commitments have been made—it is not a promise of ending emissions, but of offsetting some amount of them, in the future, with “negative emissions,” sometimes called “carbon dioxide removal,” though no approach of that kind is ready to go at anything like the necessary scale. And while some amount of skepticism about those commitments is surely warranted, it is also the case that, according to [a recent Bloomberg review](https://www.bloomberg.com/graphics/2020-company-emissions-pledges/), of 187 corporate climate pledges made for 2020 in 2015, 138 will be met. (Many of those promises were quite modest, but it is a much better performance than has been managed by the 189 parties to the Paris agreement, of which only two — Morocco and Gambia — are today [judged](https://climateactiontracker.org/countries/) fully “compatible” with the 1.5-degree goal, and only six more with the 2-degree target). In the political sphere, the uneasy alliance between activists and those in power will be tested, producing new conflicts, or new equilibria, or both. Consider, though, that Varshini Prakash, whose [Sunrise Movement](https://www.sunrisemovement.org/) gave Biden’s primary candidacy an F, later helped write his climate plan along with Alexandria Ocasio-Cortez. Climate expertise has been distributed throughout the incoming administration, as was promised during a campaign that closed, remarkably, with a climate-focused advertising blitz. During the transition, Biden’s pick for director of the National Economic Council, Brian Deese, was targeted by the environmental left for his time with BlackRock, but even this purported stooge had been married by Bill McKibben, one of the godfathers of modern climate activism. Elsewhere in the world, where 85 percent of global emissions are produced, the great infiltration of climate concerns represents what the British environmental [writer](https://www.businessgreen.com/blog-post/4025199/2020-crisis-crossroads-alternative-histories) James Murray has called “an alternative history to 2020” and what the scientist turned journalist Akshat Rathi [has declared](https://www.bloomberg.com/news/articles/2021-01-05/climate-action-is-embedding-into-how-the-world-works) “a strong sign that climate action is starting to be ‘institutionalized’ — that is, getting deeply embedded into how the world works.” This is not about coronavirus lockdowns producing emissions drops or “nature healing.” It is instead about long-standing trajectories passing obvious tipping points in coal use and political salience; promises and posturing by powerful if compromised institutions; and policy progress almost smuggled into place, all over the world, under cover of pandemic night. In the U.S., in the second coronavirus stimulus, [$35 billion in clean-energy spending](https://nymag.com/intelligencer/2020/12/what-is-in-covid-stimulus-omnibus-climate-pell-grants-medical-billing.html) passed in the Senate 92-6 — an effective down payment, energy researcher Varun Sivaram has estimated, on the innovation spending needed for a full electrification of the country. Did you even notice? Biden’s climate plan now faces the challenge of a filibuster, a skeptical Supreme Court, and the mood of Senator Joe Manchin of West Virginia, which means American climate action over the next four years is probably more likely to be delivered piecemeal — through appropriations and stimulus, executive action, and regulation — than through a landmark Green New Deal–style piece of legislation. That does limit what can be achieved, but it also means avoiding a protracted battle over climate as a referendum on the identity of the nation. And at least nominally, having been pressured by activists to do so, Biden is promising to multiply the green spending in that recent stimulus by a factor of 60. The numbers are numbingly large — reminders that in the midst of pandemic turmoil, the rules of state spending have been dramatically revised and perhaps even suspended. Is this global free-spending binge the beginning of a new era or merely a crisis interregnum to be followed by a new new austerity? “We don’t know what the recovery packages of COVID are going to be,” Christiana Figueres, one of the central architects of the Paris accords, told me this summer. “And honestly, the depth of decarbonization is going to largely depend on the characteristics of those recovery packages more than on anything else, because of their scale. We’re already at $12 trillion; we could go up to $20 trillion over the next 18 months. We have never seen — the world has never seen — $20 trillion go into the economy over such a short period of time. That is going to determine the logic, the structures, and certainly the carbon intensity of the global economy at least for a decade, if not more.” For those dreaming of a climate recovery, the first round of spending was not so encouraging. The E.U. was the gold standard, promising that 30 percent of its stimulus would be earmarked for climate. The U.S. and China each pledged only a fraction of that (and in each case, there was fossil stimulus, too). But in October, a team of researchers including Joeri Rogelj of the Imperial College of London [calculated](https://www.reuters.com/article/climate-change-stimulus/tenth-of-pandemic-stimulus-spend-could-help-world-reach-climate-goals-study-idUSKBN271098) that just one-tenth of the COVID-19 stimulus spending already committed around the world, directed toward decarbonization during each of the next five years, would be sufficient to deliver the goals of the Paris agreement and stop global warming well below two degrees. That analysis may be a touch optimistic, but the level of spending seems, now, doable. When Donald Trump was elected, trashing Paris, climate hawks were left hoping that the world would hang on for the length of his administration — insisting that, in the long term, the crisis couldn’t be solved without America at the helm. But the past four years of missing leadership have produced astonishing gains. The price of solar energy has fallen ninefold over the past decade, as has the price of lithium batteries, critical to the growth of electric cars. The costs of utility-scale batteries, which could solve the “intermittency” (i.e., cloudy day) problem of renewables and help power whole cities in relatively short order, have fallen 70 percent since just 2015. Wind power is 40 percent cheaper than it was a decade ago, with offshore wind experiencing an even steeper decline. Overall, renewable energy is less expensive than dirty energy almost everywhere on the planet, and in many places it is simply cheaper to build new renewable capacity than to continue running the old fossil-fuel infrastructure. Oil demand and carbon emissions may both have peaked this year. Eighty percent of coal plants planned in Asia’s developing countries have been shelved. This summer, I heard the Australian scientist and entrepreneur Saul Griffith talk about what it would take to get the U.S. within range of a 1.5 degree world. He said it would mean that beginning in 2021, this year, every single person buying a new car would have to be buying an electric one. That seems unrealistic, I thought, making a note of it as a useful benchmark illustrating just how far we have to go. Then, in the fall, the U.K. pledged to ban nonelectrics by 2030—a once-unthinkable law coming both too slow and much more quickly than seemed possible not very long ago. Similar plans are now in place in 16 other countries, plus Massachusetts and California. Canada recently raised its tax on carbon sixfold. Italy cut its power-sector emissions 65 percent between 2012 and 2019, and Denmark is now aiming to reduce its overall emissions 70 percent by 2030. “We set ourselves challenges that on paper looked almost impossible,” the country’s minister for the environment, Dan Jørgensen, told me recently. “And I think experts in many countries said, when looking at Denmark, ‘This is going to be too expensive, this is going to lower their living standards, this is going to hurt their ability to compete.’ But actually I’m proud to say that the opposite has happened. Now, of course, we have set even higher standards.” In the midst of the pandemic, new net-zero pledges, far more ambitious than those offered at Paris, were independently made by Japan, South Korea, the E.U., and, most significant, China, the world’s biggest emitter, which promised to reach an emissions peak by 2030 and get all the way to zero by 2060. China’s promise is so ambitious it has inspired one wave of debate among experts about whether it is even feasible — given that it would require, for instance, roughly twice as much renewable power to be installed every year for the next decade as Germany has operating nationwide today — and another debate about whether it has revived the possibility of that 1.5-degree target, with economic historian Adam Tooze writing, just after Xi Jinping’s surprise announcement in September, that it single-handedly “redefined the future prospects for humanity.” Together, the new net-zero pledges may have subtracted a full half-degree from ultimate warming. Add Biden’s campaign pledge of net zero by 2050, and you’ve got about two-thirds of global emissions at least nominally committed to firm, aggressive timelines to zero. These are all just paper promises, of course, and the history of climate action is littered with the receipts of similar ones uncashed. Plot the growth of carbon concentration in the atmosphere against the sequence of climate-action conferences and a distressing pattern emerges: the World Meteorological Conference of 1979, the U.N. framework of 1992, the Kyoto protocol of 1997, the Copenhagen accord of 2009, and the 2015 Paris accords, all tracking an uninterrupted trajectory upward for carbon from a “safe” level under 350 parts per million, past 400, to 414 today, and pointing upward from there. Before the industrial revolution, humans had never known an atmosphere with even 300 parts per million. Inevitably now, within a few years, the concentration will reach levels not seen since 3.3 million years ago, when sea levels were 60 feet higher. For all their momentum, renewables still only make up 10 percent of global electricity production. But alarmists have to take the good news where they find it. And while mood affiliation is not always the best guide to the state of the world, in 2020, for me, there were three main sources of hope. The first is the fact that the age of climate denial is over thanks to extreme weather and the march of science and the historic labor of activists — climate strikers, Sunrise, Extinction Rebellion — whose success in raising alarm may have been so sudden that they brought an end to the age of climate Jeremiahs as well. Their voices now echo in some unlikely places. Exxon was booted from the S&P 500 within months of Tesla making Elon Musk the world’s richest man. The cultural cachet of oil companies is quickly approaching that of tobacco companies. Jair Bolsonaro of Brazil aside, practically every leader of every country and every major figure in every corporate and industrial sector now feels obligated — because of protest and social pressure, economic realities, and cultural expectation — to at least make a show of support for climate action. It would be nice not to have to count that as progress, but it is. The questions are: How much does it matter? And what will follow? Disinformation and human disregard are not the only instruments of delay, and the age of climate denial is likely to yield first not to an age of straightforward climate deliverance but to one characterized by climate hypocrisy, greenwashing, and gaslighting. But those things, ugly and maddening and even criminal as they are, have always been with us. It is the other thing that is new. The second source of good news is the arrival on the global stage of climate self-interest. By this I don’t mean the profiteering logic of BlackRock, which opportunistically announced some half-hearted climate commitments last year, but rather the growing consensus in almost every part of the globe, and at almost every level of society and governance, that the world will be made better through decarbonization. A decade ago, many of the more ruthless capitalists to analyze that project deemed it too expensive to undertake. Today, it suddenly appears almost too good a deal to pass up. (A recent McKinsey [report](https://www.mckinsey.com/business-functions/sustainability/our-insights/how-the-european-union-could-achieve-net-zero-emissions-at-net-zero-cost): “Net-Zero Emissions at Net-Zero Cost.”) The logic may be clearest in considering the effects of air pollution, which kills an estimated 9 million people per year. In India, where more than 8 percent of GDP is lost to pollution, poor air quality is also responsible for 350,000 miscarriages and stillbirths every year. Globally, coal kills one person for every thousand people it provides power to, and even in the U.S., with its enviably clean air, total decarbonization would be entirely paid for, Duke’s Drew Shindell [recently testified](https://www.vox.com/energy-and-environment/2020/8/12/21361498/climate-change-air-pollution-us-india-china-deaths) before Congress, just through the public-health benefits of cutting out fossil fuels. You don’t even have to calculate any of the other returns — more jobs, cheaper energy, new infrastructure. Of course, countries all around the world are incorporating those considerations too, turning the page on a generation of economic analysis that said decarbonization was too costly and its benefits too small to sell to the public as upside. A decade ago, capitalists deemed decarbonization too expensive. Suddenly, it appears too good a deal to pass up. What is perhaps most striking about all the new climate pledges is not just that they were made in the absence of American leadership but that they were made outside the boundaries of the Paris framework. They are not the result of geopolitical strong-arming or “Kumbaya” consensus. They are, instead, plans arrived at internally, in some cases secretly. This has been eye-opening for the many skeptics who worried for decades about climate’s collective-action problem — who warned that because the benefits of decarbonization were distributed globally while the costs were concentrated locally, nations would move only if all of their peers did too. But a [recent paper](https://www.mitpressjournals.org/doi/full/10.1162/glep_a_00578) by Matto Mildenberger and Michaël Alkin suggests this shouldn’t be a surprise. In their retrospective analysis, they found that, despite much consternation about designing climate policy to prevent countries from “cheating,” there was basically no evidence of any country ever pulling back from mitigation efforts to take a free ride on the good-faith efforts of others. There was, in other words, no collective-action problem on climate after all. For a generation, the argument for climate action was made on a moral basis. That case has only grown stronger. And now there are other powerful, more mercenary arguments to offer. The third cause for optimism is that, while the timelines to tolerably disruptive climate outcomes have already evaporated, the timelines to the next set of benchmarks is much more forgiving. This is why Glen Peters, the research director at the Cicero Center for International Climate Research, often jokes that while keeping warming below two degrees is very hard, perhaps even impossible, keeping it below 2.5 degrees now looks like a walk in the park. This isn’t to say we’re on a glide path to safety. At current emissions levels, the planet will entirely exhaust the carbon budget for 1.5 degrees in just seven years — stay merely level, in other words, and we’ll burn through the possibility of a relatively comfortable endgame within the decade. We could buy ourselves a little more time by starting to move quickly, but not that much more. To decarbonize fast enough to give the planet a decent chance of hitting that 1.5-degree target without any negative emissions would require getting all the way to net-zero emissions by around 2035. Simply running the cars and furnaces and fossil-fuel infrastructure that already exists to its expected retirement date would push the world past 1.5 degrees—without a single new gasoline SUV hitting the road, or a single new oil-heated home being built, or a single new coal plant opened. A two-degree target, by contrast, yields a much longer timeline, requiring the world to achieve net-zero by 2070 or 2080 — without even the help of negative emissions. We’d have to cut carbon production in half in about three decades, rather than one. That pathway will almost certainly prove harder than it looks. The good news is that we seem to be beginning, at least, to try.

### Answers to: HSR Will Be Powered By Coal

#### HSR can now be powered by renewables; the new bill invests in that

Oliver Millman, 8-12, 22, Al Gore hails Biden’s historic climate bill as ‘a critical turning point, https://www.theguardian.com/us-news/2022/aug/12/al-gore-climate-turning-point-inflation-reduction-act

**America’s passing of its first ever climate legislation will prove a pivotal moment in history that will help bring to an end the era of fossil** fuels, according to Al Gore, the former US vice-president. **Joe Biden is poised to sign a huge $370bn package of clean energy spending**, overcoming decades of American political rancor and inaction on the climate crisis. Gore said he was now sure the fossil fuel industry and its political backers will not be able to reverse the shift to a decarbonized world, even if Republicans are able to wrest back control of Congress or the White House. Biden’s landmark climate and spending bill – what’s in it, and what got cut? Read more “In crossing this threshold we have changed history and will never go backwards,” Gore told the Guardian in an interview. “I’m extremely optimistic that this will be a critical turning point in our struggle to confront the climate crisis.” While the oil and gas industry is currently making enormous profits off the back of soaring fuel prices spurred by Russia’s invasion of Ukraine, Gore insisted this was “momentary compared to the big wheel that is now turning” on renewable energy. **Solar**, recently described by the International Energy Agency as the cheapest source of electricity in history, **and wind power have both plunged in cost in recent years and the new US bill,** **known as the Inflation Reduction Act, is expected to drive down these costs further**. Analysts expect the support for renewable projects, along with hefty investments to boost US manufacturing of solar panels, wind turbines, batteries and other components, could help technologies become more easily available for other countries, too. **“This is momentum that I think will be unstoppable,” Gore said. “**The savings to consumers will be so impressive, and so massively deflationary, that people will not support politicians who will want to take us backwards. We’re not going back again.” The legislation narrowly passed the US Senate on Sunday and is expected to ease through the House of Representatives, controlled by Democrats, on Friday before being signed by Biden. Democrats needed all 50 of their senators to assent in the face of uniform Republican opposition, which required compromises on a deal struck with Joe Manchin, a centrist Democrat who receives more money in political donations from the fossil fuel industry than any other senator. This fraught process, which appeared doomed at several moments over a year of negotiations, followed repeated failures over many years by the American political establishment to confront the climate crisis, despite the US expelling more greenhouse gases into the atmosphere than any other country in history. Gore was a 33-year-old member of Congress when he organized what is thought to be the first hearing on climate change to be held with lawmakers, in 1981. Despite urging action throughout the 1980s and 1990s, including his time as vice-president in Bill Clinton’s administration, Gore, who is now 74, has seen multiple attempts at legislation fail and the topic become politically toxic to conservatives, even as evidence of disastrous harm from global heating has mounted. “I never imagined I would end up devoting my life to this,” said Gore, who authored the Inconvenient Truth on global heating in 2006. The book was turned into a documentary and resulted in Gore winning the Nobel peace prize in 2007. “I thought, naively in retrospect, that when the facts were laid out so clearly we would be able to move much more quickly,” he said. “I did not anticipate the fossil fuel industry would spend billions of dollars on an industrial-scale program of lying and deception to prevent the body politic acting in a rational way. But here we are, we finally passed that threshold.” Gore said the passage of the legislation through the Senate, a moment that brought several Democratic senators to tears, was a “celebratory and joyful moment” but stressed that the bill itself will not solve the climate emergency. **While it’s expected the breakthrough will help the US cut its emissions by about 40% by the end of the decade, scientists have warned that the country, like almost every other nation in the world, is still cutting emissions far too slowly to avoid disastrous levels of global heating. “We can’t let this be a once-in-a-lifetime moment,” Gore said. “The path to net zero [emissions] requires us to move forward and a lot of the hard work lies ahead.”**

## Pollution

### Oil Pollution

#### Producing oil and gas causes massive health problems in the US

Lindsay Maizland and Anshu Siripurapu, Council Foreign Relations, August 11, 2022, How the U.S. Oil and Gas Industry Works, https://www.cfr.org/backgrounder/how-us-oil-and-gas-industry-works

**There are also domestic consequences of finding, producing, and transporting oil and gas.** For example, **the industry is a large source of the country’s air pollution. Researchers in many states have found that oil and gas workers—and the estimated seventeen million Americans who live within a half mile of production sites—are more likely to suffer health problems such as asthma and cancer. Many of these sites are located near Indigenous or minority communities.**

#### Oil spills cause environmental harm

Lindsay Maizland and Anshu Siripurapu, Council Foreign Relations, August 11, 2022, How the U.S. Oil and Gas Industry Works, https://www.cfr.org/backgrounder/how-us-oil-and-gas-industry-works

In addition, hundreds of thousands of gallons of oil are spilled into U.S. waterways and oceans every year, killing plants and animals and damaging ecosystems. Spills happen in a variety of ways, such as collisions, as was the case with the Exxon Valdez tanker in 1989, and explosions, as on the BP Deepwater Horizon drilling platform in 2010. Fracking, in particular, can contaminate water resources [PDF] and contribute to earthquakes.

### HSR Reduces Air Pollution

#### HSR reduces pollution

Derek Markham, no date, 8 Benefits of High-speed Trains, https://science.howstuffworks.com/transport/engines-equipment/8-benefits-high-speed-trains.htm

While there is still some controversy over which form of transportation is more fuel efficient, trains or cars, **the amount of smog and pollution released into the city is much less with a high speed train than with the number of cars necessary to transport the same amount of people.**

#### HSR reduces haze pollution

Zhu, June 2022, XinhuaZhuaChunDaibcYigangWeid, a School of Public Administration, Hohai University, Nanjing, 211100, China b Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, 100101, China c College of Resources and Environment, University of Chinese Academy of Sciences, Beijing, 100049, China d School of Economics and Management, Beihang University, Beijing, 100083, China e Beijing Key Laboratory of Emergency Support Simulation Technologies for City Operation, Beijing, 100083, China, Socio-economic planning sciences, Does the opening of high-speed railway improve air quality? Evidence from China, <https://www.sciencedirect.com/science/article/abs/pii/S0038012122001768>,

This study aims to investigate the effects and mechanisms of the opening of HSR on air quality in China. The Difference-in-Difference-in-Differences estimation approaches are used to explore the cases of 271 cities during 2007–2016. Results are presented as follows. (1) The opening of HSR has generally improved the air quality significantly. **Compared with cities with no HSR, the PM2.5 concentration in cities with HSR has been lowered by 3.5%;** (2) From a dynamic perspective, the pollution inhibition effects of HSR start in the first and second years after the opening; (3) Heterogeneity analysis shows that the air quality of cities with HSR affected by the Ten Clauses by The State Council is significantly improved; (4) **Mechanism analysis shows that the opening of HSR has affected the PM2.5 concentration through three ways: the substitution effect on traditional means of transportation, the optimisation of industrial structure and the influence of technological progress**

Chen, 2020, Yu Chen 1, Yuandi Wang 1 and Ruifeng Hu 2,\*Business School, Sichuan University, Chengdu 610064, Sichuan, China; scuchenyu@gmail.com (Y.C.); School of Economics, Xihua University, Sustainability, Sustainability by High–Speed Rail: The Reduction Mechanisms of Transportation Infrastructure on Haze Pollution, https://www.mdpi.com/2071-1050/12/7/2763/pdf#:~:text=The%20empirical%20results%20indicate%20that,pollution%20by%2017%25%20on%20average.&text=Haze%20pollution%20has%20been%20the,consequences%20in%20the%20long%20term.

Abstract: **Haze pollution impacts human health**, as well as the competitive capabilities of firms and local economic development. Considerable attention has been given to the study of mechanisms for reducing haze pollution, but few studies have investigated the effect of city-to-city transportation infrastructures on environmental issues based on an institutional perspective. To address this research gap, this study advances our understanding by assessing the effect of city–to–city transportation on haze pollution caused by the operation of high-speed rail, which triggers the rapid flow of individuals and information, improves information transparency, as well as imposes institutional pressure on local governments and firms to reduce haze pollution. To further verify the underlying mechanisms, we tested the development of hard infrastructure (information communication technology) and soft infrastructure (market development level), which represent two conditions for which the mechanism is likely to be critical. **We tested our hypotheses using a sample of 288 prefecture-level cities in China during the period from 2005 to 2016. The empirical results indicate that the operation of high-speed rail can reduce haze pollution by 17% on average.** institutional pressure 1. Introduction **Haze pollution** has been the subject of increasing concern among both academics and practitioners alike, due to its serious consequences in the long term. It has **been shown to have direct influences on the health and life spans of residents, the innovation capabilities of firms, and the economic development of local cities [1–5]. According to a World Health Organization report in 2016, almost 3 million deaths every year are related to air pollution, of which 94% of these deaths are due to respiratory infections, lung disease, and lung cancer because of the inhalation of particulate matter** (PM**). In addition, cities with severe air pollution are likely to experience a loss of talent and a decrease in regional vitality and creativity. Haze pollution, as one type of air pollution, is mainly caused by particulate matter and can be easily observed compared with other pollutants, such as SO2, NO2, or CO, because of its visibility. Thus, identifying mechanisms for reducing haze pollution has become an urgent task**. Previous studies have mainly focused on mechanisms that lead to stricter regulations, technological innovation, and infrastructure improvement [6–8]. Governments have implemented various incentives and punishments to encourage subordinate departments to protect the environment, such as tax exemptions, financial subsidies, penalties, and policies [9]. Technological innovation is also an important reduction mechanism of environmental pollution, as it can help firms to improve production processes as well as reduce emissions of toxic gases [6]. Infrastructure improvement, such as road intensity and transportation infrastructure, has been suggested as an important mechanism for reducing haze pollution; however, few studies have focused on the relationship between haze pollution and long-distance transportation across cities and provinces [8,10]. Previous studies initially highlighted the role of urban transportation, such as urban rail transit, bus rapid transit (BRT), and electric cars, in improving air quality in terms of the associated reduction of CO emissions and other pollution sources [10–12]. However, it is not yet known whether

### Air Pollution Kills

#### Air pollution kills

Hannah Ritchie and Max Roser, 2021, Air Pollution, https://ourworldindata.org/air-pollution

**Air pollution is one of the world’s leading risk factors for death, attributed to millions of deaths each year.**

**Air pollution is attributed to 11.65% of deaths globally.**

It is also one of the leading risk factors for disease burden.

#### Air pollution responsible for 1 in 5 deaths world-wide

Harvard Chan School of Public Health, February 9, 2021, Fossil fuel air pollution responsible for 1 in 5 deaths worldwide, <https://www.hsph.harvard.edu/c-change/news/fossil-fuel-air-pollution-responsible-for-1-in-5-deaths-worldwide/>

New research from Harvard University, in collaboration with the University of Birmingham, the University of Leicester and University College London, found that **more than 8 million people died in 2018 from fossil fuel pollution**, significantly higher than previous research suggested—meaning **that air pollution from burning fossil fuels like coal and diesel was responsible for about 1 in 5 deaths worldwide.**

**350,000 deaths in the US**

Harvard Chan School of Public Health, February 9, 2021, Fossil fuel air pollution responsible for 1 in 5 deaths worldwide, https://www.hsph.harvard.edu/c-change/news/fossil-fuel-air-pollution-responsible-for-1-in-5-deaths-worldwide/

The study, “Global Mortality From Outdoor Fine Particle Pollution Generated by Fossil Fuel Combustion,” published in Environmental Research, is based on a groundbreaking analysis that enabled the researchers to directly attribute premature deaths from fine particulate pollution (PM 2.5) to fossil fuel combustion.

“Often, when we discuss the dangers of fossil fuel combustion, it’s in the context of CO2 and climate change and overlook the potential health impact of the pollutants co-emitted with greenhouse gases,” said Dr. Joel Schwartz, Professor at Harvard Chan School and co-author of the study. “**We hope that by quantifying the health consequences of fossil fuel combustion, we can send a clear message to policymakers** and stakeholders of the benefits of a transition to alternative energy sources.”

The findings underscore the detrimental impact of fossil fuels on global health.

“The health gains we can achieve from getting off fossil fuels is twice what we thought it was yesterday,” said Dr. Aaron Bernstein, Director of the Center for Climate, Health, and the Global Environment at Harvard Chan School. “The Global Burden of Disease study estimated deaths from fossil fuels numbered 4.2 million in 2015, but thanks to more rigorous science, we can now see that fossil fuels cause far more harm than previously understood. Now more than ever we can see the healthier, more just and sustainable world that climate actions can deliver.”

Key Takeaways

Worldwide, **air pollution from burning fossil fuels is responsible for about 1 in 5 deaths—roughly the population of New York City.**

**In the United States 350,000 premature deaths are attributed to fossil fuel pollution**. The states with the highest number of deaths per capita are PA, OH, MI, IN, KY, WV, IL, NJ, WI

Transitioning from fossil fuels to renewable energy has immediate health benefits, including preventing premature deaths attributed to fossil fuel pollution.

Exposure to particulate matter from fossil fuels accounted for 21.5% of total deaths in 2012, falling to 18% in 2018 due to tightening air quality measures in China

In India, fossil fuel pollution was responsible for nearly 2.5 million people (aged over 14) in 2018; representing over 30% of total deaths in India among people over age 14

Thousands of kids under age 5 die each year due to respiratory infections attributed to fossil fuel pollution

#### Air pollution causes extinction

Driesen 3 (David, Associate Professor – Syracuse Univeristy Law, 10 Buff. Envt'l. L.J. 25, Fall/Spring, Lexis)

Air pollution can make life unsustainable by harming the ecosystem upon which all life depends and harming the health of both future and present generations*. The Rio Declaration articulates six key principles that are relevant to air pollution. These principles can also be understood as goals, because they describe a state of affairs that is worth achieving. Agenda 21, in turn, states a program of action for realizing those goals. Between them, they aid understanding of sustainable development's meaning for air quality. The first principle is that "human beings. . . are entitled to a healthy and productive life in harmony with nature", because they are "at the center of concerns for sustainable development." 3* While the Rio Declaration refers to human health, its reference to life "in harmony with nature" also reflects a concern about the natural environment. 4 Since air pollution damages both human health and the environment, air quality implicates both of these concerns*. 5*

## Reduced Land Use/Urban Sprawl

#### HSR is more land use efficient

IOT Marketing, February 16, 2022, <https://iotmktg.com/advantages-of-high-speed-rail-systems/>, Advantages of High-Speed Rail Systems

Efficient Use of Land - **High-speed rail doesn't take up as much land as highways and city streets. The width needed for a rail line is 82 feet, while a six-lane highway requires 246 feet.**

#### HSR increases the livability of cities

Junfend Zhao, August 2022, Socio-Economic Planning Sciences, Does the opening of high-speed railways improve urban livability? Evidence from a quasi-natural experiment in China

<https://www.sciencedirect.com/science/article/abs/pii/S0038012122000532?dgcid=rss_sd_all>

With the spread of “urban disease”, urban livability has aroused common concern in academic circles at home and abroad. High-speed railway opening is substantially affecting the development of cities. Based on the data of 271 cities in China from 2005 to 2018, this paper applies the entropy method to calculate urban livability level, and then the difference-in-differences (DID) model and mediatory effect model are constructed to test the impact and mechanism of high-speed railway (HSR) opening on urban livability. The findings show that: (1) Overall, HSR opening has significantly improved urban livability by 13.04%. After alleviating the endogenous problem and conducting a series of robustness tests, the conclusions are still valid. (2) Mechanism analysis indicates that HSR opening improves urban livability by promoting economic growth, talent agglomeration and industrial structure upgrading. Among them, the industrial structure upgrading effect is the strongest, followed by talent agglomeration and economic growth. (3) The heterogeneity analysis shows that the promotion effect of HSR opening on urban livability is more significant in the central and western regions and large-sized cities. Accordingly, the feasible path to improve urban livability through HSR opening is proposed. Finally, in the face of the impact of the COVID-19 pandemic on the world economy, more channels to enhance urban livability are expected to cope with the future “the global talent war”.

### Biodiversity

#### Urban sprawl causes biodiversity loss

MSNBC 5 (1/11, <http://www.msnbc.msn.com/id/6814251/>)

WASHINGTON - Urban sprawl is gobbling up open spaces in fast-growing metropolitan areas so quickly that it could spell extinction for nearly 1,200 species of plants and animals, environmental groups say. The National Wildlife Federation, Smart Growth America and NatureServe projected that over the next 25 years, more than 22,000 acres of natural resources and habitat will be lost to development in 35 of the largest and most rapidly growing metropolitan areas. According to the groups, as many as 553 of the nearly 1,200 at-risk species are found only in those areas. “The bottom line is that these species are at risk of extinction due to habitat destruction,” said John Kostyack, a National Wildlife Federation attorney and report co-author. “And in these metro areas, the leading cause of habitat destruction is sprawl — development of homes and office buildings and roads in outlying forests and farm fields.”

#### Biodiversity loss triggers extinction

Diner ’94 (David, JD Ohio State, Military Law Review, Winter, l/n)

4. Biological Diversity. -- The main premise of species preservation is better than simplicity. As the current mass extinction has progressed, the world's biological diversity generally has decreased. This trend occurs within ecosystems by reducing the number of species, and within species by reducing the number of individuals. Both trends carry serious future implications. Biologically diverse ecosystems are characterized by a large number of specialist species, filling narrow ecological niches. These ecosystems inherently are more stable than less diverse systems. "The more complex the ecosystem, the more successfully it can resist stress... [l]ike a net, in which each knot is connected to others by several strands, such a fabric can resist collapse better than a simple, unbranched circle of threads -- which is cut anywhere breaks down as a whole." By causing widespread extinctions, humans have artificially simplified many ecosystems. As biologic simplicity increases, so does the risk of ecosystem failure. The spreading Sahara Desert in Africa, and the dustbowl conditions of the 1930s in the United States are relatively mild examples of what might be expected if this trend continues. Theoretically, each new animal or plant extinction, with all its dimly perceived and intertwined affects, could cause total ecosystem collapse and human extinction. Each new extinction increases the risk of disaster. Like a mechanic removing, one by one, the rivets from an aircraft's wing, mankind may be edging closer to the abyss.

### Air Pollution

#### Urban sprawl significantly increases air pollution

Frumkin, 02- Professor of Environmental and Health sciences at University of Washington (Howard, “Urban Sprawl and Public Health,” 201-204)

*One of* the cardinal features of sprawl is driving, reflecting a well-established, close relationship between lower density *development* and more automobile travel. *For example,* in the Atlanta metropolitan area*, one of the nation’s leading examples of urban sprawl,* the average person travels 34.1 miles in a car each day—an average that includes the entire population, both drivers and non-drivers.17 More densely populated metropolitan areas have far lower per capita daily driving figures than Atlanta, e.g., 16.9 miles for Philadelphia, 19.9 for Chicago, and 21.2 for San Francisco.*17 On a neighborhood scale, the same pattern is observed. In the Los Angeles, San Francisco, and Chicago metropolitan areas, vehicle miles traveled increase as neighborhood density decreases.* Automobile use *offers extraordinary personal mobility and independence. However, it* is *also* associated with health hazards, including air pollution, motor vehicle crashes, and pedestrian injuries and fatalities. Motor vehicles are a leading source of air pollution.*20 Even though automobile and truck engines have be- come far cleaner in recent decades,* the *sheer* quantity of vehicle miles driven results in large releases of carbon monoxide, carbon dioxide, particulate matter, nitrogen oxides, and hydrocarbons into the air. Nitrogen oxides and hydrocarbons, in the presence of sunlight, form ozone. Nationwide, “mobile sources” (mostly cars and trucks) account for approximately 30% of emissions of oxides of nitrogen and 30% of hydrocarbon emissions. *However,* in automobile-dependent *metropolitan* areas, the proportion may be substantially higher. In the 10-county *metropolitan* Atlanta area*, for ex- ample,* on-road cars and trucks account for 58% of emissions of nitrogen oxides and 47% of hydrocarbon emissions, figures that underestimate the full impact of vehicle traffic *because they exclude emissions from related sources, such as fuel storage facilities and filling stations. In various combinations,* the pollutants that originate from cars and trucks*, especially nitrogen oxides, hydrocarbons, ozone, and particulate matter,* account for a substantial part of *the* air pollution *burden of American cities. Of note,* the highest air pollution levels in a metropolitan area may occur *not at the point of formation but* downwind, due to regional transport. Thus, air pollution is a problem not only alongsideroadways (or in close proximity to other sources) but also on the scale of entire regions. The health hazards of air pollution are well known.24 Ozone is an airways irritant. Higher ozone levels are associated with higher incidence and severity of respiratory symptoms, worse lung function, more emergency room visits and hospitalizations, more medication use, and more absenteeism from school and work*. Although healthy people may demonstrate these effects, people with asthma and other respiratory diseases are especially susceptible.* Particulate matter is associated *with many of the same respiratory effects and, in addition,* with elevated mortality*. People who are especially susceptible to the effects of air pollution include the elderly, the very young, and those with underlying cardiopulmonary disease.* Carbon dioxide is the major greenhouse gas, accounting for approximately 80% of emissions with global warming *potential.* Motor vehicles are also a major source of other greenhouse gases, including methane, nitrogen oxides, and volatile *organic* compounds. As a result, automobile traffic is a major contributor to global climate change, accounting for approximately 26% of U.S. greenhouse gas emissions.28 During the decade of the 1990s, greenhouse gases from mobile sources increased 18%, *primarily* a re- flection of more vehicle miles traveled.28 In turn, global climate change threatens human health in a number of ways, including the direct effects of heat, enhanced formation of some air pollutants*, and increased prevalence of some infectious diseases. Thus, the link between sprawl and respiratory health is as follows:* Sprawl is associated with high levels of driving, driving contributes to air pollution, and air pollution causes morbidity and mortality. In heavily automobile-dependent cities, air pollution can rise to hazardous levels, and driving can account for a majority of the emissions. *Although ongoing research is exploring the pathophysiology of air pollution expo- sure and related issues, there are also important re- search questions that revolve around prevention. Technical issues include such challenges as the development of low-emission vehicles and other clean technologies. Policy research needs to identify approaches to land use and transportation that would reduce the need for motor vehicle travel. Behavioral research needs to identify factors that motivate people to choose less-polluting travel behaviors, such as walking, carpooling, or use of more efficient vehicles.* Sprawl and car usage have been linked together, which has in turn been linked to pollution*. Stone, 06-(Brian, “Urban sprawl and air quality in large U.S. cities,” 689-690)//I.S.* A significant relationship between land use and vehicle travel has been widely documented *(Transportation Research Board, 1995; Apogee, 1998). Perhaps the most compelling evidence of this relationship is provided by the handful of studies that has examined readily available measures of land use and travel within a large number of cities.* In one of the most widely cited of these studies, Newman and Kenworthy (1989) documented a strong and significant negative relationship between population density and per capita fuel usage within 63 large metropolitan regions around the world *(R2 1⁄4 0:86).1 Similar significant relationships have been found to exist between population density and vehicle ownership, vehicle trip generation, and vehicle miles traveled (VMT) in American cities and abroad (Pucher and Lefevre, 1996).*

#### Traffic related air pollution increases elderly health care costs Stacey Axeleff, October 2022, Division of Research, Kaiser Permanente Northern California, Atmospheric Environment, Association between traffic related air pollution exposure and direct health care costs in Northern California, https://www.sciencedirect.com/science/article/abs/pii/S1352231022003363#!

Abstract Background Traffic related air pollution (TRAP) is associated with a complex and diverse array of health effects. It is unknown whether these effects may be reflected by higher health care costs. Objectives Evaluate the association between TRAP exposure and direct health care costs in an elderly population. Methods This multi-ethnic population-based cohort of 25,684 elderly subjects, served by Kaiser Permanente Northern California (KPNC), were followed between 2013 and 2017. Hyperlocal long-term pollutant concentrations for nitrogen dioxide [NO2], nitric oxide [NO], and black carbon [BC] were measured at a resolution of 30 m using repeated street-level mobile measurements and linked to residential addresses. Health care utilization and costs were derived from KPNC databases and were used to calculate individual annual total health care, inpatient, outpatient, and emergency room (ER) and pharmacy costs. The associations between TRAP exposures and health care costs were evaluated using generalized estimating equation models adjusted for age, sex, race, BMI, smoking, SES and comorbidities. Subgroup analyses and interaction models were used to assess differences among specific susceptible population subgroups. Results An IQR difference (10.1 ppb vs 4.2 ppb) in NO2 concentration was associated with a 3% (95% CI: -1%, 6%), 22% (95% CI:11%, 35%), and 5% (95% CI:1%, 8%) increase in annual total health care, ER and outpatient costs in the baseline model. Associations with black carbon showed similar patterns but were smaller in magnitude. Among those with cardiovascular diseases, an IQR increase in NO2 was associated with a 7% (95% CI: 1%, 13%) increase in total annual health care cost and 23% (95% CI: 17%, 29%) increase in ER costs. Discussion Higher long-term TRAP exposure was associated with higher direct annual health care cost in this elderly cohort. Those with existing cardiovascular disease had particularly strong associations between TRAP exposure and direct annual health care costs.

### HSR Good – Ozone Impact

#### High speed rail stops ozone depletion

**Hansen 3** (David, Not the Terrible Band, “Don’t Let Train Vow Hit Buffers”, Evening News (Edinburgh), 3-17, Lexis)

AS well as short-term improvements, airport rail links provide the possibility of replacing some air journeys by trains. The Government has yet to escape from a destructive "predict and provide" approach to airport building, which will simply lead to hyper-mobility as it has done on the roads. Short distance air travel is particularly damaging to the ozone layer, causing climate change out of all proportion to the length of journey.

#### Ozone depletion causes extinction

**Greenpeace 1995** (Full of Holes: Montreal Protocol and the Continuing Destruction of the Ozone Layer -- A Greenpeace Report with contributions from Ozone Action, http://archive.greenpeace.org/ozone/holes/holebg.html)

When chemists Sherwood Rowland and Mario Molina first postulated a link between chlorofluorocarbons and ozone layer depletion in 1974, the news was greeted with scepticism, but taken seriously nonetheless. The **vast majority of credible scientists** have since confirmed this hypothesis. The ozone layer around the Earth shields us all from harmful ultraviolet radiation from the sun. Without the ozone layer, life on earth would not exist. Exposure to increased levels of ultraviolet radiation can cause cataracts, skin cancer, and immune system suppression in humans as well as innumerable effects on other living systems. This is why Rowland's and Molina's theory was taken so seriously, so quickly - **the stakes** **are literally the continuation of life on earth**.

## Oil Dependence

### HSR Reduces Oil Dependence

#### HSR reduces oil dependence and gas prices

Josef, Lifelong Rail Enthusiast and Owner of Worldwide Rails, https://worldwiderails.com/what-are-the-benefits-of-high-speed-rail/

**A city with many vehicles means there’s a higher demand for fuel. It also means the gas prices rise, bringing the overall price of everything high as well. Diesel locomotive engines also consume a lot of fuel, making them an unsustainable long-term mode of transportation**. Countries would be required to import more oil to curb this demand, which increases the reliance and dependency on foreign oil. Doing so puts the country at a disadvantage as it gives the suppliers power over the pricing. **High-speed rails run on electricity, cutting down fuel consumption. When there’s a high-speed train connecting several cities, people often find no need to use vehicles, which ends up lowering the demand for oil. Such actions also help the city to move away from fossil fuels and dependency on foreign oil.**

#### HSR more efficient

IOT Marketing, February 16, 2022, <https://iotmktg.com/advantages-of-high-speed-rail-systems/>, Advantages of High-Speed Rail Systems

More Reliable - **High-speed trains don't get caught up in traffic congestion, which alone makes them more reliable than automobiles or buses. Along with fewer delays than other forms of ground or air transportation, high-speed trains can operate more frequently than conventional public transit systems.**

#### HSR is energy efficient compared to cars and driving

Richard Nunno**,** July 19, 2018, Transportation: Fact Sheet | High Speed Rail Development Worldwide, https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

**Energy savings. Reducing the number of cars on roads and highways translates into big energy savings and a reduced demand for oil. According to International Union of Railways (UIC) data, high-speed rail is more than four times as energy efficient as driving in cars and nearly nine times more efficient than flying.**

#### HSR Reduces oil consumption

American Public Transportation Association, Benefits of High-Speed Rail for the United States, https://www.apta.com/research-technical-resources/high-speed-passenger-rail/benefits-of-high-speed-rail-for-the-united-states/

**Implementing high-speed rail will keep billions of dollars in the U.S. economy by decreasing the amount of oil that the U.**S. **consumes.**

#### HSR reduces oil dependence/powered by renewables

Derek Markham, no date, 8 Benefits of High-speed Trains, https://science.howstuffworks.com/transport/engines-equipment/8-benefits-high-speed-trains.htm

**A high speed rail network carrying electric trains could be powered (at least in part) by renewable energy sources, reducing our need for foreign oil**, with all of its accompanying side effects.

#### HSR is the single most powerful thing we can do to get the U.S. off oil – combination of renewable sources can be used for power

**USHSR NO DATE** (The US High Speed Rail Association is the leading company in the study of HSR. “Energy Security” <http://www.ushsr.com/benefits/energysecurity.html>)

Building an electrically-powered national high speed rail network across America is the single most powerful thing we can do to get the nation off oil and into a secure, sustainable form of mobility. A national network of high speed trains can be powered by a combination of renewable energy sources including wind, solar, geothermal, and ocean/tidal energy. America's dependency on oil is the most severe in the world, and inevitably pulls us into costly resource wars. It also pushes us into exploring for oil in extreme locations such as 10,000 feet deep below the Gulf of Mexico. We use 25% of the entire world's oil supply, yet we only have 5% of the world's population. We use 8-10 times more oil per person per day than Europeans, and they have faster, easier and better mobility than we do. The extremely high daily oil consumption of Americans is not due to a higher standard of living, but because of the extremely inefficient nature of our national transportation system – based on individual vehicles powered by internal combustion engines, combined with our sprawling community designs that force people into cars for every trip.

#### HSR is the ideal medium to facilitate a shift away from oil and will reduce oil-based transportation by 40%

**Perl**, Director Urban Studies Program, Simon Fraser University,’**10** (Anthony, June 10, Council on Foreign Relations, “Expert Roundup: Reducing U.S. Oil Consumption,”<http://www.cfr.org/energyenvironment/reducing-us-oil-consumption/p22413>)

High-speed trains have revolutionized the way that people move between cities hundreds of miles apart. These trains are powered by electricity--the ideal medium to facilitate a transition away from oil because it can blend energy sources and thus shift from non-renewable carbon based fuels like coal and natural gas to renewable sources like solar, wind, and water as soon as the infrastructure to generate them can be built. These trains are powered by electricity--the ideal medium to facilitate a transition away from oil because it can blend energy sources, and thus shift from non-renewable carbon-based fuels. In "Transport Revolutions," Richard Gilbert and I illustrated one scenario whereby the United States could reduce oil-powered transportation by 40 percent between 2010 and 2025 while obtaining roughly the same levels of ton-miles in freight transportation and passenger-miles in local and intercity travel. Around half of today's car travel would shift to electric propulsion, mostly aboard local buses and trains, while about one-third of domestic flying would be substituted by electric trains, mostly running at 125 miles per hour or faster. Electric cars also would play a modest, but growing role in providing local mobility. Similar shifts would occur in freight transportation.

#### HRS solves congestion and oil dependency

**Rosenthal 11** (John December 11 Bloomberg news <http://www.bloomberg.com/news/2011-12-19/riding-high-speed-rail-to-a-u-s-recovery-john-rosenthal.html>)

Investment in rail is a step toward energy independence. Transportation accounts for almost three-quarters of U.S. oil consumption. Shifting millions of passenger trips from cars and airplanes to electric-powered trains each year wouldn’t just relieve airport and highway congestion; it would also reduce the amount of oil we need to import from the Middle East. And because trains use a third less energy per passenger mile than cars do, they’re far less damaging to the environment. The weak economy only increases the urgency. Interest rates are at historic lows, real estate values remain depressed, private sector spending is stagnant, and unemployment is stuck around 9 percent. There could hardly be a better time to borrow billions of dollars to buy up land for train rights-of-way and to create high-paying jobs in engineering, manufacturing and construction.

#### HSR drastically lowers our oil dependency and our risk from the coming peak oil crisis

**USHSR NO DATE** (The US High Speed Rail Association is the leading company in the study of HSR. “Numerous benefits with train systems” http://www.ushsr.com/benefits.html)

Faster, more efficient mobility, enormous energy savings, reduced environmental damage - a train system solves many problems: Creates millions of green jobs nationwide building the new rail infrastructure and manufacturing the rail cars Pays for itself by significantly reducing our $700 billion a year oil purchase trade deficit Offers a convenient, comfortable way to travel without hassles or delays Congestion Relief - delivers new mobility while relieving congestion on highways and runways A major step toward solving global warming by reducing our oil consumption and emissions Drastically reduces our oil addiction and lowers our risk from the coming peak oil crisis Lowers our dependence on costly military operations securing oil flow around the world Lowers our national security risk, and ends wars for oil Freedom from oil - Powered by clean electricity from renewable energy sources: wind, solar, geothermal, ocean/tidal Safe, affordable, green transportation for everyone Saves lives (43,000 Americans die each year in car accidents) Provides efficient mobility that moves people and goods without delay and waste.

#### HSR is the single most powerful thing the U.S. can do to shift away from oil before prices inevitably rise and resource wars escalate

**USHSR, 12** – United States High Speed Rail, created of HSR (“Rail - The Solution to Rising Gas Prices”, 2012, <http://www.ushsr.com/benefits/energysecurity.html)//MP>

Building an electrically-powered national high speed rail network across America is the single most powerful thing we can do to get the nation off oil and into a secure, sustainable form of mobility. A national network of high speed trains can be powered by a combination of renewable energy sources including wind, solar, geothermal, and ocean/tidal energy. America's dependency on oil is the most severe in the world, and inevitably pulls us into costly resource wars. It also pushes us into exploring for oil in extreme locations such as 10,000 feet deep below the Gulf of Mexico. We use 25% of the entire world's oil supply, yet we only have 5% of the world's population. We use 8-10 times more oil per person per day than Europeans, and they have faster, easier and better mobility than we do. The extremely high daily oil consumption of Americans is not due to a higher standard of living, but because of the extremely inefficient nature of our national transportation system – based on individual vehicles powered by internal combustion engines, combined with our sprawling community designs that force people into cars for every trip. As the world oil supply begins to peak and then irreversibly declines, prices will rise faster, and the situation will get far worse for America if we don't quickly reduce our national oil dependency. This dependency cuts across our entire society and affects our daily survival. Oil provides 95% of the energy to grow, process and deliver food to the nation. Our entire national transportation system is powered mostly by oil. Numerous daily products we use are made from oil. We use 20 million barrels of oil every day - just in America - 70% of it for transportation. Of the 20 million barrels we consume, we import 2/3 of this oil (13 million barrels per day) from foreign sources, many in unstable places. No combination of drilling off our coasts, hydrogen fuel cells, natural gas, biofuels, and used French fry oil will solve this and carry 300 million Americans into the future. None of these fuels can be scaled up to anywhere near the amount of liquid fuel we use daily in any practical, economical, or sustainable way.

### Oil Dependence Bad

#### Oil dependence enriches petro states and undermines US foreign policy

Mark Hannah, 8-7, 22, The West Can’t Afford to Be Dependent on Petrostates, https://nationalinterest.org/feature/west-can%E2%80%99t-afford-be-dependent-petrostates-204052

**The United States** and Europe **should focus foremost on achieving energy independence and disentangling** themselves **from the values and interests of Riyadh and Moscow.** Europe sweats under record-high summer temperatures as it simultaneously braces for the cold months coming. Last week, the Russian gas company Gazprom announced a drastic cut—down to about 20 percent of capacity—in the flow of gas through the pipeline which supplies Germany. This could make for a catastrophic winter. One recent report grimly explored how Germans might revert to heating their homes with wood.In the United States, the situation is less severe, though Americans certainly feel the pinch of high energy prices. Polls show voters worry about the rising cost of living, and especially driving costs. So, President Joe Biden reversed his campaign position to make Saudi Arabia a “pariah" and gave the kingdom’s crown prince a fist-bump and a boost to his status. How did we end up here? In 1938, an American company in **Saudi Arabia struck oil**. As the world industrialized, the kingdom swiftly became a leading oil producer and remains central to the world energy market today, **with extraordinary leverage over its security provider, the United States. But Riyadh is not alone in its ability to bend the will of powerful states. Every “superproducer,” including Russia, is able to exert pressure and resist otherwise strong countries. Most American and European consumers don’t wish to bankroll autocratic regimes, but their leaders often leave them no choice.** Policy decisions in Washington and European capitals have led to this moment. But it’s not just the lack of political will and ingenuity to pivot to more renewable sources of energy: though loath to admit it, Washington has a baffling “need to be needed” by oil-rich countries. And **by brokering power struggles in the Persian Gulf, where it otherwise has no compelling interest, Washington gains an excuse to play “globocop.”** **America’s relationship with Saudi Arabia, like Europe’s with Russia, resembles a sad cycle of codependency**. In personal relationships, codependency occurs when one prioritizes another’s needs above one’s own, losing a sense of independence in the process. This dynamic also occurs when strong countries with admirable democratic traditions enable bullying petrostates, often subordinating their own interests to those of their badly behaved partners. **Washington is complicit in its own exploitation when it sells billions of dollars in military hardware to Saudi Arabia in exchange for dubious promises of reliable access to cheap energy.** **America’s “allies and client states take the money and use their [American-made] weapons in pursuit of policies inimical to US interests**,” the Carnegie Endowment’s Andrew Miller and Richard Sokolsky write, calling Saudi Arabia a “poster child of this phenomenon.” Something similar could be said of Europe and Russia. **One solution**, easier said than done in a globally interconnected energy market, **is to stop enabling capricious petrostates. A bold step would be for the United States and Europe to announce a plan to wean themselves off of the oil** from petrostates who defy their vital interests. Washington should lead the plan to replace Russian energy in the winter. Given the looming threat of climate change, every country has an interest in ending its reliance on fossil fuels but, in a classic problem of collective action, every country also experiences this threat differently. Droughts in Syria may not seem connected to fires in Spain; erosion in Japan hardly seems to impact flooding in Kentucky. This is why the United States and Europe should focus foremost on achieving energy independence and disentangle themselves from the values and interests of Riyadh and Moscow. Some argue that “oil-for-security” deals help advance Western interests. Increased Gulf production could bring down prices at the pump (and boost Biden's party’s prospects in the midterm elections). European imports of Russian oil and gas will create the goodwill of a customer relationship. So, it is argued that we should hold our nose on hypocrisy about liberal values or the wars in Yemen or Ukraine. But the underlying assumptions here are that America’s Middle East policy needs partnership with Saudi Arabia and that Europeans need Russia to cooperate rather than capitulate. Both are flimsy. Some analysts even suggest prices might go up if Saudi Arabia were to pump more, as investors could get jittery about the lack of spare capacity. Asking Gulf states to pump more oil as a supposedly quick fix for high gas prices leads Washington to give up far too much for uncertain and temporary results. Over decades, it has caused the United States to become the suppliant guarantor of Gulf security—a role ill-suited for a professed values-first foreign policy. Doing so commits resources to a region the United States needs to draw down from, and it subsumes our national interests under the agendas of autocrats. Washington could use its leverage as a security guarantor or threaten abandonment instead of pressuring leaders through the Gulf, hat in hand. Berlin can continue to hike its defense spending in response to Russia’s war, but even it admits it has no good alternative to Russian energy. **Western political leaders will have to get relentlessly creative to accelerate the transition to renewable—and independent—sources of energy. They are unlikely to curb the demand for energy, but they could work toward a future where the developed democracies are not pushed around by weaker but resource-rich autocrats. The promotion of U.S. interests—which include the viability and longevity of the planet—demands an end to this codependency.**

## Death/Safety

#### HSR reduces passenger deaths

Edward Meng, Ed Meng has a Master in Urban Planning from Harvard University and a Bachelor of Arts in Mathematics from the University of California Berkeley. He has worked on sustainable transportation and technology projects in Saudi Arabia, China, the San Francisco Bay Area, Boston, New Orleans, Phoenix, Seattle, and Southern California., The Promise of High-speed Rail in New Cities, https://newcities.org/the-promise-of-high-speed-rail-in-new-cities-2/

**High-speed rail systems** lessen the demand on roads and crowded airports, and **are statistically safer to ride than automobiles. For example, the French and Japanese high-speed systems have been operational for over 30 years and there have been no passenger deaths as a result of a high-speed crash in either country**

#### Zero fatalities on Japan’s HSR system

Richard Nunno, July 19, 2018, Transportation: Fact Sheet | High Speed Rail Development Worldwide, https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

**The first high-speed rail system began operations in Japan in 1964, and** is known as the Shinkansen, or “bullet train.” Today, Japan has a network of nine high speed rail lines serving 22 of its major cities, stretching across its three main islands, with three more lines in development. **It is the busiest high-speed rail service in the world, carrying more than 420,000 passengers on a typical weekday. Its trains travel up to 320 km/h (200 mph), and the railway boasts that, in over 50 years of operation, there have been no passenger fatalities or injuries due to accidents.**

#### HSR saves 43,000 lives

Andy Kunz, President and CEO of the US High Speed Rail Association (USHSR), sets their vision and direction. He brings 30 years of successful business experience to USHSR and provides senior leadership and an ambitious vision for sustainable transportation in America. This vision includes a 17,000-mile national high-speed rail network built in phases and slated for completion by 2030. Andy holds a Bachelor of Fine Arts degree and a Master of Architecture in Town Design from the University of Miami. He has served as an expert in a number of forums, speaking extensively at leading conferences and events on transportation and planning topics and providing keynote presentations on high-speed rail and sustainability at numerous international conferences., 2020, <https://www.globalrailwayreview.com/article/69858/10-reasons-america-needs-high-speed-rail/>, Ten reasons America needs high-speed rail

**Approximately 43,000 people are killed every year in car accidents in America and another million more seriously injured. High-speed rail is the world’s safest form of transportation proven by decades of safe operation. Japan was the first nation to build high-speed rail in 1964 and has since transported 10 billion passengers without a single fatality!** France has a similar record with their 30 years of high-speed rail operations, as do several other countries.

#### 

#### HSR reduces accident deaths

Derek Markham, no date, 8 Benefits of High-speed Trains, https://science.howstuffworks.com/transport/engines-equipment/8-benefits-high-speed-trains.htm

Tens of thousands of people die each year in automobile accidents, but trains are one of the safest forms of transportation we currently have.

## Convenience

#### HSR is more convenient

Audrey Henderson, 2017, Public Transit and the Benefits of High-Speed Rail, https://www.smartcitiesdive.com/ex/sustainablecitiescollective/benefits-high-speed-rail/151136/

Airline travel used to be a luxury, with passengers treated to full hot meals as well as free checked baggage, comfortable seats and leisurely boarding procedures. Those days are long gone. Airlines routinely charge fees for everything from checked bags to early boarding privileges along with stringent restrictions imposed on carry on luggage.

**With high-speed rail, travel times for distances of 400 miles or less could compare favorably to travel time by air — with much less hassle. Train travel has far fewer restrictions on luggage than air travel, along with a somewhat more relaxed boarding process. In addition, many passenger trains feature amenities such as electric outlets for laptops and roomy seats, along with the opportunity to sit back and relax while chatting with fellow passengers or just watching the scenery go by.**

## Social Cohesion

#### HSR strengthens social cohesion

Audrey Henderson, 2017, Public Transit and the Benefits of High-Speed Rail, https://www.smartcitiesdive.com/ex/sustainablecitiescollective/benefits-high-speed-rail/151136/

**High-speed rail can promote a sense of social cohesion among residents, by bringing distant populated areas closer together. Sprawl is a reality of modern American urban life**. The metropolitan areas for cities like Chicago spread far beyond the borders of the city. In addition to sprawl, a large country like the United States often has vast distances between populated areas. High-speed rail reduces the travelling distance between far flung suburbs and center cities. High-speed rail can also help to ease congestion of urban areas with mega-large populations. By virtue of its speed, high-speed rail allows individuals and commercial enterprises to be located further away from the city center while still being able to readily access its amenities and resources. As a result, urban residents may enjoy a vastly enhanced quality of life.

## Houston-Dallas Line

#### Houston to Dallas HSR line depends on federal funding

Diana Wray, November 8, 2021, Houston Press, Texas Central Seeking Federal Funds to Jumpstart the Texas Bullet Train Project, https://www.houstonpress.com/news/federal-funds-to-jumpstart-the-texas-bullet-train-12262819

Way back when Texas Central was first formulating its plans to construct a highspeed rail line that would tote passengers between Houston and Dallas in just 90 minutes, company officials made vague, broad promises that they would not be seeking any federal funding to construct the Shinkansen railway. However, that’s a claim that Texas Central folks have steadily moved away from over the past decade as the company has managed to obtain regulatory permits and backing that have inched the project ever closer toward becoming a reality, as we noted in our story back in 2017. Thus, it shouldn’t come as much of a surprise now that **Texas Central has recently announced that it is currently seeking $12 billion in federal loans to help fund the project’s estimated cost of about $20 billion. If the loan goes through it will be the largest one in the history of the Railroad Rehabilitation and Improvement fund’s history, gobbling up more than a third of the $35 billion debt limit Congress has set on the fund**. Of course, politicians who have been lobbying against the construction of the rail line since word of the plans to build the Japanese-created bullet train first started going around in 2015 have been quick to criticize Texas Central for going after the federal funds. U.S. Rep. Kevin Brady, a Republican representing The Woodlands, decried the move, which makes sense since some of the landowners who have been most vehemently opposing the highspeed rail line are in the rural sections of the state located between the edges of Houston and Dallas. “Texas Central Railroad has yet again reneged on their promise after vowing for years to not seek federal funding for their proposed high-speed rail project,” Brady stated in a letter issued to Department of Transportation Secretary Pete Buttigieg. “Taxpayers should not be left on the hook for boondoggle projects that never come to come to fruition. I will always fight to protect federal taxpayers—not only in my district, but across America—to make sure our constituents aren’t stuck holding the bag when rail projects default on their loans.” **But on closer inspection, the federal loan program Texas Central is hoping to tap into is potentially one of the best chances the company will have of getting enough funding to finally start construction.** (Back in late 2019 Texas Central had announced plans to kick off construction in 2020, but all of that got derailed, so to speak, by the COVID-19 pandemic that saw the company go through layoffs and downsizing instead.) If the company is approved for the loan program—a program that was created back in 1998 specifically to entice non-freight train companies to build or upgrade their railways, according to a 2018 report issued to Congress by the Congressional Research Service—it will simply be accessing funds that will have to be repaid at 0.5 percent interest. The entire program is designed to help improve our railroad infrastructure, allowing the less profitable railways that don’t operate freight lines loans without any cost to the federal government. So if Texas Central does manage to obtain this loan the groundbreaking that urban dwellers and rail enthusiasts have been waiting for may finally happen marking the beginning of construction. Texas Central seems confident despite the pandemic-related delays. This summer the company signed a $16 billion deal with an Italian outfit to construct the line, and it has been recently reported that investors have been buying up property south of Downtown Dallas with plans to put a station there. If things go according to plan, the Houston-to-Dallas line could be up and running by 2028. Of course, so far little about this has played out as envisioned, and the rural Texas landowners who haven’t signed agreements with the company for right of way are still opposing the entire thing. (The Texas Supreme Court recently to hear a Leon County landowner’s eminent domain case against Texas Central.) But who knows, maybe it really will become a reality. The only thing certain is that if the company does obtain that federal loan, it’s going to be a hell of a lot more likely.

## Answers to Con Arguments

### HSR Has Less Security Answers

#### HSR would require more security if it became widespread

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

The biggest factor slowing down air travel is the time required to get through airport security. Yet, security systems can be streamlined for a lot less than it would cost to build high‐​speed rail. For a modest fee, for example, the Transportation Security Administration’s PreCheck program allows frequent travelers to swiftly bypass many security steps.44

If high‐​speed rail ever became a significant mode of travel, it also would require security systems. Wait times to pass through security to ride the Eurostar from London to Paris, for example, can sometimes be 30 minutes or more.45

### Inflation Answers

#### Shift to renewables ends fossil-fuel driven inflation

Rebecca Leber, 8-12, 22, Fight climate change. End fossilflation. Here’s how, https://www.vox.com/science-and-health/2022/8/12/23290488/fight-climate-change-end-fossil-fuel-inflation

It’s a mundane day for errands: you run out to the store to pick up some groceries, some drugstore supplies, and **fill up the gas tank**. Afterward, you cook up some lunch on the gas stove. For all this, **you’d be spending roughly 8.5 percent more than you were a year ago**, based on the Bureau of Labor Statistics’ July report on prices for consumer goods and services — over the course of the month, that translates into roughly $500 more for most households than last year. **Economists have pointed to energy prices as the main reason for high inflation**. Americans have had to spend more on gasoline, on natural gas for stoves, water heaters, and furnaces, and on any electricity derived from oil and gas. But the impact from fossil fuels is bigger than that — energy prices indirectly affect virtually every part of the economy. The impact of higher energy prices is especially evident in food prices, because most of the cost of food is based on how expensive it is to get from the farm to the shelf. But it’s also affecting other consumer goods. For example, Amazon recently hiked its Amazon Prime rates in European countries, citing rising costs for fuel and transportation. **Mark Zandi, Moody’s chief economist, said fossil fuels were a major cause of every period of inflation since World War II.** “Invariably, it’s the high cost of oil and fossil fuels in general that drive big fluctuations and overall inflation,” Zandi said. “Every recession since World War II has been preceded by a jump in oil prices.” Higher oil and gas prices are responsible for about 40 percent of the price increases across the economy (or 3.8 percentage points of the 8.5 percent inflation from July, according to calculations from Moody’s). One big reason that inflation cooled down this month could be that energy prices are falling; natural gas and gasoline are cheaper than they were earlier in the year. But even though prices have decreased, they are still higher than a year ago. In general, the consumer can still expect to be paying a lot more for goods and services in the near future. The interplay between the price of fuel and the price of everything else over the last year shows what a tight hold fossil fuels have on the economy. The US is trapped in a cycle where oil and gas prices go up, and political leaders try to do everything they can to bring them down again to lessen the burden on inflation. It pits renewable energy sources against the economy. Breaking free of this means shifting to more electricity that’s powered by solar and wind to fuel cars, homes, and businesses. **Reducing reliance on fossil fuels “will significantly reduce its grip on inflation in the broader economy**,” said Zandi. It’s the reason why economists eventually expect the Inflation Reduction Act to live up to the bill’s name. Fossilflation, explained A complicated set of factors is driving inflation right now — including but not limited to supply chain problems, insufficient labor, and anticipated gas shortages in Europe — but dig a bit deeper, and a common element is reliance on fossil fuels. Inflation isn’t just an issue in the US or because of federal spending in the pandemic. It’s doubled in the last year in 37 advanced economies. In some circles, economists have preferred to use “fossilflation” as the more accurate description of current inflation woes. European Central Bank executive board member Isabel Schnabel used the term in a March speech on the new age of inflation. “Fossilflation reflects the legacy cost of the dependency on fossil energy sources,” she said. Volatility is always a feature of relying heavily on fuels to drive the economy. These are commodities that have to be stored, refined, and transported; as Gernot Wagner, a climate economist at Columbia Business School, explained, “commodities always fluctuate.” This was especially true in the 1970s and ’80s when the economy suffered under even higher inflation. The circumstances driving higher prices today are different, of course. The oil industry has had a tumultuous few years during the pandemic: it is now drilling fewer wells and struggling with limited available refinery capacity that hasn’t matched the sharp rise in demand. And Russia’s invasion of Ukraine and the resulting global sanctions have lowered available supplies of oil and gas, and prices are higher accordingly in anticipation of winter shortages in Europe. “A hundred years into the oil age it shouldn’t surprise us anymore that every decade or so something happens somewhere and prices go up,” Wagner said. BLS’s July report actually showed no growth in inflation last month. The reason is the same: fossil fuel prices. Zandi explained that June’s high numbers reflected Europe’s decision to sanction Russian oil and gas. But investors seemed to have overestimated the impact on actual global oil and gas supplies, which is why prices came down a bit in the following weeks. It’s not ideal to be this tethered to oil’s ups and downs. The oil industry is reaping rewards while consumers suffer higher prices. The 50 biggest oil and gas companies raked in $113 billion in profit so far in 2022, because of high prices, according to one calculation. And they’re still getting billions in subsidies, with the entire US oil and gas industry receiving more than $20 billion in tax breaks, according to a 2017 analysis from Oil Change International. The solutions for climate change perform double duty and help consumers break free from this cycle. Green tech isn’t a panacea for the economy; in fact, “greenflation” is the term coined for higher demand for copper, lithium, and cobalt needed for clean technology. But moving off of fossil fuels does help in one major way. Rather than rely on fuel, a commodity, Wagner argues that the US adopting renewables will mean a switch to technological solutions. “Technologies, by definition, get better and get cheaper,” he said. “That’s the way to get off the unfortunate cycle of fossilflation.” Breaking the cycle of “fossilflation” What Congress’s investments could do, if they truly help to move the American economy off of its fossil fuel reliance, is to break the economy free from the volatility of oil markets. The Inflation Reduction Act promises to help because it does a few simultaneous things. It invests in solutions that help to reduce consumer demand for fossil fuels, and incentivizes manufacturers and businesses to do the same. It also raises taxes on corporations, another way of curbing inflation, “not dissimilar to the Fed raising [interest] rates,” said Energy Innovation’s Robbie Orvis, an economic modeler who has studied the impact of the bill. The IRA’s nearly $370 billion in climate measures aren’t going to make a dent in current inflation. But as the decade goes on, economists like Zandi expect that Americans may start to feel some difference. Moody’s estimates that by 2030, the bill could reduce the typical American household’s spending on energy by more than $300 each year, in today’s dollars. It also may help with insurance rates for home and business properties because of its investments slashing emissions (which worsen climate change) and in physical climate adaptation. Another report from Rewiring America finds even greater gains when tallying up the bill’s total tax credits for electric vehicles, rooftop solar, and electric appliances like heat pumps. Rewiring America found a household would save $1,800 annually if it adopted all this clean tech. Of course, doing all this in your household costs a lot of money up front. There are still some policies in the bill that target low-income households specifically, like expanding a low-income home rebate that covers the full cost of heat pump installation, with a cap of $8,000. “That could go a long way to mitigating the ups and downs in the broader economy and our standard of living,” Zandi said. These policies are too late to help with high prices in the immediate future, but they will stem the impact of the next major crisis.

# CON

### Political Capital Links

#### Republican opposition to pubic HSR funding

Thomas Hart, 2012, High-speed rail's many benefits, https://www.politico.com/story/2012/05/the-many-benefits-of-high-speed-rail-076682

Rep. John Mica (R-Fla.), chairman of the House Transportation and Infrastructure Committee, introduced controversial legislation last year that would privatize Amtrak, only to meet strong Democratic resistance. **Tea party Republicans eliminated federal funding for high-speed rail in 2012, preferring private-sector financing**. Indeed, high-speed rail funding may be zeroed out in the surface transportation bill now being negotiated in a House-Senate conference — though there is growing bipartisan support for provisions that could spark private investment through tax incentives and government guarantees.

### Cost/Spending

#### HSR costs $4 trillion

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Secretary of Transportation Pete **Buttigieg’s proposal to make the United States a “world leader” in high‐​speed rail would add more than $4 trillion to the federal debt for construction of new rail lines plus tens of billions of dollars of annual deficit spending** to subsidize operating costs. In exchange, such a high‐​speed rail network is likely to carry less than 2 percent of the nation’s passenger travel and no freight.

#### Trillions to build, billions to sustain

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

**California has spent an average of more than $100 million per route‐​mile building 220 mph** track on flat land.17 The latest estimates project that **the entire 520‐​mile route will cost $100 billio**n, of which $20 billion is for 120 miles of flat land and $80 billion is for 400 miles of hilly or mountainous territory.18 That works out to $200 million a mile for hilly areas.

At these costs, Obama’s original high‐​speed rail plan would require well over $1 trillion, while the USHSR’s plan would need well over $3 trillion. Building a system longer than China’s would cost at least $4 trillion.

**High‐​speed rail proponents are likely to predict lower costs, but costs always end up being higher than originally projected**. **In 1999, the 520‐​mile Los Angeles–San Francisco line was projected to cost $25 billion.19 The most recent projection is $100 billion.20 Even after adjusting for inflation, costs have nearly tripled**. Cost overruns are typical in other countries as well. Britain’s 345‐​mile London–Scotland HS2 high‐​speed rail line was originally projected to cost £32.7 billion (about $123 million per mile) and is currently expected to cost £106 billion ($400 million per mile).21 Even Japan’s original bullet train had a nearly 100 percent cost overrun.22

Zero‐​Based Transportation Policy: Recommendations for 2021 Transportation Reauthorization

This paper begins with a look at the history of federal transportation policies and continues with an evaluation of how they relate to each of the main forms of transportation in the United States.

Once built, high**‐​speed rail systems are expensive to maintain**. Long‐​run capital renewal requirements include replacement of rails and trainsets as frequently as every 10 years. Transit agencies in the United States currently have a $176 billion maintenance backlog, mostly for rail infrastructure.23 A country that can’t keep its urban rail systems in shape is not likely to keep even more expensive high‐​speed rail lines running.

Rail planners often ignore these capital replacement costs. The California High‐​Speed Rail Authority is legally required to earn enough revenues to cover its operations and maintenance costs. The agency’s business plans estimate future capital replacement costs (which it calls “lifecycle costs”), but when it projects the future profitability of the project, it only counts operations and maintenance costs, not lifecycle costs, against the revenues.24 This means taxpayers will be on the hook to cover those costs even in the unlikely event that the system manages to cover its operations and maintenance costs.

**Passenger revenues probably won’t even cover operating costs**. Amtrak claims that the Acela, its high‐​speed train between Boston and Washington, covers its operating costs, but it doesn’t count its second‐​largest operating expense: depreciation. By ignoring depreciation, Amtrak has managed to build up a $52 billion maintenance backlog in the corridor.25 If Amtrak’s high‐​speed rail corridor through the most heavily and densely populated region of the country can’t pay for its operating costs, then no other corridor will be able to do so either.

Where all this money will come from is even more problematic. In 2008, California voters agreed to allow the state’s high‐​speed rail authority to sell $9 billion worth of bonds without identifying any source of revenues to repay those bonds. The authority’s original business plans anticipated that private investors would be willing to offset as much as $7.5 billion of the construction costs in exchange for being able to profitably operate the line, but no investors have been willing to risk their money based on the state’s projections that the line can operate at a profit.26 The state also hoped to sell carbon credits to help pay for the line, but revenues fell well short of expectations.27 Beyond this, California hopes for more federal funding, all of which would come from deficit spending.

**Proponents often compare their high‐​speed rail ambitions with the Interstate Highway System, yet that system cost far less to build and didn’t require any deficit spending**. The 48,500 miles of interstate highways connect every state and every major urban area in the contiguous United States.28 Constructing the system cost about $530 billion in present‐​day dollars, making the average cost of $11 million per mile well below that for high‐​speed rail.29 If built today, it might cost a little more but would still be less than a fifth of the cost, per mile, of high‐​speed rail lines.

Federal gas taxes and other highway user fees covered nine‐​tenths of the cost of interstate highways; state highway fees paid for the rest. The interstate system was also built on a pay‐​as‐​you‐​go basis, with no bond sales or other debt financing.30 Since high‐​speed train ticket revenues are not likely to cover operating costs, much less capital costs, all of the construction cost would come from deficit spending.

**While interstates make up only 1.2 percent of highway miles in the United States, they carry close to 20 percent of all passenger‐​miles and at least 16 percent, and probably closer to 20 percent, of freight ton‐​miles.31 In contrast, even the most extensive high‐​speed rail networks would carry less than 2 percent of passenger‐​miles and no freight**. One projection by high‐​speed rail proponents estimated that Obama’s 8,600-mile high‐​speed rail plan would carry 25 billion passenger‐​miles per year, which is less than 0.5 percent of all passenger travel in the country.32 Since the routes in the Obama plan were the ones most likely to succeed, doubling or tripling high‐​speed rail miles would result in less than double or triple passenger‐​miles. Thus, it is unlikely that high‐​speed trains would ever carry as much as 2 percent of passenger travel. Because of the lightweight equipment required for high‐​speed trains, such trains are incompatible with heavy freight trains for safety reasons, so such routes would carry zero freight.

#### Many ways HSR increases costs

Josef, Lifelong Rail Enthusiast and Owner of Worldwide Rails, https://worldwiderails.com/what-are-the-benefits-of-high-speed-rail/

Cons

Cost is the primary factor when considering the challenges facing **high-speed rail**. Although the entire system is meant to offer affordable transportation, it **costs a lot to set it u**p. Here are the costs associated with the entire project.

**Set up cost – financing the entire project is often the first obstacl**e faced by any city planning to get a high-speed train. However, financial institutions usually step in and offer loans for the project.

**Technological cost – bringing in new technology, such as modern railroads, sensors, hyperloop, and magnetic levitation, can be costly**.

**Electric cost – since high-speed trains run on electricity, there’s always a high demand to sustain the trains and keep them functional**. The bill could amount to millions of dollars, as a single train can consume 3.8 KWh for every 100 passengers

**Operation cost – this cost includes hiring and training crew members, train engineers, train operators, conductors**, and anyone else involved in the running and maintaining of the train.

#### HSR very expensive

The DPost, September 29,2021, Pros and Cons of High-Speed Rail in the U.S., https://thedpost.com/pros-and-cons-of-high-speed-rail-in-the-u-s/

Do you know how expensive it would be to build a High-speed railway system in dense areas? Think about the accrued cost of transport to send things from places like San Francisco to Los Angeles. It wouldn’t be easy, but for this railway system to work in the U.S, all these things must be done. What happens to dwellers and settlers that settled at areas where the railway lines must pass through. It would cause many problems, like the noise the train makes, and they would have to be around many strangers. Strangers as in people that make use of the train to move around. That would take a lot of getting used to, but still, it counts as a con to the high-speed rail in the United States.

**Did you know about the high level of debt it took to create high-speed rail in the United States?**

**Before the railway system was made, many funds were borrowed for this project to become a reality.** Trust me when I say that wasn’t easy to do in any way. No one likes gathering debts, not even the government.

#### HSR $ can be better spent on literally anything else

#### Thomas Buckley, July 25, 2022, What Else California Could Have Done With the High-Speed Rail Funds, https://californiaglobe.com/articles/what-else-california-could-have-done-with-the-high-speed-rail-funds/

First things first, let’s set some parameters for this article. One – California’s High Speed Rail network is not going to be built. At this point, that’s a given. Two – Even it were to be built and managed to hit its ridership projections it would require that 140 loaded-to-capacity trains would have to move both north and south each day. That means a train carrying 1,000 people would have to leave from both ends of the system every eight minutes. Three – Those numbers, when compared against operating expenses and debt repayment, would have to translate into an average per person fare of about $150 each trip. And remember that not every trip will travel the entire length of the system, meaning the round-trip cost from LA to San Fran will run well over $400 if the system is to break even (depending upon how you buy your ticket, at least double if not triple what a flight on Southwest costs). **So, instead of spending $100 billion (a number that will continue to rise) on a system that is a decade beyond schedule** (another number that will continue to rise), **and even if the waters part and the planets align and a literal Deus ex Machina moment occurs and it does get finished it will still have no hope of matching the speeds and ticket prices DEMANDED of it in the original bond, what else could California have done with the money?** Those playing along at home may recall a similar article regarding the looting of the EDD – click here if you care to refresh your memory. And some of the expenditure concepts will be similar to the previous article. In no particular order, one hundred billion dollars would pay for: Cover the entirety of the EDD fraud-generated debt plus leave about $70 billion aside for when, not if, the unemployment agency gets fleeced again…and again…and again. **At about $700,000 per 500 square-foot unit** (yes, that’s the going price now), **every homeless person in the state could be given a free apartment.** If, for whatever reason you would wish to, you could pave Death Valley. **The Salton Sea could be restored every decade until the year 2300. San Diego could get three** – not just one – **floating airports. The entire shortfall in the CalSters teacher pension could be funded** (or just most of the CalPers shortfall). **The state could provide free insulin for four years to every diabetic Californian.** Put into a trust, it would be enough money to cover the cost of every organ transplant procedure and the treatment of every Californian with HIV forever. According to the current total assessed property value, **California taxpayers could buy Marin County and every building in it.** Phil Mickelson could lose $10 million per year (which he reportedly has been doing) gambling for the next 10,000 years. You could build and stock 10 new Getty museums (better than a koi pond in the backyard, wouldn’t you say?). **Instead of Stanford students paying $80,000 a year to go to school, each could actually be paid $150,000 per year to attend, year in, year out.** Every bald Californian – no matter the age – could get free hair transplants. At the current clip, **California could match the federal military aid budget for Ukraine for 14 years. Or the state could simply double Ukraine’s gross domestic product for a year. Every child in the state could go to private school for a year** (fun fact: average private school tuition is nearly identical to the amount the public system pays per student – wonder who is getting the better deal?). The state could pay $8 million to every resident of the Pacific Island nation of Tuvalu and simply buy the country. On a transportation note, $**100 billion placed in a trust would generate enough money each year to make all Bay Area and Southland public transit free of charge for eternity. Continuing in a mobility frame of mind, NASA is planning to spend about $230 billion on its proposed manned mission to Mars in 2035. The high-speed rail funds would cover nearly half of that, or about one way of the round trip. The rail project would – at its lengthiest – connect San Diego and Sacramento, a journey of about 550 miles. The trip from Earth to Mars is about 110,000,000 miles.** Guess who is getting the better deal?

### Capitalism Kritik

#### Only socialism can prevent ecological overshoot; reform fails, only a complete overthrow of the capitalist system solves, and *only socialism can solve for the impacts of the environmental crisis it is too late to stop*

John Bellamy Foster and Brett Clark, July 1, 2022, Socialism and Ecological Survival: An Introduction, https://monthlyreview.org/2022/07/01/socialism-and-ecological-survival-an-introduction/

**Capitalism has brought the world to the edge of the abyss. We are rapidly approaching a planetary tipping point in the form of a climate Armageddon, threatening to make the earth unlivable for the human species, as well as innumerable other species. Such an absolute catastrophe for civilization and the human species as a whole is still avoidable with a revolutionary-scale reconstitution of the current system of production, consumption, and energy usage, though the time in which to act is rapidly running out.**2

Nevertheless, while it is still possible to avoid irreversible climate change through a massive transformation in the mode of production, it is no longer feasible to circumvent accelerating environmental disasters in the present century on a scale never seen before in human history, endangering the lives and living conditions of billions of people. **Humanity, therefore, is facing issues of ecological survival on two levels: (1) a still reversible but rapidly worsening Earth System crisis, threatening to undermine civilization as a whole and make the planet uninhabitable for the human species, and (2) accelerating extreme weather and other ecological disasters associated with climate change that are now unavoidable in the coming decades, affecting localities and regions throughout the globe. Social mobilization and radical social change are required if devastating near-term costs to people and communities, falling especially on the most vulnerable, are to be prevented.**

Six decades after the threat of accelerated global warming was first raised by scientists, the situation has only gotten worse. In August 2021, UN secretary general António Guterres declared that it is “Code Red for Humanity.”3 His warning coincided with the UN Intergovernmental Panel on Climate Change’s (IPCC) release of the Physical Science Basis report of Working Group I of its Sixth Assessment Report (AR6). In this report, five primary scenarios were provided with respect to climate mitigation. Among the most significant findings was that even in the best-case scenario (SSP1-1.9), requiring at this point nothing less than a rapidly escalating transformation of the entire global system of production and consumption, the world will surpass a 1.5°C increase in global average temperature after 2040, and will not get below that temperature again until the very end of this century.4

The second scenario (SSP1-2.6) points to an increase in global average temperature at the end of the century of 1.8°C (still well below the guardrail of 2°C). The threat of irreversible planetary catastrophe is represented by the next three IPCC scenarios. The fifth scenario (SSP5-8.5) points to an increase in the global average temperature of 4.4°C (best estimate)—spelling the collapse of civilization and absolute disaster for the human species. To avoid such a prospect, given the direction in which the world is now headed, it is necessary to reverse “business as usual,” transcending the prevailing logic of an “unsustainable” capitalist system.5

At the same time**, the IPCC report makes it clear that it is no longer conceivable to prevent accelerating climate disasters this century, even in the best-case scenario, in which an irrevocable planetary tipping point would be avoided. The decades immediately ahead will therefore see the proliferation of extreme weather events that will compound one another: heavy precipitation, megastorms, floods, heatwaves, droughts, wildfires, and failing monsoo**ns. Sea-level rise will continue throughout this century and beyond, regardless of the actions taken by humanity—though the rate of sea-level rise can still be affected by the world’s actions. Massive global crop failures are to be expected.6 Climate refugees will be in the hundreds of millions.7 All of this is further complicated by the fact that climate change is not the only planetary boundary that capitalism is currently crossing or threatening to transgress. Others include: the loss of biological diversity (marking the sixth extinction), ocean acidification, disruption of the nitrogen and phosphorus cycles, loss of ground cover (including forests), loss of freshwater resources, chemical pollution, and radioactive contamination.8

Up to now, the ecological, including ecosocialist, strategy with respect to climate change has focused almost entirely on mitigation, aimed at stopping greenhouse gas emissions, particularly carbon emissions, before it is too late. Yet, this general approach has all too often been rooted in a type of reformist environmentalism that does not seriously challenge the parameters of the present system, allowing the ecological crisis to deepen and expand. Mitigation—but today necessarily of a far more revolutionary character—still has to play the leading role in any global climate strategy, since it is essential for the continuation of civilization and survival of the human species (and most of the known species on Earth). However, it is now also necessary, given the inevitable degradation of the earth this century, to mobilize immediately for survival at the level of communities, regions, nations, and whole peoples. The harsh reality is that during the next few decades, which according to even the IPCC’s most optimistic scenario will involve breaching the 1.5°C threshold—at least for a time—humanity will inevitably see the proliferation of environmental catastrophes at all levels and throughout the planet. This requires that populations organize, plan, and create spaces of ecological sustainability and substantive equality designed to protect what Karl Marx called “the chain of human generations.”9

**Self-mobilization of populations in order to protect lives, communities, and local and national environments, while carrying out revolutionary changes at all levels of existence as part of completely reorganizing production, consumption, and energy usage, now constitutes the pathway to ecological survival.** Yet, this new strategic moment, in which mitigation has to be accompanied by environmental disaster management aimed at protecting populations in the community in the present as well as future, has not yet been fully mapped. A broad revolutionary ecological and socialist strategy has to be articulated that transcends the dominant liberal refrains of individual “adaptation” and “resilience,” which largely deny the realities of class, race, gender, and imperialism—along with the metabolic rift between capitalism and the environment.10

**The only meaningful, radical approach to these unprecedented challenges and multiple levels of catastrophe is that of socialism as a pathway to ecological survival.** It is now widely understood within natural science that the Holocene Epoch in the geological history of the earth of the last twelve millennia has ended and that the planet entered into the Anthropocene Epoch around 1950.11 The Anthropocene Epoch is defined as the geological epoch in which anthropogenic, rather than non-anthropogenic factors (as in the entire prior history of the earth), now largely determine the rate of Earth System change. In what might be called the Capitalinian Age, the first geological age of the Anthropocene, the world is characterized by an Anthropocene crisis associated with “anthropogenic rifts” in the biogeochemical cycles of the planet, brought on by the Great Acceleration of the human impact on the planet under mature monopoly capitalism.12 What is needed in these circumstances is the creation of a novel mode of production ushering in a new geological age of the Anthropocene (since the Anthropocene itself is now a permanent feature of geological history, as long as human civilization continues).

**In a previous analysis, we dubbed this potential future geological age of the Anthropocene the Communian Age**, standing for community, communal, and the commons. The advent of the Communian Age would mark the historical development of a new, higher, more sustainable human relation to the earth, one which could only come about through ecological, collective, and socialist action. This transition to the second age of the Anthropocene, transcending the present Capitalinian, must begin as soon as possible to protect lives, coordinate environmental disaster management strategies, and undercut the momentum associated with the accelerating trends of ecological disaster.13 Such revolutionary, socialist transformations constitute the necessary foundation for survival, moving forward in this century.

The Great Acceleration and the Great Ecological Revolt

The advent of the Anthropocene Epoch is associated in natural science with the Great Acceleration of economic impacts, energy use, and pollution, marking the changed physical relation to the environment arising from anthropogenic factors. However, the Great Acceleration and the advent of the Anthropocene also corresponded to the emergence of the modern environmental movement in the late twentieth and early twenty-first century, which might be seen as signifying the beginnings of a Great Ecological Revolt, still emerging on a planetary level in the present century.14

Modern environmentalism, or the ecological revolt of the post-Second World War years, is usually said to have begun in 1962 with the publication of Rachel Carson’s Silent Spring. It is more accurate, however, to see its point of origin in the response to the disastrous U.S. thermonuclear test carried out under the code name “Castle Bravo” at Bikini Atoll in the Marshall Islands on March 1, 1954. The Castle Bravo hydrogen bomb test was intended to have a yield of no more than six megatons, but, due to an error of the scientists involved, it had an explosive power of fifteen megatons, about two and a half times what was expected and a thousand times that of the atomic bombs that the United States dropped on Hiroshima and Nagasaki. The detonation resulted in ten million metric tons of coral being radiated and absorbed into the fiery mushroom cloud that climbed over 100,000 feet into the air and spanned over seventy-five miles.15

The Castle Bravo test released an enormous, unexpected level of radiation, with the fallout extending over 11,000 square kilometers. Traces of radioactive materials, which had entered the atmosphere and stratosphere, were detected all over the globe. Marshall Islanders on the inhabited atolls were covered with a fine, white-powdered substance (calcium precipitated from the vaporized coral) containing radioactive fallout. Decades after the Castle Bravo test, most of the children and many adults on Rongelap Island had developed thyroid nodules, some of which proved malignant. The crew of a Japanese fishing boat, the Lucky Dragon, which at the time of the test was some eighty-two nautical miles from Bikini, well outside the official danger zone, were coated in radioactive fallout. By the time the boat reached Japan, members of the crew were already exhibiting radiation sickness, setting off a world alarm.16

The Dwight Eisenhower administration refused to release information on the effects of radioactive fallout and exposure in the face of the Castle Bravo disaster, downplaying the issue for almost a year. However, the veil that hid the fallout problem fell. Alarmed scientists immediately began to research the effects of radioactive fallout and how it was distributed by air, water, and living organisms throughout the global ecosystem. This work revealed how the operations of the Earth System resulted in fallout being concentrated in the Arctic, despite this region being far removed from where nuclear testing was taking place. It documented how iodine-131 adversely affected the thyroid gland. It detailed how plants and lichen absorbed strontium-90, which then moved throughout the food web, where this radioactive isotope was incorporated into bones and teeth, increasing cancer risks. These studies raised fears of a planetary ecological crisis, whereby the world’s population would share a common environmental fate from the spread of radiation, threatening survival everywhere, as dramatized in fictional form in Nevil Shute’s 1957 dystopian nuclear holocaust novel On the Beach.

All of this was to contribute to the inception of the Great Ecological Revolt or worldwide development of environmental movements. Disturbed by the spread of radionuclides in the biosphere, scientists began protesting against above-ground nuclear tests, led by such left/socialist figures as J. D. Bernal, Virginia Brodine, Barry Commoner, W. E. B. Du Bois, Albert Einstein, H. J. Muller, Linus Pauling, and Bertrand Russell.17 Reflecting on these issues, Leo Huberman, the editor of Monthly Review, remarked in 1957 that “time is running out.… The tests [of these bombs] are dangerous to the health of the world. We must make the movement to ban the bomb encompass not just the Left who are already aware of the dangers, but all of our countrymen.”18

Commoner, a biologist and a pioneer in ecological thought, helped organize in 1958 the St. Louis Citizen’s Committee for Nuclear Information (later the Committee for Environmental Information) that brought scientists and citizens together to share accurate information regarding nuclear issues and concerns, including the dangers of exposure to radioactive fallout. This group famously initiated the baby tooth study in 1958, which involved coordinating with community organizations to recruit participants to collect teeth from young residents in the region to examine the absorption and prevalence of strontium-90. By 1970, approximately 300,000 teeth had been analyzed, revealing that the presence of strontium-90 in teeth rose in direct correspondence to an increase in atmospheric bomb tests, only to decline following the end of such above-ground tests. Given the rich findings, similar studies were done in other parts of the United States, Canada, and Germany, further documenting how radioactive isotopes were readily incorporated into specific parts of the body, contributing to an increase in childhood cancer.

Carson herself entered into this ecological movement initially through her concern over bioaccumulation (concentration of contaminants like radionuclides and other toxins within organisms) and biomagnification (the magnified concentration of contaminants at higher levels within the food chain). She offered an extensive analysis of the dangers that accompanied the widespread use of synthetic pesticides, explaining that the “chemical war,” poisoning, and ecological degradation were driven by “the gods of profit and production.”19

In the context of the Great Ecological Revolt, both before and after the publication of Carson’s Silent Spring, socialist environmentalists were generally distinguished by their more thoroughgoing critiques and far-reaching analyses of the fundamental threat that the capital accumulation system posed to the global environment, and by their insistence on the need for the formation of a revolutionary ecological movement for human survival.20 Three classic works in this respect are Commoner’s Science and Survival (1963); Charles H. Anderson’s The Sociology of Survival: Social Problems of Growth (1976); and Rudolf Bahro’s Socialism and Survival: Articles, Essays, and Talks 1979–1982 (1982).21 Commoner’s and Anderson’s books both addressed the multiple critical ecological thresholds, such as climate change, that were being crossed as a result of the profit-driven production system.22 The red-green theorist Bahro, building on the analysis of British Marxist historian E. P. Thompson, insisted in “Who Can Stop the Apocalypse?” that capitalism was leading to “exterminism,” or the systematic death of multitudes. He called for the mobilization of a massive, global ecological “conversion movement” aimed at transcending the system of capital accumulation.23

As Commoner, Anderson, and Bahro all emphasized, there were two existential crisis tendencies facing humanity—a reality that remains true today. One is associated with the nuclear arms race and the threat of a global thermonuclear exchange, ushering in nuclear winter.24 The other is the crossing of planetary boundaries, constituting a direct threat to ecological existence, due to the inherent drive of the system of capital accumulation in the Anthropocene. Six decades after the danger of accelerated global warming was first raised by scientists in the Soviet Union and the United States, the situation has only gotten progressively worse and more threatening, marking the complete failure of the capitalist environmental state in checking fossil capital.25 The only answer is to build a strong socialist and ecological, or ecosocialist, movement locally and globally, that ensures the survival of populations and communities in the present while safeguarding the future of humanity and the earth.

Ecosurvival and Ecosocialism

Born in 1917, Commoner was a child of the Great Depression and of the socialist and communist movements of the time. He was strongly influenced by the mass movements supporting the Republican cause in the Spanish Civil War and by protests against lynchings in the U.S. South. Drawn early on to socialist, dialectical-materialist approaches to science, he was a close reader of Frederick Engels’s Anti-Dühring and the Dialectics of Nature. He was to be a lifelong ecosocialist. He once declared, ironically, that “the Atomic Energy Commission made me an environmentalist.”26 In “To Survive on the Earth,” the closing chapter of Science and Survival, Commoner warned:

As a biologist, I have reached this conclusion: **we have come to a turning point in the human habitation of the earth. The environment is a complex, subtly balanced system, and it is this integrated whole which receives the impact of all the separate insults inflicted by pollutants. Never before in the history of this planet has its thin life-supporting surface been subjected to such diverse, novel, and potent agents.** I believe that the cumulative effect of these pollutants, their interactions and amplification, can be fatal to the complex fabric of the biosphere. And, because man is, after all, a dependent part of this system, I believe that continued pollution of the earth, if unchecked, will eventually destroy the fitness of this planet as a place for human life.… I believe that world-wide radioactive contamination, epidemics, ecological disasters, and possibly climatic changes would so gravely affect the stability of the biosphere as to threaten human survival everywhere on the earth.27

Commoner was deeply concerned with “the assault on the biosphere.” Already in Science and Survival, he presented the basic nuclear winter hypothesis in which a general thermonuclear exchange would result, due to the lofting of smoke and soot into the stratosphere, in a drastic reduction in global average temperatures imperiling all of humanity.28 In the same work, he pointed to climate change, warning of the effects of accelerated carbon dioxide accumulation in the atmosphere, the consequences of this on the biosphere, and the “catastrophic floods” arising from sea-level rise. “Control of this danger,” that is, global warming, he observed in the mid–1960s, “would require the modification, throughout the world, of domestic furnaces and industrial combustion plants.… Solar power, and other techniques for the production of electrical power which do not require either combustion or nuclear reactors, may be the best solution. But here…massive technological changes will be needed in all industrial nations.” Nevertheless, technology itself was not the answer. As Commoner went on to state, “technology has not only built the magnificent material base of modern society, but also confronts us with threats to survival which cannot be corrected unless we solve very great economic, social, and political problems.… Science can reveal the depth of this [ecological] crisis, but only social action can resolve it.”29

In 1971, in the chapter on “The Question of Survival” in The Closing Circle, Commoner made a similar declaration, writing:

**My own judgement, based on the evidence now at hand, is that the present course of environmental degradation, at least in industrialized countries, represents a challenge to essential ecological systems that is so serious that, if continued, it will destroy the capability of the environment to support a reasonably civilized human society**.… One can try to guess at the point of no return—the time at which major ecological degradation might become irreparable.… It is now widely recognized, I believe, that we are already suffering too much from the effects of the environmental crisis, that with each passing year it becomes more difficult to reverse, and that the issue is not how far we can go to the brink of catastrophe, but how to act—now.30

For Commoner, the ultimate problem was the mode of production itself. As he stated in the introduction to the 1992 edition of Making Peace with the Planet, “If the environment is polluted and the economy is sick, the virus that causes both will be found in the system of production.”31

Anderson, who was deeply influenced by Commoner’s work, was a Marxian sociologist and political economist, author of The Political Economy of Social Class (1974). In the mid–1970s, he developed a powerful ecosocialist degrowth analysis, focusing on the planetary environmental crisis and issues of human ecological survival. His major work, The Sociology of Survival, argued that the alienated capitalist growth economy was destroying the environmental conditions of human existence. “The stakes involved in this crisis of survival,” he wrote, “are in the extreme sense nothing less than the physical continuation of human beings on the planet.”32

Operating in the tradition of Paul A. Baran and Paul M. Sweezy’s Monopoly Capital, Anderson saw capitalism in its mature state as prone to economic stagnation, manifested in a tendency toward slower growth and higher levels of unemployment/underemployment and excess capacity. But stagnation (what Herman Daly was to call a “failed growth system”) in many ways only served to intensify the system’s thrust against the environment, since a “stagnating capitalism is a doomed system and everything must be directed toward restoring growth, including industrial and technological innovation and change, regardless of need or impact.” Hence, a capitalism, prone to stagnation, becomes more intensively destructive of “earthly life,” relative to the level of output.33 This has been partially confirmed by research on the effects of economic slowdowns on carbon emissions. Thus, empirical studies have shown that, as the capitalist economy declines in terms of overall output in recessions, carbon emissions do not decrease proportionately, but rather increase in intensity.34

Focusing on the core ecological problem posed by the exponential accumulation of capital, Anderson argued: “With ever increasing speed and force, humanity presses forward upon the unknown limits of its own life-support systems. The breaking point, or a point of irreversible ‘no return,’ approaches in such major life-giving systems as the atmosphere, hydrology, nitrogen cycles, and photosynthesis. It is the nature of living systems to have threshold levels, meaning that things may appear to be going quite all right until virtually all of a sudden the system is in a state of irreversible decline.”35

An important part of Anderson’s argument was the danger to human survival represented by climate change, in which he argued that “a mere two degrees centigrade increase” in average global temperature due to the concentration of carbon dioxide in the atmosphere “could destabilize or melt the polar ice caps, raising the ocean 50 meters and flooding coastal populations and agricultural areas.”36 He insisted that in the rapacious capitalist growth economy “nothing grows faster in the growth of society than energy consumption”—a view that continues to be borne out in the twenty-first century, with the U.S. Energy Information Administration projecting in 2021 that world energy consumption will rise by 50 percent from 2020 to 2050, despite the urgent need to reach zero net carbon emissions by 2050.37

A crucial aspect of Anderson’s argument was his emphasis on “environmental debt.”38 Inherently unable to adopt a sustainable approach to nature, requiring relations of ecological reciprocity incompatible with its economic expropriation of the planet, capitalism was in effect drawing down the resources of the earth needed for human survival. As he cogently explained, referring to what is now known as Marx’s theory of metabolic rift: “Modern agriculture, charged Marx, is as guilty of soil exploitation as it is of labor exploitation; the capitalist extracts a fictitious surplus from the soil by taking more wealth out than he restores. Thus, just as workers produce more value than they are paid in return, and thus perform unpaid labor, so has nature been forced to yield up its capital stock at a rate far in excess of actual or restorative costs. The unpaid costs to the environment underlie the ecological challenge to survival.”39

For Anderson, the extraction and depletion of resources was even more evident in the underdeveloped nations of the third world or Global South, given imperialistic relations. Resources in the periphery of the capitalist world system were expropriated without any concern for restoration or reciprocity, at the same time that the economic surplus generated in those countries was siphoned off by the rich countries in the capitalist core. In the case of poor, underdeveloped countries, therefore, growth remained necessary, but it was also crucial to implement a more “balanced growth” in the periphery and internationally, organized on a socialist, equitable, and sustainable basis aimed at addressing real needs. Here, growth is related to advancing human social development, establishing social relations with nature that mend ecological rifts, and preventing further “environmental debts.”40 Such a transformation necessitated strongly confronting capital.

Monopoly capitalism, for Anderson, was a system of economic and ecological waste in both production and consumption. It included a massive sales effort, which penetrated into the production process, high levels of military spending, and financial speculation—all of which reinforced its unsustainable tendencies and intensified its wasteful operations. Science and technology themselves took alienated forms. This generated “an openly exploitative and destructive science and technology geared toward the maximization of surplus wealth and the minimization of immediate financial cost.”41 The result was an anti-ecological system, which became more unecological the further accumulation proceeded. Growth beyond a certain “point, particularly artificially forced growth, may be seen to reverse previous progress, destroying the foundation upon which a socialist society and culture could be constructed.” Nevertheless, there was no possibility of a shift away from growth/accumulation by capitalism itself, since to “give up growth” would be to “give up everything that really matters to the capitalist class qua class.”42

The critique of unlimited capitalist economic growth, for Anderson, did not mean that “social growth” or human development could not continue. “Growth becomes what it must become: social growth.… True socialism provides the conditions for growth in knowledge, art and literature, music, science and technology, ties with nature, sociality, individuality, bodily activity and spiritual appreciation—available for all and pursued with everyone’s well-being and personal dignity in mind.”43

“Socialism and survival,” in Anderson’s view, were “in effect, synonymous.” But survival was not simply about preserving human existence; it was also about the quality of that existence, and for this too socialism was required. Such a view stressed not only the “danger inherent in existing economic, technological, environmental, resource, population, and agricultural conditions…but also…the kind of social reconstruction” crucial to overcoming capitalism’s existential ecological crisis. Ecological survival means a thoroughgoing transformation of the mode of production. “The manner in which people organize their materially productive activities,” in other words, their metabolic relations with nature, he explained, constitutes “the crucial linkage between the social quality of life people experience and the reproductive viability of the physical life-support system.” Above all, this requires the “liberation of time,” both work time and leisure time, so they promote human development and sustainability, and neither are aimed at profits. The breakdown of the “work-leisure dichotomy” is essential since it is “the heart of the growth system.”44

A socialist dissident from East Germany who became a leader of the red-green movement within West Germany, Bahro articulated in his Socialism and Survival a sense of real urgency associated with the need to stop the planetary devastation and deepening social contradictions brought on by the “so far unstoppable process of capital accumulation.”45 Capitalism, he contended, raises the question of survival, which only an ecological, socialist, peace movement, involving a new material and spiritual relation to the earth, can solve.46

For Bahro, following Thompson’s earlier analysis, exterminism meant the destruction of industrial civilization along with human multitudes. “To express the extermination thesis in Marxian terms,” he wrote: vone could say that the relationship between productive and destructive forces is turned upside down. Like others who looked at civilisation as a whole, Marx had seen the trail of blood running through it, and that “civilisation leaves deserts behind it.” In ancient Mesopotamia it took 1500 years for the land to grow salty, and this was only noticed at a very late stage, because the process was slow. Ever since we began carrying on a productive material exchange with nature, there has been this destructive side. And today we are forced to think apocalyptically, not because of culture-pessimism, but because this destructive side is gaining the upper hand.47

**Capitalism, precisely because its motor and purpose are found in the process of endless, exponentially increasing capital accumulation, can only proceed down the exterminist path**. Hence, there is “no Archimedean point [no place to stand with which to move the world] within existing institutions which could be used to bring about even the smallest change of course.” Turning to G. W. F. Hegel, Bahro explained that the prevailing “economic principle of surplus-value production” means that social advance is defined in the narrowest of quantitative criteria associated with the gains of capital. Significantly, “Hegel used to speak in such cases of a ‘bad infinity,’ by which he meant a process which involved no more than adding 1 to 1, and did not lead in its own context to a decisive qualitative leap. This kind of progress must cease for the share of the earth’s crust that can be ground up in the industrial metabolism is limited, despite all possible and senseless expansion, if the planet is to remain habitable.”48

For Bahro, “the enormous ecological destabilisation” in the Global South “is primarily a symptom of western structural penetration into ‘indigenous’ social and natural conditions.”49 The result of this global capitalist exterminist expansion is “a crisis of human civilisation in general. There has never been anything comparable in the whole past history of our species on the earth.” In fact, “exterminism is expressed in the destruction of the natural basis of our existence as a species.”50 The control exerted by the system over the working class is a product of capitalism’s ability constantly to create an internal dependence of workers on the system, which the combined ecological and economic crisis is now weakening. But the movement of resistance that is needed has to be organized primarily through the merger of the ecological and peace movements and their relation to the working class, rather than on traditional productivist grounds. Ecology, given the scope and depth of the planetary crisis and the undermining of the conditions of life, becomes the common material ground “affecting more people in their existential interests than in any other contradiction.”51

To advance on a path of sustainability and survival therefore would mean a revolutionary break with the logic and institutions of capitalism, out of which the ecosocialist transition was to emerge. Capitalism, in Bahro’s view, was not all inclusive, in the sense that it is often depicted in contemporary ideology as constituting the entirety of the present-day world. It continued to have an external area, which, as in the conception of Arnold Toynbee, gave rise to an “external proletariat” occupying the periphery and precarious parts of the capitalist world. This existed alongside the “internal proletariat” of the advanced capitalist world, which, by definition, was never fully incorporated within the system.52

“The oldest stratum of civilisation involved in the present crisis,” Bahro argued, following Engels, “is that of patriarchy, with ten millennia behind it.”53 Many of the distinctive tendencies of contemporary civilization, including forms of oppression, thus run deeper than present-day capitalism. There were cultural and spiritual resources that were resistant to capitalist exterminism. All of this created the potential that “the capitalist industrial system” could be “driven back and destroyed by an unstoppable manifold movement of humanity,” defined in ecological and socially reproductive more than “purely economic terms.”54

**A central reality of capitalism, in this view, was the inability of the capitalist state itself to change course or to reverse the ecological devastation generated through its own operations**. The capitalist state governed by industrial and financial interests, Bahro wrote, “is obviously so very much wedded to exterminism that it doesn’t permit itself to be used as an emergency brake.… No government which could be constituted on the present ‘place’ of the state [within the existing socioeconomic order] could be anything but a bad emergency government.”55 The essence of the problem was the juggernaut of capital itself, which the capitalist state only sought to accelerate, never to apply the brakes, heading therefore toward a collision with the earth. This, he said, would especially impact “the marginalised and excluded, those with their backs to the wall, [who] now [however] have an unbeatable ally in this very wall that they have their backs against. This wall is formed by the limits of the earth itself, against which we really shall be crushed to death if we do not manage to brake and bring to a halt the Great Machine that we have created before this finally bumps against it.” The answer clearly could not be seen as lying in a capitalist “emergency state,” which would only make things worse for the vast majority, and for the earth itself, but in a revolutionary “salvation government” in which the material struggle for survival coupled with the struggle for human liberation—the end of alienation and the focus on essential human needs—would generate a new emergent reality.56

However, this revolutionary ecological critique offered by socialist ecologists, premised on the rejection of capitalism’s relentless destruction of humanity and the earth, and therefore on the linking of the struggle for survival to the struggle for human freedom, did not come to dominate the environmental movement—even though it played a critical role in the ecological struggles of the time. The environmental movement, and even much of ecosocialist thought, in the tamer periods that followed the initial revolt, gravitated toward a radical reformism, in which the full urgency of the struggle for survival was forgotten, despite the rapidly accelerating planetary ecological crisis. A stage of environmental denialism—not of the whole environmental problem but of its worst threats and their inherent relation to capitalism—set in on the left. Hence, the understanding of the existential crisis stemming from the ecological deficits of capitalism that thinkers such as Commoner, Anderson, and Bahro raised—not apocalyptically, but in terms of an ecosocialism of survival demanding revolutionary social change—is now needed more than ever.

Existential Crisis Now!

The IPCC reports, representing the world scientific consensus with respect to climate change, serve to illuminate how the imperatives of capitalism are pushing the world into the inferno looming before us. The more optimistic IPCC scenarios, those resulting in a growth of global average temperature this century of well below 2°C, point to the actions necessary to reach net zero carbon emissions (as well as reducing other greenhouse gas emissions), thus avoiding irrevocable climate change. The remaining scenarios, representing the continuation of “business as usual,” depict how the ongoing accumulation of greenhouse gases in the atmosphere will drive an increase in the average global temperature, resulting in abrupt changes in the Earth System that undermine the conditions of life for humanity and other species. Unfortunately, the capitalist “business-as-usual” trends persist, pointing to hellish consequences. Thus, with each new IPCC report, the situation is ever more dire, and the possibility of pulling away from disaster requires ever more revolutionary change, given both the increasing physical scale of the problem and the diminishing time scale. This represents the existential crisis that now lies before the entire world.

In the best-case scenario (SSP1-1.9) provided by the Physical Science Basis assessment in part 1 of AR6, written by Working Group I, global average temperature, as we have seen, is expected to surpass a 1.5°C increase above pre-industrial levels after 2040, rising to 1.6°C, and not declining below the 1.5°C threshold again (returning to 1.4°C) until the end of the century. But in order for this scenario to hold, global carbon emissions must peak within a few years, with net zero emissions achieved by 2050. Still, even in this scenario—the most optimistic one now provided by the IPCC—the world will continue to experience the propagation of extreme weather events, heavy precipitation, flooding, drought, heatwaves, wildfires, glacial melting, and sea-level rise, which will affect every region of the earth, while threatening billions of people.57

The IPCC’s Impacts, Adaptation and Vulnerability assessment, written by Working Group II of AR6, released in February 2022, documents the observed consequences of climate change so far, detailing the vulnerabilities and projected risks in the coming decades. The “Summary for Policymakers” of Working Group II highlights the range of changes in the Earth System, which have already increased the risks that much of humanity experiences and which are decreasing the quality of existence in general. Among the “observed impacts,” it is emphasized that “human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability.… Across sectors and regions, the most vulnerable people and systems are observed to be disproportionately affected. The rise in weather and climate extremes has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt.”58

Heat- and drought-related conditions have increased tree mortality and wildfires. The warming of the ocean has resulted in “coral bleaching and mortality” and the “loss of kelp forests.” Half of the species considered are already migrating toward the poles or moving to higher elevations. Climate change is also increasing irreversible conditions such as species extinctions. In comparison to previous estimates in prior assessments, “the extent and magnitude of climate change impacts are [now] larger.”59

Climate change is negatively affecting both the physical and mental health of people. For example, “extreme heat events have resulted in human mortality and morbidity”; “the occurrence of climate-related food-borne and water-borne diseases has increased”; “the incidence of vector-borne diseases has increased from range expansion and/or increased reproduction of disease vectors”; and “animal and human diseases, including zoonoses, are emerging in new areas.” Populations around the world are experiencing greater trauma from extreme weather events. They are also contending with “climate-sensitive cardiovascular and respiratory distress” due to “increased exposure to wildfire smoke, atmospheric dust, and aeroallergens.” Heatwaves are amplifying air pollution events. Climate change and extreme weather events are reducing “food and water security.” It is estimated that up to 3.6 billion people currently reside in places “that are highly vulnerable to climate change,” which is contributing to the overall humanitarian crisis.60

The “Summary for Policymakers” report of Working Group II of AR6 is clear that the current socioeconomic system that organizes production and consumption is unsustainable, “increasing exposure of ecosystems and people to climate hazards.” In fact, “unsustainable land-use and land cover change, unsustainable use of natural resources, deforestation, loss of biodiversity, pollution, and their interactions, adversely affect the capacities of ecosystems, societies, communities and individuals to adapt to climate change.” Short-term interests, focused on increasing profits, drive poor management of resources, habitat fragmentation, pollution of ecosystems, and overall ecological degradation.61

**Between now and 2040, it is absolutely necessary to keep warming below the 1.5°C** threshold (or at the very worst well below 2°C), otherwise the climate-related “losses and damages” to both ecosystems and society will dramatically multiply. **Surpassing this threshold will result in extreme and high risks associated with biodiversity loss, a dramatic decline in snowmelt water availability for irrigating crops, a severe reduction in above-ground and groundwater availability, declining health of soils, widespread food insecurity, flooding of “low-lying cities and settlements,” accelerated proliferation of disease risks, even more intense and frequent weather events, and extensive heatwave conditions.** “Many natural systems are near the hard limits of their natural adaptation capacity,” whereby additional warming will result in irreversible changes that undermine essential ecosystem services that support life. The overall damages, threats, and problems “will continue to escalate with every increment of global warming.” It will only become more and more difficult to intervene and manage the compounding risks that will cascade throughout the world, depending on the magnitude of the overshoot.62

Hence, the “Summary for Policymakers” of Working Group II in AR6 focusing on Impacts, Adaptation and Vulnerability concludes that “there is a rapidly narrowing window of opportunity” to forge a radically different future. It warns that

It is unequivocal that climate change has already disrupted human and natural systems. Past and current development trends…have not advanced global climate resilient development.… Societal choices and actions implemented in the next decade determine the extent to which medium- and long-term pathways will deliver higher or lower climate resilient development.… Importantly climate resilient development prospects are increasingly limited if current greenhouse gas emissions do not rapidly decline, especially if 1.5°C global warming is exceeded in the near term.63

The leaked scientific-consensus draft of the “Summary for Policymakers” by Working Group II of AR6, received by the French news agency Agence-France Presse in June 2021, included the following statement: “We need transformational change operating on processes and behaviours at all levels: individual, communities, business, institutions and governments. We must redefine our way of life and consumption.” This transformation requires coordinated action, massive public mobilization, political leadership and commitment, and urgent decision-making to change the global economy and support an effective and accelerated mitigation-adaptation strategy.64 Unfortunately, such action has been consistently thwarted by capital and global political leaders, who managed to remove the statement from the final published Working Group II report, where it is nowhere to be found.

In May 2022, the carbon dioxide concentration in the atmosphere measured 421.37 parts per million, marking a new high. Peter Tans, a climate scientist at the National Oceanographic and Atmospheric Administration, explained that in “this last decade, the rate of increase has never been higher, and we are still on the same path. So we are going in the wrong direction at maximum speed.”65 As climate breakdown accelerates, the conditions of life are rapidly deteriorating, creating numerous health problems, some of which manifest as corporeal rifts, undermining bodily existence.66

Corporeal challenges, which could be viewed as indications of a corporeal rift in which climate change disrupts human bodily functions, have received additional attention given the brutal heatwaves and record-breaking temperatures in India and Pakistan in spring 2022. On May 1, the temperature in Nawabshah, Pakistan, was 49.5°C (120.2°F). What made this heatwave, along the coasts and the Indus River Valley in these countries, particularly unbearable was that it was accompanied by high levels of humidity.67 Together, these can create dangerous levels of heat stress, which can result in death. This issue is particularly important to consider in regard to global warming, as climate change increases heat and the amount of water vapor in the atmosphere. Furthermore, warmer air holds more moisture, making humidity worse. Heat and humidity are additive, generating conditions in the form of wet-bulb temperatures (combining both normal, dry-bulb temperature and humidity) that exceed the capacity of people to survive. One of the important issues, under such conditions, is that nighttime temperatures are also high, making it difficult or impossible for the body to recover partially overnight—worsening the situation. This is part of the reason that, as heatwaves progress, it becomes increasingly difficult for people to function physically.

In the article “The Emergence of Heat and Humidity Too Severe for Human Tolerance,” published in Science Advances, Colin Raymond, Tom Matthews, and Radley M. Horton explain that what are called dry-bulb temperatures, measurements obtained from an ordinary thermometer, are not adequate in ascertaining the dangers to human health associated with heat stress.68 Instead, it is necessary to measure the wet-bulb temperature—heat and humidity. This is obtained by placing a wet cloth on the thermometer and blowing air on it. Human beings cool themselves or shed their metabolic heat at high temperatures via sweat-based latent cooling. But once the wet-bulb temperature reaches 35°C (or 95°F), this cooling mechanism ceases to be effective. Under such conditions, human beings are not able to cool themselves by sweating, even if they are in the shade, wearing little clothing, and drinking plenty of water. When outside and exposed to such wet-bulb temperatures for six hours, even young, healthy individuals will perish from this heat stress. In humid regions, and for populations whose physical conditions are less than optimal, it is possible for lives to be threatened even with lower wet-bulb temperatures, between 26°C and 32°C, as was the case in the heatwaves that hit Europe in 2003 and Russia in 2010, killing thousands of people, especially the elderly and other vulnerable populations.69

Raymond and his colleagues stress that “extreme heat remains one of the most dangerous natural hazards” and “a wet-bulb temperature…of 35°C marks our upper physiological limit.” Thus, it is not possible simply to adapt to progressively warmer temperature, when heat and humidity surpass the point of what is survivable. These worrying wet-bulb temperature conditions are occurring a few hours at a time in coastal and major river regions of South Asia, the Middle East, Mexico, and Central America. Such conditions are likely to become more regular and to last longer in these regions over the next few decades, or even years, with even more deadly consequences, while spreading across larger terrestrial stretches, rendering parts of the world uninhabitable. In the second half of the century, if “business-as-usual” trends continue, the likely consequences are too horrific to imagine.70

Nevertheless, in the opening scene of The Ministry for the Future, the science-fiction novelist and socialist Kim Stanley Robinson tries to imagine what could happen to human beings under the unbearable heat and humidity associated with wet-bulb temperatures. The population of a town in India is suffering from an intense heatwave. People are panicking, immersing themselves in the lake, trying to cool down, but to no avail, as the water provides no relief. It is noted that the people are being poached. Before too long, the lake is filled with corpses—”all the children were dead, all the old people were dead.”71 It is a hellish scene, but it captures the gravity of exterminism that is unfolding and the urgency of the fight for survival. This is the sobering reality of the current ecological moment, as the leaked draft of the “Summary for Policymakers” of Working Group II stated (though this was removed, probably by governments, from the published report): “Life on Earth can recover from a drastic climate shift by evolving into new species and creating new ecosystems. Humans cannot.”72

The Structural Crisis of Capital and the Failure of Environmental Reform

The failure of capital to face up to the rapidly increasing ecological crisis, even as the earth as a home for humanity is fast approaching an irreversible tipping point, is often attributed to the growth of neoliberalism, as if this were simply a contingent fact of history determined by political swings and policy changes.73 The advance of neoliberalism, however, was itself a response of the capitalist system to the insurmountable structural crisis of capital that first emerged in the mid–1970s, leading to the restructuring of this system. This included not only the reduction of the relative autonomy of the state, but also the restructuring of the capital-labor relation through the globalization of production and the financialization of the system.74 In these changed circumstances, the centrality of what was dubbed the “environmental state,” introduced as the capitalist system’s response to the deepening environmental crisis, experienced an early death. It was to be replaced under neoliberalism by a more diffuse system of “environmental governance,” involving both the private and public sectors, ensuring that the accumulation of capital always took complete precedence over the sustainability of the natural environment.75

The initial Great Ecological Revolt of the early post-Second World War years was largely radical in inspiration, strongly critical of capitalism, drawing its strength from the grassroots, and raising the essential question of human survival. However, these radical environmental challenges to the system were soon contained and co-opted through the rise to prominence of the capitalist environmental state, allowing the Great Acceleration of economic impacts on the environment to expand largely unhindered. The notion of the environmental state stood for a patchwork system of environmental regulations and statutory laws introduced by the state within the limits allowed by the powers that be, thereby precluding any major challenges to the process of capital accumulation. The dominant state-directed environmental reformism that emerged in these years, combating isolated cases of extreme pollution and environmental degradation at the local level, was commonly presented in received ideology as a logical outgrowth of capitalist modernization, viewed as an extension of the logic of the welfare state. Capitalism, it was claimed, followed a path whereby environmental spending increased at higher levels of economic development, ameliorating the negative effects of growth.76

All of this has proved to be a dangerous illusion. **The environmental state as a central actor within the system was at best a very short-term affair, soon overshadowed by the structural crisis of capitalism that emerged only a few years later by the mid–1970s**. The economic restructuring of the late 1970s and early ’80s was a response to the deepening stagnation of capital accumulation, evident in a slowdown in economic growth and rising unemployment/underemployment and idle capacity.77 Although there was no solution to the economic malaise of the mature capitalist economies, the ruling class was able to extend its power, in a context of “disaster capitalism,” through the promotion of a more predacious system that brought the state more firmly within the rules of the market.78 These developments were accompanied by the globalization of production and the financialization of the economy, ushering in a new phase of globalized monopoly-finance capital, made possible in part by new systems of communication and surveillance.

**By the 1990s, even those proponents of capitalist ecological modernization, who were the most enthusiastic cheerleaders of the environmental state, were forced to point to the counter-pressures being imposed on it by capital; while more recently, they have acknowledged its virtual demise**.79 In the context of this rapid decline of the state-directed system of environmental regulation (the environmental state), the notion of environmental governance was introduced as the new reform-oriented concept to take its place. Environmental governance was meant to refer to the much greater role assumed by private interests, including corporations, corporate foundations, non-governmental organizations, international financial institutions, and intergovernmental organizations in determining the realm of environmental regulation, which, in many areas, such as various certification processes, carbon markets, and the financialization of nature/conservation, generated new markets for capital accumulation, legitimated in terms of so-called green capitalism.80 The environmental nation-state (a notion that in the international context represented a further distancing from the concept of the domestic environmental state) was seen as subject to intergovernmental agreements such as the 2015 Paris Accord on climate change.81

Nonetheless**, the phases of limited environmental reform, presided over initially by the capitalist environmental state and more recently by so-called environmental governance under direct corporate and ruling-class dominance, have seen the acceleration of the destruction of the earth as a home for humanity**. According to the world scientific consensus, ecological catastrophes, on scales never before seen by humanity, are now fast approaching. Marginal attempts by the present political-economic system to address the planetary ecological emergency have proven entirely ineffectual since the capitalist juggernaut always takes priority. The world is now on a runaway train to disaster, rapidly approaching the edge of the cliff. As Engels once remarked, capitalism is ruled by “a class under whose leadership society is racing to ruin like a locomotive whose jammed safety-valve the driver is too weak to open.”82 The ruin, when it comes, will be ecological as well as political-economic and will fall most heavily on the vulnerable and future generations.

This deadly trajectory is evident everywhere, underscoring the failure of capitalist ecological reform. According to the UN Emissions Gap Report 2021, the present voluntary national climate pledges of countries in accordance with the Paris Agreement would generate a 2.7°C increase (66 percent probability) in global average temperature this century, as opposed to the well-below 2°C increase, which is the goal of the accords, and far above the scientific-consensus goal of 1.5°C, which is the most important threshold for planetary climate security.83 Presently, there are more than four hundred ongoing fossil fuel extraction projects in process in the world (40 percent of which have not yet commenced extraction), currently advanced by corporations and supported by governments, known as “carbon bombs.” Each of these represents at least one gigaton of carbon emissions, which, if they are all carried out, “will exceed the global 1.5°C carbon budget by a factor of two.”84 There is no sign anywhere that the necessary limits will be imposed by capitalism to protect the planetary environment. Rather, the signs all point to the opposite as a frenzy for fossil fuels is developing. The G7 leading capitalist countries, meeting in May 2022, agreed eventually to “phase out” “unabated coal” but put forward no date for doing so, with the discussion dominated instead by the need for vast new fossil fuel sources in the context of the Ukraine War, setting aside all climate objectives.85

Perhaps the greatest single example of the collective duplicity of governments within the dominant capitalist world system in the face of the planetary ecological emergency is the rewriting of the scientific-consensus “Summary for Policymakers” of Working Group III in the IPCC’s AR6 report on Mitigation, published in April 2022. A comparison of the scientific-consensus version of the “Summary for Policymakers,” leaked in August 2021, with the later published version, which was censored and completely rewritten by governments in consultation with corporate lobbyists—carried out in line with the IPCC process—demonstrates a complete betrayal of science and humanity. The collective pronouncements of the scientists on the need to: (1) eliminate all coal-fired plants worldwide this decade, in order to avoid greatly surpassing the 1.5°C target; (2) carry out immediate, rapid transformational change in the political-economic regime affecting production, consumption, and energy use; (3) shift to low-energy solutions; (4) implement plans for “accelerated mitigation”; and (5) support mass social movements against climate change rooted in the most vulnerable sectors of society, advancing a radical just transition—were all removed from the report. All criticisms of the “vested interests,” including the term vested interests itself, were erased from the report. Flatly contradicting the scientific-consensus “Summary for Policymakers,” the redacted governmental-consensus report went so far as to claim that the number of coal-fired plants could be increased due to the promise of carbon capture and sequestration—a view that the scientists had rejected.

Governmental leaders also eliminated statements in the scientific-consensus “Summary for Policymakers” regarding how: (1) the wealthiest 10 percent of the global population are responsible for around ten times the greenhouse gas emissions of the poorest 10 percent (despite the fact that this was a very conservative estimate of the emissions gap); (2) the top 1 percent of air travelers account for 50 percent of aviation-based emissions; and (3) some 40 percent of the emissions from developing countries are linked to export production for core nations.86

Indeed, the entire critique of the fossil capital regime presented in the scientific-consensus “Summary for Policymakers” was excluded by governments in the interest of keeping the accumulation process, the motor of the capitalist system, going. In nearly every line of the final, published “Summary for Policymakers” by Working Group III of AR6, the Mitigation report, the betrayal of the global population by the world’s governments is present, as the latter, operating together, eviscerated the IPCC’s scientific consensus, undermining any meaningful actions and policies. When the Mitigation report was published in April 2022, Guterres remarked that the current moment is one of “climate emergency,” marked by “a litany of broken climate promises,” constant “lies,” and “empty pledges [by the vested interests] that put us firmly on track towards an unlivable world.”87 The consequence of this is to further promote what Engels called “social murder,” but now on a planetary scale, threatening the entire chain of human generations.88

The U.S. federal government’s prioritization of capital accumulation, including that of the fossil fuel industry, over not only human lives in the present, but the future of humanity as a whole, is evident in the nonstop battles of the Barack Obama, Donald Trump, and Joe Biden administrations against the federal lawsuit of Juliana vs. the United States, in which twenty-one young plaintiffs have challenged the U.S. government for wrongfully promoting the fossil fuel industry in violation of what is known as the public trust doctrine within the common law, affirmed in a famous 1892 decision involving the Illinois Central Railroad company, as applicable to the U.S. Constitution. Applying the public trust doctrine to the federal government, the lawsuit declares that the executive and legislative branches in Washington knowingly violated the public trust with respect to climate change by allowing the undermining of the “survival resources” on which the lives of people in the present and future depend, putting human survival in question. As Oregon District Court judge Ann Aiken ruled in 2016, “I have no doubt that the right to a climate system capable of sustaining human life is fundamental to a free and ordered society.” Juliana vs. the United States is based on the presumption that statutory law with respect to the climate is too narrow and is not enforced, requiring that the federal government be mandated on constitutional grounds to cease its support of the fossil fuel industry.89

In response, successive Democratic and Republican administrations have done everything they could to stop this lawsuit, which has been subject to more “exceptional legal tactics” (including “six rulings on the notorious shadow docket,” where legal opinions are not published and the justice’s votes are not made public) than any other federal lawsuit in history. The Biden administration Department of Justice has made it evident that it will use every procedural tool available to arrest the progress of the lawsuit, killing it at the earliest opportunity.90 The goal is to allow the fossil fuel industry to continue to accumulate and expand by preventing any obligation of the U.S. federal government to protect the present and future of humanity.

Not only has the U.S. federal government put capital accumulation and the fossil fuel industry before human life as a whole, promoting social murder on a global scale, or exterminism, it has also neglected to take proactive and comprehensive action to protect the population, particularly the most vulnerable, in the face of accelerating ecological catastrophes. The U.S. government’s program of disaster relief is based in the Federal Emergency Management Agency (FEMA). But FEMA at present is underfunded and geared primarily to protecting high-end private property, thus leaving the mass of the population with little or no protection—and without any coordinated programs aimed at reducing risk associated with environmental disasters. Under the Obama administration, proposals were made, as articulated by FEMA director Craig Fugate, to put FEMA on a fully capitalist basis along the lines of the private insurance industry, complete with deductibles. FEMA assistance was thus to be determined largely by whether the private insurance industry had decided to ensure a given structure, an approach that would inevitably have a detrimental effect on the poor.91

With record-breaking hurricanes, wildfires, and other extreme weather disasters presenting themselves in 2020, coupled with the COVID-19 pandemic, FEMA and the U.S. government in general, as explained by Scientific American, proved itself utterly incapable of addressing the growing natural and epidemiological disasters. This brought “into stark relief problems of capacity and inequity—[with] people of color and low-income communities” getting “hit disproportionately hard.” “All emergency agencies” in the United States taken together do little in advance to prepare for disasters, while FEMA programs have been shown to “entrench and exacerbate inequities because they focus on restoring private property. This approach favors higher income, typically majority white areas with more valuable homes and infrastructure over people of color and low-income communities, which are disproportionately affected by disaster and least able to recover from it.” A precondition of FEMA disaster relief is “cost matching,” which systematically and structurally favors wealthier over poorer communities. The comprehensive failure of the United States to address the COVID-19 pandemic, resulting in more than a million deaths, is a manifestation of the complete lack of an infrastructure, including public health facilities, equipped to cope with disasters in general, particularly where the most vulnerable populations are concerned. Instead, the capitalist system has enshrined the principle of the devil take the hindmost.92

Ecological Civilization or Exterminism

In the 1860 edition of his Trades’ Unions and Strikes, the English Chartist and trade unionist Thomas Joseph Dunning wrote:

Capital is said by this reviewer [in the Quarterly Review] to fly turbulence and strife, and to be timid, which is very true; but this is very incompletely stating the question. Capital eschews no profit, or very small profit, just as Nature was formerly said to abhor vacuum. With adequate profit, capital is very bold. A certain 10 per cent. will ensure its employment anywhere; 20 per cent. certain will produce eagerness; 50 per cent. positive audacity; 100 per cent. will make it ready to trample on all human laws; 300 per cent., and there is not a crime at which it will scruple nor a risk it will not run, even to a chance of its owner being hanged. If turbulence and strife will bring a profit, it will freely encourage both. Smuggling and the slave-trade have amply proved all that is here stated.93

It is this innate drive of capital, trampling over all other social considerations, already depicted by Dunning in the nineteenth century, that helps explain why, even in the face of the certain ruination of contemporary civilization, humanity, and to a considerable extent life as a whole, capital nonetheless proceeds down that same road of creative destruction. It is not deterred from burning all existing fossil fuel reserves, and thus the heating up of the climate, as long as the short-term profits are ample. Its “solutions” to the environmental crisis increasingly take the form of the financialization of nature, aimed at buying up the “environmental services” of the entire planet, operating under the senseless presumption that if there is a global ecological crisis it is due to the failure to incorporate nature fully into the market.94

**Consequently, a whole new revolutionary ecological civilization and mode of production, dedicated to sustainable human development, one in which the associated producers regulate the metabolism between humanity and nature, is now necessary for survival and for life**. This requires revolutionary transformative actions to mitigate climate change, in order to protect the planet as a safe place for human habitation and life in general. But in seeking to protect the earth as a home for the future of the chain of human generations, it is also necessary to protect current generations. At issue today is not only the long-term issue of the survival of humanity as a species, but also the more immediate imperative of ensuring the lives and living conditions of twenty-first-century populations, including whole communities, nations, and peoples, and especially those whose lives and living conditions are most exploited, precarious, and vulnerable.

This two-level movement, to protect the earth both as a home for humanity (and innumerable other species) well into the future and for the defense of human communities in the present, is most fully addressed in the world today, though not without contradictions, in those societies with a more socialist bent.95 It is socialist, post-revolutionary societies that are better able to resist the logic of capital, despite the continuing dominance of the capitalist world economy, by introducing ecological as well as economic planning, and facilitating alternative forms of social metabolic reproduction. We can see this in Cuba, which has developed an ecosocialist model of degrowth, in the sense, designated by Don Fitz, of a society that embodies “a reduction of unnecessary and destructive production by and for rich countries (and people),” that “exceeds the…growth of production of necessities by and for poor countries (and people).”96

Cuba has not only repeatedly been designated by international indicators as the most ecological nation on the earth, but also as the one most prepared for disasters. Cuba in 2017 was “the only country in the world with a government-led plan (Project Life, or Tarea Vida) to combat climate change” based on a century-long projection. In September 2017, Maria, a category 5 hurricane, hit Puerto Rico, a U.S. colony, resulting in almost three thousand deaths. In that same month, Irma, another category 5 hurricane, hit Cuba, causing only ten deaths. Cuba’s low mortality was the result of comprehensive disaster protection measures introduced from the beginning of its revolution and built into the entire structure of the society. Cuba put in place a national plan to protect the population from COVID-19 prior to the first death there from the pandemic. It has developed highly effective COVID-19 vaccines, which have been used to vaccinate its entire population and to help other countries at low cost.97

In terms of the wider issues of climate change, Cuba, rather than following the dominant capitalist strategy of promoting maximum energy usage and simply converting to “alternative” energies (which are also extremely damaging to the environment at higher levels of energy generation), has chosen energy conservation, seeking to minimize both energy usage and the resultant negative effects. As Cuban energy advisor Orlando Rey Santos has observed: “One problem today is that you cannot convert the world’s energy matrix, with current consumption levels, from fossil fuels to renewable energies. There are not enough resources for the panels and wind turbines, nor the space for them. There are insufficient resources for all this. If you automatically made all transportation electric tomorrow, you would continue to have the same problems of congestion, parking, highways, heavy consumption of steel and cement.”98

In “Cuba Prepares for Disaster,” Cuban analyst Fitz explains that “a poor country with a planned economy can design policies to reduce energy use. Whatever is saved from [energy efficiency] can lead to less or low-energy production, resulting in a spiraling down of energy use. In contrast, in accordance with the well-known Jevons Paradox, competition drives capitalist economies toward investing funds saved from EE [energy efficiency] toward economic expansion resulting in perpetual growth” and mounting ecological contradictions. As Fitz goes on to observe: “What is amazing is that Cuba has developed so many techniques of medical care and disaster management for hurricanes and climate change, despite its double impoverishment from colonial days and neocolonial attacks from the U.S.,” including the permanent embargo imposed by Washington as a form of economic siege warfare.99 Cuba’s Special Period, following the demise of the Soviet Union and its fossil fuel subsidies to Cuba, forced Havana, faced also with a tightening U.S. embargo, to develop agroecology and urban farming at very high levels, resulting in Cuba’s eco-revolutionary transformation into a model of sustainable human development.100

Cuba’s successes in promoting sustainable human development fed the anti-communist ire of Washington. Relying on new means of financial warfare, the Trump administration introduced 243 additional financial sanctions directed at Cuba, while the Biden administration extended those further. This generated increased shortages in food and other basic items, made worse by the COVID-19 pandemic. In July 2021, popular protests emerged in Cuba for the first time in a generation. The increases in global food prices, accompanied by wheat shortages, in early 2022, associated with the pandemic, profiteering, and the Russia-Ukraine War, have only exacerbated these conditions.101 This crisis has resulted in critical debates in Cuban society that, while intense, are mostly taking place within the revolution rather than outside of it, suggesting that Cuba will continue to carry out a process of socialist construction and reconstruction that will defy all those who are seeking its demise.102

Venezuela’s Bolivarian Revolution, although in a different way than Cuba, has also moved toward an ecological society, promoting communes that put resources and production back in the hands of associated producers, ensuring that basic needs are met. Government resources are being transferred to communes and organized communities in both rural and urban areas with the objective of enhancing food security and sovereignty partly through such agencies as the Pueblo a Pueblo (or People to People) Plan, promoting an “assembly culture, planned consumption and participatory democracy.” All of this points in the direction of ecosocialism.103

Although still one of the world’s largest polluters, the Chinese economy has made rapid ecological advances, in line with its goal—outside the capitalist framework—of promoting an ecological civilization, a concept that originated with socialist environmentalists in the final decades of the Soviet Union, and that has now taken on Chinese characteristics.104 Although still a developing country in the sense of having a low per capita income relative to the developed capitalist states, China has set 2060 as its target to reach zero net carbon emissions. Meanwhile, it has become the world leader in solar power—both production and consumption—and in reforestation/afforestation. China was able to protect its population from the COVID-19 pandemic, with 4 deaths per million as of June 4, 2022, versus 3,087 deaths per million in the United States. With only 10 percent of the world’s arable land and 20 percent of the global population, China currently produces 25 percent of the world’s grain. In the decade from 2003 to 2013, China increased its total grain output by about 50 percent. Most farms are largely organized on a semi-communal, cooperative basis, with the land held in common and distributed among producers by the community. From 2013 to 2019, the number of towns with supply-marketing cooperatives in rural China increased from 50 percent to 95 percent, as part of the revitalization of the countryside, contributing to the elimination of extreme poverty in the country.105

The global struggle for sustainable human development can also be seen in places within the advanced capitalist core, including the United States, where considerable opposition is exhibited in some locations to the dominant logic of the political-economic system. Cooperation Jackson, based in Jackson, Mississippi, is engaged in a revolutionary, transformative project, as part of building ecosocialism, in order to protect and advance the survival of existing communities and to create an “ecologically regenerative,” sustainable future. Kali Akuno, the co-founder and co-director of Cooperation Jackson, explains that the continuing realities of racial capitalism have led to extreme forms of inequality, control of knowledge by private capital, and uneven development, whereby Jackson, Mississippi, has largely been organized around resource extraction to serve capital accumulation for distant vested interests. This exploitative system “is rapidly destroying all of the vital, life giving and sustaining systems on our planet.”106 Thus, it is urgent to forge an alternative productive system.

Through collectively organizing, mobilizing, and working with “structurally under- and unemployed sectors of the working class, particularly from Black and Latino communities,” Cooperation Jackson seeks to “replace the current socio-economic system of exploitation, exclusion and the destruction of the environment with a proven democratic alternative.” It promotes a radical form of social organization built on equality, cooperation, worker democracy, and environmental sustainability, aimed at providing meaningful work through living-wage jobs, while reducing racial and other inequities, and building the public wealth of the community. This is all seen as part of a “transition to ecosocialism.”107

Cooperation Jackson has as its goal collectively owning and controlling the means of production. Akuno explains that this involves “control over processes of material exchange and energy transfer,” including the “processes of distribution, consumption, and recycling and/or reuse” to ensure that the social metabolism operates within natural limits and advances “sustainability and environmental justice.”108 Through self-organization, self-determination, and self-management, human beings will gain social control over their productive lives, allowing them democratically and collectively to make decisions focused on how to meet human needs, rather than those of capital. This approach serves as the basis on which to “upend” the dictates of the exploitive class-hierarchical system. It seeks to eliminate the artificial scarcity, rooted in waste, destruction, and inequality imposed by capital, generating the potential for abundance, while remaining “within ecological limits.” Human interactions with nature need to be focused on conservation and “preservation of the environment and ecology,” fixing and “repairing the damage done,” while creating new efforts to “regenerate the bounty of life on our planet, in all its diversity.”109

Despite the extreme capitalism promoted by U.S. corporations, the wealthy, and the servile state, which constitutes its environment, Cooperation Jackson has begun and plans to implement a series of concrete, integrative projects that serve as the means to accomplish their larger goals. This includes forming a non-profit, community land trust, focused on removing as much land as possible from “the capitalist market,” in order to “decommodify” it. Under these conditions, the community serves as the steward. It also establishes a basis with which to help block gentrification processes that have been premised on expanding capital accumulation at the expense of the local community. This revolutionary transformation involves creating an alternative currency, a system of mutual credit, and “community-controlled financial institutions ranging from lending circles to credit unions,” in order to expand the overall capacity and support of citizens.

Building on these foundations, Cooperation Jackson has gone on to establish urban farm co-ops, a restaurant/grocery store, and a lawn-care team. Compost from the store and lawns is used as fertilizer on the farms, returning important nutrients to the soil as part of metabolic restoration. There are plans to create a series of cooperatives focused on housing, recycling, construction, child care, retrofitting homes, and solar energy. All of these efforts are organized as “non-reformist reforms” to improve the quality of people’s lives, expand the power of the citizens, and confront capital, by subverting its very logic and operations. The goal is to foster “the development of a non-capitalist alternative” that will “socialize every step of the productive process required to create, distribute, and recycle a product,” forging “collective ownership and democratic management,” and increasing “the effective scale and scope of the solidarity economy.”110 Rather than promoting fashionable ideas of “resilience,” which fail to challenge the dominant system, Cooperation Jackson can be regarded as a microcosm of ecological and social revolt, as part of the struggle for survival while advancing sustainable human development and ecosocialism.

The most radical and comprehensive strategy with respect to the planetary ecological emergency emanating from North America is the Red Nation’s The Red Deal: Indigenous Action to Save Our Earth. In the words of the Red Nation:

**Rather than taking an explicitly conservationist approach, the Red Deal instead *proposes a comprehensive, full-scale assault on capitalism*, using Indigenous knowledge and tried-and-true methods of mass mobilization as its ammunition**.… We must be straightforward about what is necessary. If we want to survive, there are no incremental or “non-disruptive” ways to reduce emissions. Reconciliation with the ruling classes is out of the question. Market-based solutions must be abandoned. We have until 2050 to reach net-zero carbon emissions. That’s it. Thirty years. The struggle for a carbon-free future can either lead to revolutionary transformation or much worse than what Marx and Engels imagined in 1848, when they forewarned that “the common ruin of the contending classes” was a likely scenario if the capitalist class was not overthrown. The common ruin of entire peoples, species, landscapes, grasslands, waterways, oceans, and forests—which has been well underway for centuries—has intensified more in the last three decades than in all of human existence.111

**Survival in these terms requires the growth of what could be called an environmental proletariat, bringing together the global revolt against the capitalist expropriation of nature and exploitation of labor, thereby uniting the struggles over the economy and the earth.** This means learning from Indigenous, colonized, and historically enslaved peoples while embracing issues of social reproduction. A revolt by the world’s environmental proletariat conceived in these terms, in which hundreds of millions, even billions, of people will inevitably take part, is destined to come about in the coming decades as a result of the struggle for ecological survival. It will lead to new microcosms of existence and an assault on the macrocosm of capital and its state. But this struggle can only succeed in the end if it takes the form of a revolutionary transformation directed at the creation of a socialist ecological civilization, drawing on the rich reservoirs of human knowledge and community. In the words of the great Irish revolutionary James Connolly: “We only want THE EARTH.”112

### Environment

#### Construction destroys the environment

Martin Engel, 6-25, 2021, A Summary Reality Check of Why High-Speed Rail is a Bad Idea, https://patch.com/california/menlopark-atherton/bp--a-summary-reality-check-of-why-high-speed-rail-ised91096912

10. It will be enormously harmful to the urban and rural environment. The train must pass through the population centers north and south in California. Tunneling, which would spare the environment, is off the table due to high costs. Elevated viaduct structures are preferred by the rail authority due to their low costs and engineering design problem solving. Business centers, residential areas, schools, parks, farmlands and industrial sites will all be adversely affected not only aesthetically, but economically with severe negative impact on property values. The construction impact on the environment will be devastating.

Irwin Daweed, June 16, 2012, <https://www.planetizen.com/node/57184>, High Speed Rail: Detriment or Benefit to the Environment?

Ralph Vartabedian reports on the environmental challenges the high speed rail project faces that will affect the cost and the timeline for what "would be the largest infrastructure project in the nation".

**Potential threats to endangered species, diesel emissions from construction equipment, and wetland impacts, are a few of the obstacles the High Speed Rail Authority must confront.**

"A wide array of state and federal agencies is examining those effects and, over the next several months, will issue scientific findings that could affect the cost and schedule of construction. Beyond the regulators, environmental lawsuits brought by the powerful California agriculture industry are threatening to further delay work". And the large environmental groups have already voiced their opposition to streamlining the state's environmental law.

Among the most difficult issues will be air quality, which is regulated across eight counties by the San Joaquin Valley Air Pollution Control District. The district worries that the **construction project would exacerbate already problematic levels of nitrogen oxides, particulates and volatile compounds.**

The district is taking the position that the rail construction should make no net increase in emissions. If the cleanest diesel equipment still adds to emissions, then the district wants "financial mitigation" so it can reduce pollution from other sources, a SJVAPCD spokesman said. Even the increased population that the rail project would generate would need to be mitigated, he said."

In addition to air quality are the impacts to wetlands and other bodies of water - regulated in part by the Army Corps of Engineers.

"We anticipate there to be unavoidable impacts, given the sheer magnitude of the project," said Susan Meyer, a senior project manager at the Army Corps of Engineers. The law requires that any impacts be avoided or minimized. The Army could require "compensatory mitigation" under its permits, Meyer said.

Earlier, The Fresno Bee reported on the delayed improvement the electric train will have on air quality. "But any reductions in air pollution won't start for at least a decade, when the trains would start carrying passengers between Merced and the Los Angeles Basin. Meanwhile, building the system in the San Joaquin Valley is expected to pump tons of dust, greenhouse gases and other pollutants into the air. International experts warn it could take years for the benefits of train ridership to make up for the harm caused during construction", wrote Tim Sheehan.

#### HSR won’t significantly reduce CO2 emissions, and any reduction assumes a massive expansion of renewable energy for electrification (which is a link to renewable energy bad)

Railway Technology, October 27, 2020, Is high-speed rail the fast track to transport decarbonisation?,

The International Energy Agency (IEA) reports that rail carries 8% of the world’s passengers and 7% of freight, yet accounts for just 2% of transport energy use, and that high-speed services over long distances constitute an eco-friendly alternative to short-distance air travel by reducing emissions. However, a **study published by the IEA in 2019 entitled ‘The Future of Rail’ reveals that building a high-speed rail network does not automatically translate into significant carbon emissions savings**. **To do so, such systems must be energy efficient during construction; trains must be run on clean electricity; the services must be frequent and near capacity; and high-speed rail must entice people out of polluting passenger jets and cars – all while not generating excessive new demand for travel.** Here, Future Rail takes a whistle-stop tour of five of the world’s largest high-speed rail networks to assess if they have delivered on their green commitments and helped to reduce carbon emissions. China: size matters **China is home to the longest high-speed rail network in the world.** China is already home to the world’s most extensive high-speed rail network and, according to the IEA, passenger activity increased by approximately 13% in 2019. Beijing’s 13th Five-Year Plan from 2016–2020 targets a further 30,000km of track aimed at connecting 80% of the country’s big cities. From an environmental perspective, the key question is whether the train journeys themselves are sufficiently energy efficient – and whether enough passengers use rail or make the modal change from aviation and road travel – to offset emissions produced during construction of the network. **China Dialogue reports that coal consumption, much of it connected with the production of steel and cement, increased for the second successive year in 2018, and CO2 emissions followed suit.** Research shows that operating the Beijing-Shanghai high-speed line, for example, accounts for 70% of its emissions; however, as China adds more renewable energy to the grid, this figure will decrease. Passengers numbers increased from 2011–14, meaning the per-passenger CO2 footprint fell, and an IEA study shows the Beijing-Shanghai line has shifted people away from flying. However, **there is evidence that high-speed rail in China as a whole is under-used**; IEA’s study reveals that the number of trains that China runs on its high-speed tracks is almost half that of Europe and Korea. The US: a Brightline to low emissions? Brightline trains in the US are fuelled by biodiesel and meet Tier-4 emissions standards. Credit: Brightline. Under-use of high-speed rail services is also an objection that has been raised in the US, along with the prohibitive cost of building high-speed infrastructure spanning the country’s vast landscape. However, as an ancillary to short-haul air travel, US high-speed rail services are already proving their worth. Described as a “private-sector solution to a public need”, Brightline operates a passenger-rail service in south-eastern Florida, plans to extend its high-speed service to Las Vegas – thus tying it into existing Los Angeles commuter lines and, ultimately, California’s own high-speed rail project. Brightline ran its five-train fleet carbon neutral throughout February 2020 and all of the company’s carbon emissions will be offset with renewable energy credits. In addition, its trains are fuelled by biodiesel and meet Tier-4 emissions standards, plus Brightline stations in Fort Lauderdale and West Palm Beach feature FPL SolarNow trees, structures that provide shade and harness solar power. **Across the Atlantic, the High-Speed Rail Group is lobbying the government to decarbonise the UK’s rail system by *2040,*** and heralded the High Speed 2 (HS2) project as a “new carbon transport backbone for the UK”. Supporters argue that HS2 will reduce demand for air travel, road freight and car journeys by linking northern England with the Midlands, London and High Speed 1 (HS1) to the Channel tunnel and continental Europe. The Guardian reports on claims by HS2 that the service can achieve 8g of carbon emissions per person per km compared with 67g of emissions from the same journey by car and 170g by plane. However, the report goes on to argue that t**he UK Government’s own calculations for HS2 suggest the route’s carbon emissions could exceed potential savings; that overall construction and operation will result in 1.49 million tonnes of CO2 equivalent at a time when emissions need to be falling rapidly to reach net zero; and that the UK Department for Transport suggests the modal shift to HS2 from driving and flying will be negligible.** Meanwhile, Eurostar claims it has reduced carbon emissions in the past eight years by 32%, and that a Eurostar journey from London to Paris emits 90% less greenhouse gas than the equivalent short-haul flight and less carbon per passenger than a journey from central London to Heathrow. France and Spain: Euro vision In France, the state-owned rail operator SNCF has introduced a raft of measures aimed at boosting energy efficiency and slashing emissions. Global Railway Review reports that the Renfe-SNCF in Cooperation high-speed service has allowed for a saving of half a million tonnes of CO2 since 2013. When taking into account domestic travellers using Renfe-SNCF in Cooperation’s services in France and Spain, the figures increase to around one million tonnes of CO2 saved, a figure that corresponds to the average annual emissions from electrical consumption by a city with population of 3.7 million. **The high-speed trains between Spain and France run on renewable electrical energy and have a low carbon footprint,** with every 100km travelled enabling an emission reduction of around 15kg of CO2. Speaking at the International Union of Railways’ (UIC) low-carbon mobility conference in Brussels in February 2020, UIC director general François Davenne noted that, among other benefits, passenger rail overall requires less than one-tenth of the energy needed to move an individual by car or plane and that trains have 30-year lifespan, minimising the need to invest in non-renewable resources. Japan: bringing it all back home A Japanese Shinkansen high-speed bullet train at JR Osakastation. Credit: Icosha/Shutterstock. In a 2019 case study published by Triodos Investment Management – which invests in companies that “actively contribute to a sustainable economy through their products, services and processes” – the firm explains the rationale behind its decision to invest in Central Japan Railway (JR Central). JR Central generates 70% of its annual revenues from the Tokaido Shinkansen high-speed train line, which transports 452,000 passengers daily (165 million per annum) between Tokyo and Osaka. Triodos claims that, compared with an airplane on the same route, the line uses 88% less energy and produces 92% less carbon emissions per seat, and that for distances of up to 1,000km, travelling by high-speed train is time and price-competitive with air travel. JR Central has also outlined plans to reduce its energy consumption by 25% by the end of 2030 compared with 1995 levels.

#### Building HSR substantially increases CO2 emissions

**Jianyi Lin, 2020,** Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China, 2020, Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6981942/

Only CO2 was considered for greenhouse gases during the construction of the Beijing–Tianjin intercity HSR. At this stage, CO2 emissions were mainly derived from the upstream production of the materials and energy consumption of the construction equipment. As depicted in Figure 2, the CO2 emissions from the different subsystems and sectors were calculated, and the total emission caused by the construction period was 3451.7 kt. Among the different subsystems, **bridges contribute the largest CO2 emissions in the entire stage** with 2186.4 kt CO2, accounting for 63.3%. Considering the straight route, road settlement, and land savings, **the construction of HSRs results in a large number of bridge**s. The Beijing–Tianjin intercity HSR line used 100.6 km of bridges to overcome the above factors, corresponding to 83.8% of the length, thereby leading to large volumes of materials and energy consumption. Rail systems rank second, with 518.6 kt CO2, accounting for 15.0%. The emissions from EMUs rank third, with 339.3 kt CO2, accounting for 9.8%. The remaining subgrade, station, and electric subsystems contribute 131.9, 228.8, and 46.6 kt CO2, respectively, accounting for a total of 11.8%.

For the emission sources, **the CO2 emission caused by the upstream production of materials was 3094.5 kt, accounting for 89.7%. The metal smelting and rolling industry sector was the largest emitter** with 1775.5 kt CO2, accounting for 51.4%. The non-metallic mineral production sector was the second largest emitter with 736.4 kt CO2, accounting for 21.3%. The third largest emitter was the transport equipment manufacturing sector with 450.2 kt CO2, accounting for 13.0%. **A large number of metal products, organic raw materials, and earth and stones were used in the construction, leading to huge amounts of CO2 discharge in these sectors**. Direct energy uses emit 357.2 kt CO2, accounting for 10.3% in the construction stage. The direct energy uses of bridges contribute the highest CO2 emission with 295.1 kt CO2, accounting for 82.6% of the entire direct energy uses. Subgrades rank second with 33.6 kt, accounting for 9.4%. The third largest contributor was rail systems with 18.0 kt CO2, accounting for 5.0%, and the remaining subsystems emitted a total of 10.5 kt CO2, accounting for 3.0%.

#### Building HSR substantially increases pollution

**Jianyi Lin, 2020,** Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China, 2020, Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6981942/

**The environmental footprints of China’s high-speed railway (HSR) have attracted much attention** nationally and internationally. Although there is some research focusing on CO2 emissions, a comprehensive environmental impacts assessment of HSR construction is still lacking. In this study, the emissions of the Beijing–Tianjin intercity HSR line was calculated using a hybrid input–output life cycle assessment method to quantify the environmental impacts of HSR throughout its construction. The environmental footprints during the construction stage were analyzed in terms of different subsystems and sectors. The results showed that bridges contribute the largest environmental footprints at approximately 60%, followed by rail and electric multiple unit (EMU) systems. **The top three sectors that contribute to pollutant emissions are the metal smelting and rolling industry, transport equipment manufacturing, and non-metallic mineral production.** CO2 and NOx are the major pollutants directly emitted by site equipment operation. More chemical oxygen demand (COD), total phosphorus (TP), total nitrogen (TN), and petroleum are emitted in EMU production than in rail construction, while NH3-N is emitted more in rails instead. Cd, Pb, As, and Hg are the significant pollutants in the metal smelting and rolling industry, whereas Cr, Cu, and Zn are the main heavy metal emissions in the transport equipment manufacturing sector**. Heavy metals are the main types of environmental footprints in bridges, stations, and electric systems. Water pollutants are the main environmental impacts for rail and EMU systems, and the emissions of air pollutants are significant in subgrades**. The production efficiency of upstream materials, desulfurization and denitration in fossil combustion, and the length of the bridge construction should be considered for an HSR under construction, in order to become environmentally friendly and sustainable.

#### Building CSR substantially increases air pollution

**Jianyi Lin, 2020,** Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China, 2020, Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6981942/

**The discharge of air pollutants from the upstream production of raw materials and the energy consumption of construction equipment are depicted** in Figure 3**. The amount of SO2 emitted by the intercity HSR during the construction stage was the largest** with 10,241.7 t, followed by NOx and dust with 6685.6 and 4742.9 t, respectively. The proportion of air pollutants in various subsystems and sectors was similar, which may be because gaseous pollutants are mainly derived from the combustion of fossil fuels. Among the different subsystems, bridges, rails, and EMUs were the top three emission contributors, and their proportions were similar. Bridges contributed approximately 60% of the total air pollutants, followed by rails (16%) and EMUs (11%).

**For the emissions from the production of upstream materials, the metal smelting and rolling industry is the largest source of emissions,** especially SO2, with 6069.9 t, accounting for 59.3%. This condition was because the combustion of sulfur-containing coal and petroleum was widely used in the metal smelting and rolling industry. A large amount of fuel needs to be burned during metal smelting, in which SO2 is emitted as the main pollutant in exhaust gas. The sector of non-metallic mineral production is the second largest contributor. In this sector, the proportion of dust emissions was the largest with 1571.2 t, accounting for 33.1%. Among the raw materials used in constructing the Beijing–Tianjin intercity HSR, the production of concrete materials, including cement and sandstone, belong to this sector, and these substances can be easily discharged as small particles during the manufacturing of non-metallic minerals. The transport equipment manufacturing sector ranked third with 1002.3 t, and the emission ratio of NOx was the largest, accounting for 15.0%. Direct emission was also a main contributor to NOx (8.4%), because it is emitted from fossil fuel combustion during equipment operation on construction sites, without denitration.

#### CSR construction substantially increases water pollution

**Jianyi Lin, 2020,** Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China, 2020, Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6981942/

**The discharge of water pollutants during the construction of the Beijing–Tianjin intercity HSR was analyzed** by comparing the emissions of five pollutants in different subsystems and sectors (Figure 4). The emission trends between the different water pollutants were relatively similar. Among the different subsystems, water pollutants, especially NH3-N, had the largest proportion of emissions in the bridge system, with 84.9 t emissions, accounting for 56.6%. The contribution rate of different pollutants in rails and EMUs was similar. Among the four pollutants (COD, TP, TN, and petroleum), EMU was the second largest contributor, especially petroleum, with 21.6 t, accounting for 22.7%. The rails ranked third, especially TP, with 5.6 t, accounting for 19.5%. The NH3-N emissions in the rails were larger than that in the EMUs, accounting for 17.0% and 16.0% of the total emissions. In the upstream production of the rails, the amount of NH3-N in industrial wastewater should be controlled, especially in the metal smelting and rolling industry and non-metallic mineral production sector.

**From the perspective of emission sources, the five water pollutants had exactly the same sources. The metal smelting and rolling industry sector was the largest contributor, followed by the transport equipment manufacturing and the non-metallic mineral production sectors**. Metal products were the main building materials in the intercity HSR, indicating that the metal smelting and rolling industry sector had the largest emission of pollutants. For the Beijing–Tianjin intercity HSR, the transport equipment manufacturing sector ranked second, and the pollutants of TP, TN, and petroleum had a relatively higher proportion than that of COD and NH3-N. The transport equipment manufacturing removed the oil and impurities from the parts and components, leading to the generation of sewage.

#### HSR construction substantially increases heavy metal pollution

**Jianyi Lin, 2020,** Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China, 2020, Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6981942/

As demonstrated in Figure 5, the emissions of different subsystems and the proportions in each source are compared. Among the different subsystems, the emissions of bridges, rails, and EMUs were the top three. The emissions during the bridge construction were the largest, because this stage consumed large amounts of engineering and building materials. The sequence of emission ratios of different heavy metals in rail and EMU systems were different. The Cr, Cu, and Zn emissions in the EMUs were significantly high, especially for Cr, with 20.9 t, accounting for 26.7%. EMU manufacturing involves a large amount of metal and cabin facilities, with Cu and Zn as the basic alloy raw materials, and the infrastructures, such as plastic, cause Cr emissions. As the sole sector of EMUs, the major heavy metal emissions in the transport equipment manufacturing sector were Cr, Cu, and Zn. The emission of other heavy metal pollutants (Pb, Hg, As, and Cd) in the EMUs was lower than that in the rail systems, representing approximately 10%. The proportion of heavy metals in the subgrade system was small, especially Pb, Hg, As, and Cd, in which the emissions in subgrades were the least among the subsystems. This condition is because the construction materials of subgrades were mainly earth and stones, and did not involve the use of metallic materials, and the amount of toxic heavy metals were low.

**The analysis of the sources of seven heavy metal pollutants showed that their emissions in different sectors were consistent.** The metal smelting and rolling industry sector contributed the highest emission of heavy metals, especially Cd, Pb, As, and Hg, accounting for more than 70% of the total emissions. **The mining, smelting, and processing of these heavy metals allowed them to enter the atmosphere, water, and soil, *thereby causing serious environmental pollution*.** The transport equipment manufacturing sector was the second largest emission source, especially Cr, with 34.6 t, accounting for 44.2%. The emission of Cr was mainly caused by leather preparations, the chrome plating of metal parts, and industrial rubber manufacturing. The third largest was the production of the non-metallic mineral sector, especially Cu and Zn, accounting for 29.3%. The emissions of Cu and Zn mainly came from ore mining, metal processing, and machinery manufacturing. In the initial data acquisitions (the first national census of pollution sources), the statistical caliber of Cu and Zn was the same, thereby resulting in the same final emission ratios in various industries and systems. **The heavy metal pollution was mainly caused by human factors, such as mining, exhaust gas emission, sewage irrigation, and the excessive use of heavy metal products.**

#### Spain proves that low demand means no environmental benefit

Andoni Kortazar, December 2021, Department of Applied Economics V, University of the Basque Country UPV/EHU, Spain, Environmental balance of the high speed rail network in Spain: A Life Cycle Assessment approach, Review in Transporation Economics, https://www.sciencedirect.com/science/article/pii/S073988592100007X

Spain has the world's second longest network of high speed rail lines built and in service. High-Speed Rail (**HSR) is usually presented as a sustainable means of transport with huge potential to reduce greenhouse gas (GHG) emissions and energy consump**tion. **The majority of studies carried out on this mode of transport have focused on analysing and estimating these savings in terms of network operation, but sometimes ignore the burdens associated with the construction of the infrastructure.**

Based on the application of the Life Cycle Assessment (LCA) methodology, this work integrates into the analysis the construction and maintenance phases of the HSR lines in operation in Spain in 2016 together with their operation during that year, and verifies whether construction is justified in terms of reducing environmental impacts and energy consumption.

This article concludes that the construction of the Levante and Northern corridors is not justified in terms of energy savings and emission reductions due to the low demand and therefore the decision to build new HSR sections should be based on an analysis of demand so that only corridors with high transport demand are built. Furthermore**, policymakers should consider other measures related to transport that would lead to considerable and rapid reductions in environmental impacts without the burden of building new infrastructures: e.g. reducing the demand for transport, increasing the occupation of private vehicles, promoting electric traction and the use of electricity from renewable sources.**

#### Pro claims don’t assume the environmental costs of construction, maintenance, and management

Andoni Kortazar, December 2021, Department of Applied Economics V, University of the Basque Country UPV/EHU, Spain, Environmental balance of the high speed rail network in Spain: A Life Cycle Assessment approach, Review in Transporation Economics, https://www.sciencedirect.com/science/article/pii/S073988592100007X

Un this context, HSR is usually presented as a sustainable means of transport with huge potential to achieve significant reductions of greenhouse gas (GHG) emissions and energy savings (California High-Speed Rail Authority, 2016; Jehanno et al., 2011). However, the alleged savings have been questioned by some authors arguing that some of these environmental assessments focus on analysing and estimating these savings in terms of network operation, and fail to account for the burdens associated with the construction, maintenance and dismantling of the infrastructure (Bueno et al., 2017; Chester & Horvath, 2010; Jones et al., 2016).

Given that any HSR project significantly alters the environment, a rigorous analysis of its environmental impacts and benefits becomes essential. In addition to the significant financial resources required, the construction of infrastructure megaprojects also require enormous amounts of natural resources such as concrete and steel, as well as terrain movements, resulting in a considerable consumption of energy and emission of pollutants into the atmosphere. Therefore, project evaluation requires a rigorous cost-benefit analysis to ensure social profitability (Flyvbjerg et al., 2013) and, from an environmental perspective, to account for environmental impacts from cradle to grave, i.e. including the construction phase of the infrastructure and of the rolling stock (Baron et al., 2011; Cour des Comptes, 2014).

The main objective of this article is to analyse the role of the Spanish HSR network in mitigating climate change and reducing energy consumption. Then, this work analyses the most significant environmental impacts and energy consumption associated with the construction, maintenance and operation of the Spanish HSR network under a 60-year lifetime horizon. This comprehensive analysis of the most important environmental burdens generated in the entire life cycle of the HSR network in Spain, are presented under the inventory of the following flows: CO2eq (related to Global Warming); Cumulative Energy Demand; PM10 (related to Human toxicity); SO2 (Acidification, Human toxicity, Photochemical oxidation); NOX (Acidification, Eutrophication, Human toxicity) and NMVOC (Ecotoxicity, Human toxicity, Photochemical oxidation, Ozone layer depletion).2 The geographic scope of the study is the entire network3 in operation in 2016, which extends over 2500 km along four main corridors….

A negative result in the net impact balance corresponds to a benefit in environmental terms. According to equation [3], a negative result implies that environmental burdens associated with the construction, maintenance and the operation of the HSR network are counterbalanced by the burdens avoided which are linked to the transport of those passengers that are shifted from other modes of transport to HSR.

As most of the impacts linked to the construction and maintenance of the infrastructure occur before the line is put into operation, any new HSR network will start with an environmental deficit that will be compensated after a number of years of operation, if the operation impacts are less than the impacts avoided in other modes of transport. The number of years of operation needed to compensate that initial deficit will vary for each impact category. The exact moment in which these compensations begin is crucial information, especially regarding national objectives related to energy savings and emissions reduction deadlines. The years needed to provide such compensation in each impact category are provided in the last rows of Table 9, Table 10.

As can be observed in Table 10, the net environmental balance for the entire AVE network is negative in all impact categories, except for PM10 and SO2 emissions. CO2eq, CED, NOX and NMVOC impact categories need between 9 and 16 years to reach compensation, while SO2 emissions need 62 years, and PM10 emissions (87 years) will not be compensated during the useful life of the infrastructure.

However, these global results vary significantly from corridor to corridor (See Data in Brief). All the corridors connect the periphery of the peninsula with Madrid in a radial design, but with very different conditions regarding transport density and the avoided transport mode mix. Then, it is essential to study the introduction of the HSR in a case-by-case analysis, taking a deeper look into the environmental performance of each of the corridors. By doing so, this work has detected elements that may go unnoticed in other more analytical and methodological studies (D'Alfonso et al., 2015). This is the case of the burdens associated with the construction of the infrastructure. D'Alfonso et al. (2016) assume, based on other studies, that the construction of the HSR infrastructure adds an extra 5 g CO2 per passenger-kilometre of transport served in the network. This value, however, depends absolutely on the amount of transport served by the network, which in the case of the Spanish HSR is much lower than that of other networks in the world (see Table 15). The data collected in Table 4, Table 5 allow for the calculation of the GHG footprint associated with the construction and maintenance of each of the corridors and for the whole network, taking into account the annual transport in each corridor (See Data in Brief). The average footprint is 18.24 gCO2eq/pkm for the whole network (3.6 times the value assumed by D'Alfonso et al. (2016)), but with large differences between corridors: 12.1 g in Andalusia, 14.5 g in Catalonia, 28.1 in Levante and 59.3 in the Northern corridor.

The Catalonia corridor (Madrid-Barcelona-France) supports the highest transport volume on the network and a high proportion of transport shifted from aeroplane, which provides similar results to the Andalusia corridor. CO2eq, CED, NOX and NMVOC impacts need between 7 and 12 years to be compensated; SO2 needs 41 years, and PM10 is compensated in 54 years. Clearly, this corridor stands as the main contributor to the global warming emissions reduction of the entire Spanish network, as it is responsible for 44% of the total reduction of CO2eq emissions. This corridor also stands as the main contributor to the reduction of energy consumption (51%) of the network.

The Andalusia corridor (Madrid-Sevilla-Málaga) requires between 7 and 11 years to compensate CO2eq, CED, NOX and NMVOC impacts. Around 57 years are needed to compensate SO2, and no compensation (96 years) is achieved regarding PM10, mainly due to the high proportion of transport shifted from aeroplane (45%). But the annual GHG emissions avoided by air transport (249 kt CO2 annually) amount to 65% of the total emissions avoided, and are even much higher than the emissions linked to the transport induced in the HSR (15% of the total transport, 17.1 kt CO2 annually).

Results worsen in the other two corridors, mainly due to the very low density of transport. In the Levante corridor (Madrid-Valencia-Alicante) CO2eq, CED, NOX and NMVOC impacts need between 14 and 21 years to be compensated; SO2 (80 years) and, PM10 (143 years) emissions would not be compensated during the lifetime of the infrastructure.

The Northern corridor (Madrid-León-Zamora) offers the poorest results. A transport density of just 1.3 million passengers over the complete infrastructure gives rise to no compensation in the lifetime of the infrastructure in all of the impact categories analysed except for NMVOC, which would need 34 years.

4.2. Sensitivity analysis

A sensitivity analysis was carried out in order to check the influence of changes in certain variables over the total net environmental balance of the Spanish HSR infrastructure. Five alternative scenarios were analysed (see section 3.3 for a detailed description). The results are presented in Table 11, Table 12, Table 13, Table 14, in terms of years needed for compensation of environmental burdens linked to construction and maintenance of the infrastructure, for each of the four corridors in the AVE network.

It can be seen that the results are somewhat sensitive to the occupancy rate of private vehicles. Impact compensation requires a few more years when the occupancy rate of private vehicles is higher (S1 and S2). Average occupancy rate could increase during the lifetime of the infrastructure, since there are currently several institutional initiatives aimed at promoting vehicle sharing in society, such VAO road lanes exclusively for high occupancy vehicles in Madrid. If that rate is doubled, 3.36 people per vehicle (S2), keeping the number of HSR travellers constant, every environmental indicator worsens with respect to the Baseline Scenario. This is due to the fact that the greater the occupation of private vehicles, the lower the environmental impact per person and kilometre of this mode of private transport. Thus, under S1 and S2 circumstances, attracting passengers to the HSR from private vehicles provides less beneficial effects on the net environmental impact of the HSR project.

Section 3.1.2 described the estimation of the HSR transport demand for each corridor in the year 2016 for the Baseline Scenario. The network considered in this study includes all the HSR corridors in operation at the end of 2016. Under the assumption that passenger transport demand may increase in the future, the S3 scenario considers that the annual transport demand in each corridor doubles, with the rest of the parameters remaining equal. From an environmental point of view, a rise in demand has two opposite impacts: a positive impact, when it relates to a modal shift from more polluting modes of transport, such as air or road; and a negative impact, when it is due to induced (new) demand.

As shown in Table 11, Table 12, Table 13, Table 14, doubling passenger demand improves the environmental performance of all the corridors, reducing the compensation period by more than half, given that the previously mentioned positive effect is greater than the negative effect. However, it is important to denote that these results are highly sensitive to the magnitude of the induced demand: (1) induced demand should not be higher than 70% of the new demand in the corridor of Andalusia, in order to achieve an improvement in CO2eq emissions; (2) in the Catalonia corridor all new demand could be induced demand; (3) it should not exceed 63% in the case of the Levante corridor; and (4) it should stay below 44% and 34% in the Northern corridor in order to obtain an improvement in terms of CO2eq and CED, respectively

The S4 scenario explores a situation in which private vehicles are electric. It is reasonable to consider a progressive penetration of electric motion in the automotive sector, which will reduce future environmental impacts in road transport. The influence of this variable on the annual results of the AVE is noteworthy. In this scenario the burdens associated with the construction, maintenance and operation of the Spanish HSR four corridors do not vary with respect to the Baseline Scenario, but the loads associated with shifted transport are now reduced. All the indicators worsen their balance with respect to the Baseline Scenario, except for PM10 and SO2 that improve, although the former is almost residual. When electrifying road transport, the environmental burdens significantly reduce in this mode, so the benefits from diverting traffic from road to rail are lower. These environmental benefits are even lower if electric vehicles are powered with electricity from renewable sources. This context is explored in the fifth and last scenario (S5), where an occupancy rate of 3.36 passengers per vehicle is considered, together with the assumption that all private vehicles are powered with electricity from renewable sources. Compensation years for this scenario are similar to those provided by the previous one, S4, as a worsening derived from doubling vehicle occupancy tends to compensate with the benefit derived from the fact that the HSR would also operate on 100% renewable electricity.

5. Discussion

The main factor behind the net environmental balance of the Spanish HSR network is clearly the density of total demand as long as it is capable of diverting traffic from more polluting modes of transport (air or road) rather than inducing new demand. Vehicle occupancy rates, electrification of road transport and electricity mix have also been found to have a significant impact on the environmental balance of the network.

In line with the findings of many economic analyses (e.g. Albalate & Bel, 2011; Betancor & Llobet, 2015; De Rus, 2011**), the performance of the Spanish HSR network is clearly hampered by its low passenger demand**. In 2016 the Spanish HSR network transported the equivalent of just 4.17 million passengers over the complete infrastructure; significantly lower than the transport density supported by other networks in the world, as can be observed in Table 15.

The Spanish HSR network is also hampered by the fact that it allows only for passenger transport, which prevents attracting potentially more polluting traffic from road freight transport. As argued by Akerman (2011, p. 208), “HSR investments may not be justified for the passenger markets alone.”

**The LCA of Spanish HSR is quite robust in showing that the launch of the Catalonia and Andalusia corridors of the Spanish HSR network has led to a net environmental benefit in CO2eq after nine-twelve years of operation. However, it also shows that results worsen as the network expands to corridors with lower demand** (Levante or Northern corridors). This also coincides with transport economics literature (see e.g. Albalate & Bel, 2011).

However, two questions also need to be addressed in order to evaluate the environmental performance in absolute terms: firstly, is there a significant annual reduction in CO2eq emissions and energy consumption provided by the Spanish HSR operation? And secondly, how does this reduction compare with other alternative strategies for managing transport passenger demand?

**Overall environmental impact reductions derived from the HSR operation in Spain are very limited, if not negligible.** Spain's transport sector had a total volume of direct emissions of 85.9 Mt CO2eq in 2016 (European Environment Agency, 2016). The HSR network presents in the Baseline Scenario an annual net balance of −610.13 kt CO2eq (Table 10), or less than 1% of emissions linked to transport. Regarding energy consumption, the net balance of −7031.03 TJ (0.17 million toe) in cumulative energy demand is less than 0.5% of the energy consumed by the transport sector in Spain in 2016 (International Energy Agency, 2017). **In other words, the Spanish HSR network's capacity to mitigate climate change and reduce oil dependency is clearly insufficient in the current context of the global environmental crisis, which requires a drastic reduction in GHG emissions.** In cost-efficiency terms, it is important to consider that the total investment in AVE over the last 25 years has exceeded 50 000 million euros.

**From a sustainable mobility perspective, it is important to bear in mind the existence of other alternatives that could further reduce environmental impacts in the transport sector without the need to build new infrastructures** (Hoyos, 2009). To illustrate this, Table 16 collects the environmental impact balance of the Catalonia corridor of the AVE network in comparison with three other scenarios applied to a motorway corridor of the same length (883 km). According to traffic statistics from the Ministry of Public Works and Transport (Ministerio de Fomento, 2017), the average daily flow on motorway toll roads in Spain (2550 km) was 16 471 vehicles (heavy vehicles excluded) in 2017, which is equivalent to an annual transport density of 6.01 million light vehicles annually. While the Catalonia corridor gives rise annually to a reduction of emissions of 303 kt CO2eq, the doubling of light vehicle occupancy on a motorway toll road with the same length (883 km) and under average Spanish traffic conditions would provide an annual reduction of 858 kt CO2eq (HW1 in Table 16). If those light vehicles were electrified, the reduction would increase to 1218 kt CO2eq (HW2); and up to 1431 kt CO2eq if vehicles were also powered with electricity from renewable sources, and with double the average occupancy (HW3).

6. Conclusions

Climate change and oil scarcity have received increasing attention in transport policy. In this context, HSR has often been presented as a sustainable mode of transport, having a leading role in the European Commission's environmental goal of net-zero GHG emissions by 2050, due to its potential contribution to energy savings and GHG emissions reductions. In this paper, it is assessed the environmental performance of the Spanish HSR network by means of LCA under 2016 traffic conditions. Results show that the construction loads of the Spanish network are not disproportionate, as they remain within the lower limit of the range of construction burdens found with other HSR lines. Although these construction loads are not excessive, the net environmental balance of the entire network in the Baseline Scenario, without being detrimental in almost all indicators, is modest: an annual emission reduction of 610 kt CO2eq, of 7031 TJ of CED, of 2879 t NOX and of 627 t NMVOC, together with an annual increase of 88 t PM10, of 17 t SO2. This modest balance means that the infrastructure requires a minimum number of years of operation to offset the initial loads associated with the construction: between 9 and 16 years in all the environmental categories studied except for SO2 (62 years) and PM10 with 87 years. In absolute terms, it means a reduction in CO2eq emissions equivalent to less than 1% of the annual transport emissions in Spain in the base year (2016), together with a reduction in primary energy demand which is less than the equivalent of 0.5% of annual energy consumption in the transport sector.

The environmental balance varies according to the network corridor considered. The corridors of Catalonia (5.76 Mp) and Andalusia (5.36 Mp) present a slightly better balance than the total average, managing to compensate the initial construction loads in less than 7–12 years in all the analysed categories except for PM10 and SO2. The Northern corridor (1.31 Mp) would not be able to compensate the initial loads in the whole time of operation, and the Levante corridor (2.71 Mp) would need around 14–21 years (except for SO2 with 80 years and PM10 which would not be compensated). According to these results, the construction of the Levante and Northern corridors is not justified in terms of energy savings and emission reductions. Thus, in line with the findings on cost-benefit analysis, the decision to build new HSR sections should be based on the analysis of demand in order to build only those sections that ensure a high demand, that is, to build only those corridors that connect centres with high demographic density (De Rus, 2011).

The sensitivity analysis confirms that the main factor that conditions the net environmental balance is the density of the transport. The density of transport served by the network in 2016, measured in terms of equivalent passengers over the entire network layout (4.17 million passengers) is much lower than the transport served by the French network (24 Mp), the Japanese networks (between 20 and 99 Mp), China (18 Mp) and Taiwan (30 Mp) (Table 4, Table 15). Initially, every HSR project starts operation with an environmental deficit that can be compensated only if transport demand is sufficiently high and it comes, sufficiently, from other modes of transport, minimising new induced demand.

Doubling the quantity of passengers, which is not very likely in the medium term, shows that the results improve in all the corridors, even in the Northern corridor, and the amortisation of several indicators will be given within the term of the infrastructure's useful life. But the nature of this increase in transport demand is a relevant aspect that conditions the results in a crucial way. It is essential that this increase in total demand for HSR is not new induced demand in its entirety; otherwise, the adverse consequences on the environment will increase. In other words, the environmental performance of HSR improves if traffic is diverted from more polluting modes of transport and induced transport remains low. According to results, induced demand should not exceed 44–70% of total demand (except for Catalonia corridor) if positive effects are to be found in terms of CO2eq emissions. Similar results are found regarding other pollutants and energy consumption. So, from a sustainability perspective, our findings suggest that public institutions should focus on increasing the current levels of passenger demand in the AVE network, prioritising the diversion of existing demand from planes and private cars.

Finally, the United Nations has recently declared a climate emergency under the latest scientific evidence on the consequences of climate change, emphasising the urgent need to be carbon neutral in 2050 and to achieve a 45% reduction in emissions by 2030 in order to keep the rise of temperature below 1.5 °C by the end of the century (UNFCCC, 2019). In this context, policymakers should also consider other measures related to transport that, in application of the transport hierarchy (Hoyos et al., 2016), would provide considerable and rapid reductions in environmental impacts without the burden of building new infrastructures: e.g. reducing the demand for transport, increasing the occupation of private vehicles, promoting electric traction and the use of electricity from renewable sources.

#### Turn: Building HSR will harm air quality, aquatic life, and endangered species

**McClatchy 12** (“High-Speed Rail Faces Environmental Objections,” http://www.governing.com/mct-californias-high-speed-rail-faces-environmental-objections.html

The California bullet train is promoted as an important environmental investment for the future, but over the next decade the heavy construction project would potentially harm air quality, aquatic life and endangered species across the state's Central Valley. Eleven endangered species, including the San Joaquin kit fox, would be affected, according to federal biologists. Massive emissions from diesel-powered heavy equipment could foul the already filthy air. Dozens of rivers, canals and wetlands fed from the rugged peaks of the Sierra Nevada would be crossed, creating other knotty issues.

#### HSR construction increases air and water pollution

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The environmental footprints of China’s high-speed railway (HSR) have attracted much attention nationally and internationally. Although there is some research focusing on CO2 emissions, a comprehensive environmental impacts assessment of HSR construction is still lacking. In this study, the emissions of the Beijing–Tianjin intercity HSR line was calculated using a hybrid input–output life cycle assessment method to quantify the environmental impacts of HSR throughout its construction. The environmental footprints during the construction stage were analyzed in terms of different subsystems and sectors. The results showed that bridges contribute the largest environmental footprints at approximately 60%, followed by rail and electric multiple unit (EMU) systems. The top three sectors that contribute to pollutant emissions are the metal smelting and rolling industry, transport equipment manufacturing, and non-metallic mineral production. CO2 and NOx are the major pollutants directly emitted by site equipment operation. More chemical oxygen demand (COD), total phosphorus (TP), total nitrogen (TN), and petroleum are emitted in EMU production than in rail construction, while NH3-N is emitted more in rails instead. Cd, Pb, As, and Hg are the significant pollutants in the metal smelting and rolling industry, whereas Cr, Cu, and Zn are the main heavy metal emissions in the transport equipment manufacturing sector. Heavy metals are the main types of environmental footprints in bridges, stations, and electric systems. Water pollutants are the main environmental impacts for rail and EMU systems, and the emissions of air pollutants are significant in subgrades.

#### HSR construction increases air pollution

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The discharge of air pollutants from the upstream production of raw materials and the energy consumption of construction equipment are depicted in Figure 3. The amount of SO2 emitted by the intercity HSR during the construction stage was the largest with 10,241.7 t, followed by NOx and dust with 6685.6 and 4742.9 t, respectively. The proportion of air pollutants in various subsystems and sectors was similar, which may be because gaseous pollutants are mainly derived from the combustion of fossil fuels. Among the different subsystems, bridges, rails, and EMUs were the top three emission contributors, and their proportions were similar. Bridges contributed approximately 60% of the total air pollutants, followed by rails (16%) and EMUs (11%).

Total air pollutant emissions of subsystems by different sources. The bar chart represents the amount of air pollutants emitted by each subsystem; the pie chart represents the emission ratio of each sector.

For the emissions from the production of upstream materials, the metal smelting and rolling industry is the largest source of emissions, especially SO2, with 6069.9 t, accounting for 59.3%. This condition was because the combustion of sulfur-containing coal and petroleum was widely used in the metal smelting and rolling industry. A large amount of fuel needs to be burned during metal smelting, in which SO2 is emitted as the main pollutant in exhaust gas. The sector of non-metallic mineral production is the second largest contributor. In this sector, the proportion of dust emissions was the largest with 1571.2 t, accounting for 33.1%. Among the raw materials used in constructing the Beijing–Tianjin intercity HSR, the production of concrete materials, including cement and sandstone, belong to this sector, and these substances can be easily discharged as small particles during the manufacturing of non-metallic minerals. The transport equipment manufacturing sector ranked third with 1002.3 t, and the emission ratio of NOx was the largest, accounting for 15.0%. Direct emission was also a main contributor to NOx (8.4%), because it is emitted from fossil fuel combustion during equipment operation on construction sites, without denitration.

#### HSR construction increases water pollution

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The discharge of water pollutants during the construction of the Beijing–Tianjin intercity HSR was analyzed by comparing the emissions of five pollutants in different subsystems and sectors (Figure 4). The emission trends between the different water pollutants were relatively similar. Among the different subsystems, water pollutants, especially NH3-N, had the largest proportion of emissions in the bridge system, with 84.9 t emissions, accounting for 56.6%. The contribution rate of different pollutants in rails and EMUs was similar. Among the four pollutants (COD, TP, TN, and petroleum), EMU was the second largest contributor, especially petroleum, with 21.6 t, accounting for 22.7%. The rails ranked third, especially TP, with 5.6 t, accounting for 19.5%. The NH3-N emissions in the rails were larger than that in the EMUs, accounting for 17.0% and 16.0% of the total emissions. In the upstream production of the rails, the amount of NH3-N in industrial wastewater should be controlled, especially in the metal smelting and rolling industry and non-metallic mineral production sector.

Total water pollutant emissions of subsystems by different sources. The bar chart represents the amount of water pollutants emitted by each subsystem; the pie chart represents the emission ratio of each sector.

From the perspective of emission sources, the five water pollutants had exactly the same sources. The metal smelting and rolling industry sector was the largest contributor, followed by the transport equipment manufacturing and the non-metallic mineral production sectors. Metal products were the main building materials in the intercity HSR, indicating that the metal smelting and rolling industry sector had the largest emission of pollutants. For the Beijing–Tianjin intercity HSR, the transport equipment manufacturing sector ranked second, and the pollutants of TP, TN, and petroleum had a relatively higher proportion than that of COD and NH3-N. The transport equipment manufacturing removed the oil and impurities from the parts and components, leading to the generation of sewage.

#### HSR construction increases heavy metal pollution

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As demonstrated in Figure 5, the emissions of different subsystems and the proportions in each source are compared. Among the different subsystems, the emissions of bridges, rails, and EMUs were the top three. The emissions during the bridge construction were the largest, because this stage consumed large amounts of engineering and building materials. The sequence of emission ratios of different heavy metals in rail and EMU systems were different. The Cr, Cu, and Zn emissions in the EMUs were significantly high, especially for Cr, with 20.9 t, accounting for 26.7%. EMU manufacturing involves a large amount of metal and cabin facilities, with Cu and Zn as the basic alloy raw materials, and the infrastructures, such as plastic, cause Cr emissions. As the sole sector of EMUs, the major heavy metal emissions in the transport equipment manufacturing sector were Cr, Cu, and Zn. The emission of other heavy metal pollutants (Pb, Hg, As, and Cd) in the EMUs was lower than that in the rail systems, representing approximately 10%. The proportion of heavy metals in the subgrade system was small, especially Pb, Hg, As, and Cd, in which the emissions in subgrades were the least among the subsystems. This condition is because the construction materials of subgrades were mainly earth and stones, and did not involve the use of metallic materials, and the amount of toxic heavy metals were low.

The analysis of the sources of seven heavy metal pollutants showed that their emissions in different sectors were consistent. The metal smelting and rolling industry sector contributed the highest emission of heavy metals, especially Cd, Pb, As, and Hg, accounting for more than 70% of the total emissions. The mining, smelting, and processing of these heavy metals allowed them to enter the atmosphere, water, and soil, thereby causing serious environmental pollution. The transport equipment manufacturing sector was the second largest emission source, especially Cr, with 34.6 t, accounting for 44.2%. The emission of Cr was mainly caused by leather preparations, the chrome plating of metal parts, and industrial rubber manufacturing. The third largest was the production of the non-metallic mineral sector, especially Cu and Zn, accounting for 29.3%. The emissions of Cu and Zn mainly came from ore mining, metal processing, and machinery manufacturing. In the initial data acquisitions (the first national census of pollution sources), the statistical caliber of Cu and Zn was the same, thereby resulting in the same final emission ratios in various industries and systems. The heavy metal pollution was mainly caused by human factors, such as mining, exhaust gas emission, sewage irrigation, and the excessive use of heavy metal products.

### Racism

#### California’s high speed rail program threatens communities of color

Marc Joffe, Senior Policy Analyst, Heritage Foundation, The California High-Speed Rail Project’s Negative Impacts on Minority Communities, https://reason.org/commentary/the-california-high-speed-rail-projects-negative-impacts-on-minority-communities/

As President Joe Biden and Congressional Democrats push ambitious infrastructure plans, they’re also aiming to rectify the impact previous construction programs have had on minority communities.

They aspire to choose new transportation infrastructure projects with an eye toward minimizing disruption to communities of color. While concerns over neighborhood-destroying transportation projects typically focus on freeways, it turns out that the California high-speed rail plan shares this very same problem.

The Biden administration’s infrastructure proposal includes “$20 billion for a new program that will reconnect neighborhoods cut off by historic investments and ensure new projects increase opportunity, advance racial equity and environmental justice, and promote affordable access.”

Similarly, Sen. Tom Carper, D-Delaware, proposed a grant program to help communities of color mitigate the impact of “infrastructural barriers,” with the hope of reconnecting neighborhoods.

Concerns over the effects of infrastructure construction on disadvantaged neighborhoods emerged after the freeway construction boom in the 20th century. The poster child for this problem was the Cross Bronx Expressway, a segment of I-95 built by controversial New York planner Robert Moses. Although the freeway improved connections between the city and northern and western suburbs, it bisected ethnic communities. The project is often blamed for creating one of America’s notorious ghettos in the South Bronx, which was largely destroyed by fires in the 1970s.

Similar stories played out elsewhere in several parts of the country, including California. In Los Angeles, construction of the Santa Monica Freeway in 1963 essentially wiped out Sugar Hill, a neighborhood that had attracted African Americans during the preceding decades. A few years earlier, the Santa Ana Freeway bisected Boyle Heights, a neighborhood with a relatively high concentration of Mexican Americans.

Today, another type of infrastructure project is disrupting and threatening the state’s communities of color: the California high-speed rail system. In a recent letter to the California High-Speed Rail Authority, Congressman David Valadao, R-Hanford, called on the authority to address problems caused by its tracks running through the center of Wasco, a city with a predominantly Latino and low-income population.

The rail route forced the abandonment of Wasco’s farm labor housing complex. Although the rail authority contributed to the construction costs of new farmworker housing, it did not provide money to demolish the old complex, which has been heavily vandalized and has become a magnet for gang activity. Paying for the demolition is now a point of contention between Wasco and the rail authority.

“These are impacts that have sent ripples through our community and we need them to be held accountable and responsible for what they’ve done by choosing to build through Wasco,” said Alex Garcia, mayor of Wasco.

High-speed rail construction has also caused disruptions in Fresno, the largest city on the rail system’s initial operating segment, and one with large Latino and low-income populations. Several buildings around downtown—including a rescue mission—were forced to close and some of the abandoned buildings were set on fire by arsonists.

If the high-speed rail system ever extends beyond its initial operating segment, other communities will be impacted. Tehachapi officials, for example, already expressed concerns over noise and vibrations impacting a hospital and residential subdivision if high-speed rail begins operating along its currently-planned route.

With so much vacant land in California, one might think a high-speed rail line could be built without so much disruption. But bullet train tracks must avoid sharp turns and abrupt elevation changes so routing options are more limited than it might appear. Additionally, planners’ desire to provide stations at intermediate cities like Madera and Bakersfield means that lines must traverse multiple urban areas in the Central Valley. If the system ever makes its way to Southern California and the Bay Area, the land and community impacts will increase dramatically.

As the Biden administration and urban planners revisit the influence transportation construction has had on minority neighborhoods, they should also take seriously the similar problems the California high-speed rail system is creating today.

### Political Corruption

#### HSR projects filled with corruption

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

As with any megaproject, high‐​speed rail is a tempting target for people who would illegally or unethically divert government dollars to their own political or economic gains. In 2011, a fatal high‐​speed train crash in China was attributed to design flaws and hasty construction.71 This contributed to China’s arrest and conviction of the state minister of railways, Liu Zhijun, for embezzlement, accepting bribes, and conspiring to murder someone who threatened to expose him.72

In 1974, Kakuei Tanaka had been prime minister of Japan for only 2.5 years when he left office under a cloud of scandal and corruption and was eventually convicted for accepting bribes and directing government contracts to businesses in his prefecture.73 One of the biggest projects he promoted was the Jōetsu high‐​speed rail line.74 This line cost far more than Japan’s first bullet train, yet it carries only a quarter as many passengers.75

Similar political pressures have already influenced high‐​speed rail plans in the United States. For example, the Obama administration’s revised, 2010 high‐​speed rail plan included a line to Duluth, Minnesota, which has only 120,000 people in its urban area. Not coincidentally, at the time the map was issued, the chair of the House Transportation and Infrastructure Committee was from Duluth.76

Politics also influenced the California rail project. Many people wonder why California started building high‐​speed rail in the Central Valley, which has the fewest people along the route. The answer goes back to 2010, when the Obama administration gave California a high‐​speed rail grant. Rep. Jim Costa (D‑CA) was running a tough re‐​election campaign, so Obama required that funds granted to California be spent in or near Costa’s district and allowed Costa to announce the grant instead of the secretary of transportation, who usually makes such announcements.77 Costa won by only 3,000 votes, so the grant may have made the difference to his campaign.78

An Archaic and Obsolete Technology

The Tokyo–Osaka high‐​speed rail line supposedly made money, but it was built across fairly flat territory when construction costs were low and in a corridor with some 60 million people who did nearly all of their intercity travel by train. The United States has no such corridors.

High‐​speed rail is an obsolete technology because it requires expensive and dedicated infrastructure that will serve no purpose other than moving passengers who could more economically travel by highway or air. The United States should not make the same mistake as China, Spain, and other countries that have gambled their economies on this archaic form of travel.

Martin Engle, 6-25, 2021, A Summary Reality Check of Why High-Speed Rail is a Bad Idea, https://patch.com/california/menlopark-atherton/bp--a-summary-reality-check-of-why-high-speed-rail-ised91096912

The economy, state-wide and nationally, is a disaster. It will remain a protracted disaster for a very long time. Mega-infrastructure projects such as this are lavish in their wastefulness. This is well-documented. The opportunities for waste, fraud and abuse are also documented and have begun to appear in government accounting audits. Corrupt practices (see China's HSR) are reliably predictable. The words "scam", and "fraud" have been used to describe this project.

### Libertarianism

#### Not the government’s job to subsidize transportation for the rich

Martin Engel, 6-25, 2021, A Summary Reality Check of Why High-Speed Rail is a Bad Idea, https://patch.com/california/menlopark-atherton/bp--a-summary-reality-check-of-why-high-speed-rail-ised91096912

It serves only those who can afford it and don't need it. Ticket prices for high-speed rail, as we keep saying, are the highest of all railroad tickets, world-wide. Even in China. High-speed rail is luxury, premium, first-class travel for the affluent only. The government has no business pouring the tax-dollars collected from those who can't afford to ride this train, to build it for those who can. . . .and subsidize each of those tickets as well. As they say in the UK, the poor shouldn't be building a luxury train for the rich.

### Renewables Bad/Rare Earth

#### HSR powered by renewables

Andy Kunz, President and CEO of the US High Speed Rail Association (USHSR), sets their vision and direction. He brings 30 years of successful business experience to USHSR and provides senior leadership and an ambitious vision for sustainable transportation in America. This vision includes a 17,000-mile national high-speed rail network built in phases and slated for completion by 2030. Andy holds a Bachelor of Fine Arts degree and a Master of Architecture in Town Design from the University of Miami. He has served as an expert in a number of forums, speaking extensively at leading conferences and events on transportation and planning topics and providing keynote presentations on high-speed rail and sustainability at numerous international conferences., 2020, <https://www.globalrailwayreview.com/article/69858/10-reasons-america-needs-high-speed-rail/>, en reasons America needs high-speed rail

America is in deep trouble due to our extreme oil dependency for 98 per cent of our transportation; consuming some 20 million barrels of oil every day, 70 per cent of which is for transportation. Maintaining this enormous flow of oil requires America to dig up oceans, protected national forests and the arctic tundra; risking our clean drinking water, our health and our safety – without forgetting the expensive consequential wars. None of this is sustainable or desirable **High-speed rail is the world’s greenest form of transportation and can be 100 per cent powered by renewable energy, bypassing the entire global-oil-military-supply chain. The California HSR system under construction in the Central Valley will be powered 100 per cent by renewables.**

#### Renewable development strengthens China’s dominance in rare earth elements

Institute for Energy Research, 2020, August 4, China Dominates the Rare Earths Supply Chain, https://www.instituteforenergyresearch.org/international-issues/china-dominates-the-rare-earths-supply-chain/

**China already has 80 to 90 percent of the global rare earth market**. Further, over 70 percent of all mined cobalt needed in the electric vehicle industry comes from the Democratic Republic of the Congo, and most of that cobalt is controlled by China. **That means massive U.S. policies to “go green” with renewable energy sources and electric vehicles are in fact, “going red,” as in handing over power to the Chinese Communist Party. An energy policy based upon principles of the Green New Deal is a policy of guaranteeing overwhelming dependence for our energy on China. China’s control over these energy sources is much greater than the control OPEC ever exercised over world oil production.**

#### China could cut-off the US Barnard, 12-9, 20, Christopher Barnard is the national policy director at the American Conservation Coalition (ACC), US dependence on China for rare earth minerals is a disaster waiting to happen, https://thehill.com/opinion/energy-environment/529229-us-dependence-on-china-for-rare-earth-minerals-is-a-disaster/

In May 2019, amid the escalating U.S.-China trade war, **the Chinese Communist Part**y’s official newspaper **published a warning that its government might cut off all exports of rare earth minerals to the U**nited **S**tates.

**In 2010, it had already followed up on a similar threat, that time temporarily cutting off Japan over a minor diplomatic dispute**. The United States Geological Survey reports that China not only holds 35 percent of the world’s entire rare earth supply, but it’s also been turbocharging production, now accounting for 70 percent of global production. Crucially, China directly supplies 80 percent of the U.S.’s rare earth imports. The geopolitical, economic and environmental risks of this status quo can no longer be ignored. The inclusion of a “proposal to make us less dependent on China and other unstable, unreliable and hostile regimes for critical minerals” in the most recent Senate Energy Committee COVID-19 relief package offer is therefore very welcome.

Rare earth minerals consist of a variety of 17 different mineable natural elements, which can be extracted from the earth’s crust. They make up crucial components of many modern technological innovations, from electric cars and solar panels to fighter jets and satellites. The worldwide rare earth industry is therefore expected to nearly double from $8.1 billion in 2018 to $14.4 billion in 2025, as demand for cell phones, microchips and electric vehicles increases dramatically. In short, they are what drives the modern, technologically-advanced economy. President-elect Joe Biden’s promise to install 500,000 new electric charging stations around the country by 2030 therefore only makes sense if we can reliably supply the critical minerals needed to power these electric vehicles in the first place.

This is why the U.S. must preempt Chinese threats. When China briefly blocked all rare earth exports to Japan in 2010, the policy backfired because Japan retaliated by building a new supply chain outside of China and expanding domestic mineral research and development. As a result, China’s global market share dropped from 95 percent to 70 percent. The U.S. now finds itself in a unique position to further dent China’s control of the global market, and move toward rare earth independence. **Of particular importance is ensuring that the U.S. military does not continue its reliance on Chinese** **rare earth imports, which are now used for lasers, night vision systems, missile guidance, radar and sonar and more**.

#### REMs key to the entire economy

White House Supply Chain Report, July 2021, BUILDING RESILIENT SUPPLY CHAINS, REVITALIZING AMERICAN MANUFACTURING, AND FOSTERING BROAD-BASED GROWTH, https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf

**Strategic and critical materials and their supply chains are the bedrock of value-added manufacturing and the development, production, delivery, and sustainment of essential services, such as telecommunications and computing, food and agriculture, finance, healthcare, education, transportation, and public safety. In civilian sectors of the U.S. economy, strategic and critical materials and their supply chains are essential to countless manufactured goods, ranging from personal electronics and consumables for fuel, food, and medical supplies, to home construction and sustaining the nation’s critical infrastructure.** Reliable access to strategic and critical materials strengthens the global economy and helps improve the quality of life.

#### Semiconductors critical to all parts of the economy, disruptions in materials put the entire US economy at-risk

White House Report, 2021, SUPPLY CHAINS, REVITALIZING AMERICAN MANUFACTURING, ANDFOSTERING BROAD-BASED GROWTH, https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf

**Semiconductors** are the material basis for integrated circuits that **are essential to modern day life and are used by the typical consumer on a daily, if not hourly, basis.** The semiconductor-based integrated circuit is the “DNA” of technology and has transformed essentially all segments of the economy, **from agriculture and transportation to healthcare, telecommunications, and the Interne**t. ***The semiconductor industry is a major engine for U.S. economic growth and job creation.*** **Semiconductors are used in virtually every technology** product and underpin state-of-the-art military systems. Semiconductors are an integral part of a consumer’s everyday life and can be found in household items such as light switches, garage door openers, and refrigerators, as well as in more complex products such as mobile phones, computers, and automobiles The two semiconductor industry-related NAICS categories directly employed 207,400 workers in 2019, accounting for 1.6 percent of total U.S. manufacturing employment. These are high-quality, well-paying jobs: the semiconductor manufacturing workforce earned an average of $163,871 per person in 2019, more than twice the average for all U.S. manufacturing workers ($69,928).**5 Eighteen U.S. states have major semiconductor manufacturing operations**, according to the Semiconductor Industry Association (SIA). **These statistics, however, capture only a portion of the overall semiconductor industry and therefore understate its importance to the U.S. econom**y. Information on the broader industry further highlights its importance to the U.S. economy. SIA estimates that the U.S. semiconductor industry had $208 billion in annual sales in 2020, capturing nearly half of the world market. Despite the global COVID-19 pandemic, worldwide sales of semiconductors increased by 6.5 percent in 2020. SIA estimates the global semiconductor market will reach $726 billion in annual sales by 2027, a compound annual growth rate of 4.7 percent. Further, SIA estimates that each direct job in the semiconductor industry supports nearly five additional jobs.6 **Semiconductors are also a major export for the United States** with $47 billion in export sales in 2020, ranking fourth overall, after aircrafts, refined oil, and crude oil.7 Semiconductors power virtually every sector of the economy—including energy, healthcare, agriculture, consumer electronics, manufacturing, defense, and transportation. Worldwide demand for semiconductors in 2019 by end use was: mobile phones (26 percent), information and communications infrastructure (including data centers, communications networks) (24 percent); computers (19 percent), industrial (12 percent), automotive (10 percent), and consumer electronics (10 percent).8 Among these diverse applications, those that directly support national security and critical infrastructure account for about nine percent of semiconductor demand. These critical semiconductor end uses include defense and aerospace, telecommunications networks, energy and utilities, healthcare, and financial services.9 Defense and other government use is slightly over one percent of worldwide consumption of semiconductors.10 In summary, **while U.S. production capacity has been stable, the United States lacks sufficient capacity on a relative basis to produce semiconductors and relies extensively on sources in Taiwan, South Korea, and China for production**. The United States is heavily dependent on a single company–TSMC–for producing its . Since semiconductors are such key components, ***the fragile supply chain for semiconductors puts virtually every sector of the economy at risk of disruption***. ***Recent events affecting global supply chains, such as the COVID-19 pandemic, weather-related events, and the blockage of the Suez Canal demonstrate the importance of preparedness and supply chain resilience***. The lack of domestic production capability also puts at risk the ability to supply current and future national security and critical infrastructure needs. U.S. production is also threatened by significant Chinese investments to expand its chip production capability and a greying of the U.S. workforce.

#### HSR won’t significantly reduce CO2 emissions, and any reduction assumes a massive expansion of renewable energy for electrification (which is a link to renewable energy bad)

Railway Technology, October 27, 2020, Is high-speed rail the fast track to transport decarbonisation?,

The International Energy Agency (IEA) reports that rail carries 8% of the world’s passengers and 7% of freight, yet accounts for just 2% of transport energy use, and that high-speed services over long distances constitute an eco-friendly alternative to short-distance air travel by reducing emissions. However, a **study published by the IEA in 2019 entitled ‘The Future of Rail’ reveals that building a high-speed rail network does not automatically translate into significant carbon emissions savings**. **To do so, such systems must be energy efficient during construction; trains must be run on clean electricity; the services must be frequent and near capacity; and high-speed rail must entice people out of polluting passenger jets and cars – all while not generating excessive new demand for travel.** Here, Future Rail takes a whistle-stop tour of five of the world’s largest high-speed rail networks to assess if they have delivered on their green commitments and helped to reduce carbon emissions. China: size matters **China is home to the longest high-speed rail network in the world.** China is already home to the world’s most extensive high-speed rail network and, according to the IEA, passenger activity increased by approximately 13% in 2019. Beijing’s 13th Five-Year Plan from 2016–2020 targets a further 30,000km of track aimed at connecting 80% of the country’s big cities. From an environmental perspective, the key question is whether the train journeys themselves are sufficiently energy efficient – and whether enough passengers use rail or make the modal change from aviation and road travel – to offset emissions produced during construction of the network. **China Dialogue reports that coal consumption, much of it connected with the production of steel and cement, increased for the second successive year in 2018, and CO2 emissions followed suit.** Research shows that operating the Beijing-Shanghai high-speed line, for example, accounts for 70% of its emissions; however, as China adds more renewable energy to the grid, this figure will decrease. Passengers numbers increased from 2011–14, meaning the per-passenger CO2 footprint fell, and an IEA study shows the Beijing-Shanghai line has shifted people away from flying. However, **there is evidence that high-speed rail in China as a whole is under-used**; IEA’s study reveals that the number of trains that China runs on its high-speed tracks is almost half that of Europe and Korea. The US: a Brightline to low emissions? Brightline trains in the US are fuelled by biodiesel and meet Tier-4 emissions standards. Credit: Brightline. Under-use of high-speed rail services is also an objection that has been raised in the US, along with the prohibitive cost of building high-speed infrastructure spanning the country’s vast landscape. However, as an ancillary to short-haul air travel, US high-speed rail services are already proving their worth. Described as a “private-sector solution to a public need”, Brightline operates a passenger-rail service in south-eastern Florida, plans to extend its high-speed service to Las Vegas – thus tying it into existing Los Angeles commuter lines and, ultimately, California’s own high-speed rail project. Brightline ran its five-train fleet carbon neutral throughout February 2020 and all of the company’s carbon emissions will be offset with renewable energy credits. In addition, its trains are fuelled by biodiesel and meet Tier-4 emissions standards, plus Brightline stations in Fort Lauderdale and West Palm Beach feature FPL SolarNow trees, structures that provide shade and harness solar power. **Across the Atlantic, the High-Speed Rail Group is lobbying the government to decarbonise the UK’s rail system by *2040,*** and heralded the High Speed 2 (HS2) project as a “new carbon transport backbone for the UK”. Supporters argue that HS2 will reduce demand for air travel, road freight and car journeys by linking northern England with the Midlands, London and High Speed 1 (HS1) to the Channel tunnel and continental Europe. The Guardian reports on claims by HS2 that the service can achieve 8g of carbon emissions per person per km compared with 67g of emissions from the same journey by car and 170g by plane. However, the report goes on to argue that t**he UK Government’s own calculations for HS2 suggest the route’s carbon emissions could exceed potential savings; that overall construction and operation will result in 1.49 million tonnes of CO2 equivalent at a time when emissions need to be falling rapidly to reach net zero; and that the UK Department for Transport suggests the modal shift to HS2 from driving and flying will be negligible.** Meanwhile, Eurostar claims it has reduced carbon emissions in the past eight years by 32%, and that a Eurostar journey from London to Paris emits 90% less greenhouse gas than the equivalent short-haul flight and less carbon per passenger than a journey from central London to Heathrow. France and Spain: Euro vision In France, the state-owned rail operator SNCF has introduced a raft of measures aimed at boosting energy efficiency and slashing emissions. Global Railway Review reports that the Renfe-SNCF in Cooperation high-speed service has allowed for a saving of half a million tonnes of CO2 since 2013. When taking into account domestic travellers using Renfe-SNCF in Cooperation’s services in France and Spain, the figures increase to around one million tonnes of CO2 saved, a figure that corresponds to the average annual emissions from electrical consumption by a city with population of 3.7 million. **The high-speed trains between Spain and France run on renewable electrical energy and have a low carbon footprint,** with every 100km travelled enabling an emission reduction of around 15kg of CO2. Speaking at the International Union of Railways’ (UIC) low-carbon mobility conference in Brussels in February 2020, UIC director general François Davenne noted that, among other benefits, passenger rail overall requires less than one-tenth of the energy needed to move an individual by car or plane and that trains have 30-year lifespan, minimising the need to invest in non-renewable resources. Japan: bringing it all back home A Japanese Shinkansen high-speed bullet train at JR Osakastation. Credit: Icosha/Shutterstock. In a 2019 case study published by Triodos Investment Management – which invests in companies that “actively contribute to a sustainable economy through their products, services and processes” – the firm explains the rationale behind its decision to invest in Central Japan Railway (JR Central). JR Central generates 70% of its annual revenues from the Tokaido Shinkansen high-speed train line, which transports 452,000 passengers daily (165 million per annum) between Tokyo and Osaka. Triodos claims that, compared with an airplane on the same route, the line uses 88% less energy and produces 92% less carbon emissions per seat, and that for distances of up to 1,000km, travelling by high-speed train is time and price-competitive with air travel. JR Central has also outlined plans to reduce its energy consumption by 25% by the end of 2030 compared with 1995 levels.

#### Green tech mineral needs shift energy dependence to China

Zelikow, July/August 22, PHILIP ZELIKOW is Professor of History at the University of Virginia. A former U.S. diplomat and Executive Director of the 9/11 Commission, he has worked for five presidential administrations., The Hollow Order: Rebuilding an International System That Works, https://www.foreignaffairs.com/articles/world/2022-06-21/hollow-order-international-system

Even **the energy transition** will not, by itself, stabilize the planet. It **will shift dependence from fossil fuels to an even more pronounced reliance on certain metals used in green technology. In the relevant geology, mining, and mineral processing, China and Russia are in paramount positions.** In the absence of any concerted action, **the world is therefore trending toward addiction, and financial flows, to those new sources—China above all—in its carbon-free dreams**. The architects of this system have done little to prevent such addiction.

### Air Travel Superior

#### Air travel cost-effective

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

High‐​speed trains were rendered obsolete in 1958, six years before Japan opened its first bullet train, when Boeing’s 707 entered commercial service; the airliner could cruise at more than twice the top speeds of the fastest scheduled high‐​speed trains today. Air travel cost more than rail travel in 1964, but average airfares today are less than a fifth of the average fares paid by riders of the Amtrak Acela, the only high‐​speed train operating in the United States  
Economy Answers

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### State Alternative Better

#### States can create HSR through multistate agreements or other instruments

**U.S Department of Transportation April 2009** (http://www.fra.dot.gov/downloads/rrdev/hsrstrategicplan.pdf )(International data from: GAO report, High-Speed Passenger Rail (GAO-09-317); UIC High-Speed Department, “High-Speed Lines in the World” www.uic.asso.fr/uic/spip.php?article573; and Jane’s World Railways 2007-2008. International ridership data is from 2007, except for Germany and U.K., which are from 2005. Amtrak data from FY 2008; represents both NEC Regional (predecessor service began in 1969) and Acela services. “Train à grande vitesse” or “high-speed train.”

Multi-State Partnerships. Most intercity passenger rail corridors, including designated high-speed rail corridors, cross State boundaries. Viable HSR corridor strategies will, therefore, require a multi-State partnership in many cases. To successfully plan, fund, build and operate these corridors, the States involved will need to act in a coordinated fashion, through an interstate compact, a multi-State agreement, or other instrument. Any such multi-State understanding will require the backing of several political and administrative entities within each State.

#### States should take the lead in HSR development –they are the most efficient managers

Chicago Tribune ’01 (Editorial, “Let states drive high-speed train,” Dec 24, http://articles.chicagotribune.com/2001-12-24/news/0112240192\_1\_high-speed-rail-investment-high-speed-train-high-speed-rail)

*Amtrak--the money-losing operation that poses as a national passenger railroad in the U.S.--is taking the lead in the development of a high-speed train network in the Midwest, comparable to the European trains that zoom by at more than 150 m.p.h. High-speed rail service in the Midwest is an interesting prospect--the market, as well as environmental, energy conservation and other concerns, may justify it. But* putting Amtrak in charge and expecting the feds to pay for most of it certainly is a recipe for waste and bad planning*. For the Midwest, at least, a frequent, comfortable and reliable* high-speed rail system *would be a new concept. It* ought to be designed *and operated as such,* according to market demand, *with a rigorous bottom-line approach*. In other words, everything Amtrak is not. *According to plans being circulated in Congress and promoted by several local groups, Chicago would be the hub of a series of high-speed rail lines zipping out to Minneapolis-St. Paul, Detroit, Cincinnati, St. Louis, Cleveland and other major urban areas, with stops at some smaller cities like Springfield, Ill., and Madison, Wis. New trains would run on upgraded freight tracks at estimated speeds of 110 m.p.h. The initial phase would be funded by approximately $4 billion, the Midwest's share of the $12 billion High Speed Rail Investment initiative, under consideration by Congress. Individual states have pledged smaller amounts to the effort, including Illinois' $50 million. A reverse logic animates this project: Instead of determining there is urgent demand--and then seeking funding--Midwestern supporters seem to be saying, "The pot of money is there, so we might as well get our share." That's not the way to build a new railroad, but to extend* Amtrak *domain which,* torn by the incompatible demands of politics, *public service and profitability,* has evolved into anything but an efficient train system. *States ought to take the lead in* the *high-speed rail* effort, *and contribute a substantial amount of the money. Perhaps the federal government could pay for the start-up infrastructure improvements, as it did to build the original interstate highway system in the 1950s. Then* an independent multi-state agency could purchase the trains and turn over operations to a private concern. Such high stakes andstrong participation by the states would lead to a far tougher analysis of what service is needed than the pinata-style planning at play here*. Built modestly and incrementally, high-speed rail could work and even make money, at which time full privatization would be the next step. A Chicago-to-St. Louis line, running on relatively underutilized freight tracks through Normal and Springfield, could be a key test.* Run efficiently, it could compete favorably *with airlines on speed of downtown-to-downtown service, and certainly on roominess and comfort. Regional high-speed service has caught on in California and in the Northwest, and it may well do so here. Although Amtrak's math is complicated, the agency projects that, when fully operational, its high-speed Acela line on the Northeast will make about $180 million in annual profit Are there enough commuters and are they willing to give up their cars or airline seats in favor of high-speed trains? If it's their own money on the line,* state officials, planners--and taxpayers--would make sure the project makes sense before any money is invested*. High-speed train service in the Midwest is a prospect worth investigating, on the right terms.*

#### Multistate pacts solve for HSR – already being used

OPA ’03 (Office of Public Affairs, US Department of Transportation, Fact Sheet, The Passenger Rail Investment Reform Act of 2003, http://www.dot.gov/affairs/Passenger%20Rail%20Fact%20Sheet.htm)

#### \* The Administration believes that states, not Amtrak, are best equipped to decide where rail service is important. States should be empowered to choose the rail service provider of their choice, whether it's Amtrak, a private company or a public transit agency. Following a transition, the Administration's proposal would allow states to submit proposals for passenger rail capital investment to the U.S. Department of Transportation, as they have successfully done for highway and transit capital investments. \* Amtrak would transition into three companies: \* A private passenger rail company that would operate trains under contract to states and multi-state compacts - just as the current Amtrak operates trains under contract to commuter rail agencies; \* A private rail infrastructure company that would maintain and operate the infrastructure on the Northeast Corridor under contract to a multi-state Northeast Corridor Compact. Title to Amtrak's current tracks, stations and other infrastructure on the Northeast Corridor will be held by the federal government and leased to the Northeast Corridor Compact; and \* The National Passenger Rail Corporation, which would continue as a government corporation that would retain Amtrak's current right to use the tracks of the freight railroads, and the Amtrak corporate name. Both the track-access rights and the Amtrak brand would be provided under contract to states and multi-state compacts for qualifying passenger rail service they sponsor. \* Separating train operations and infrastructure ownership is not a new concept. Train operations and infrastructure ownership have for decades been split in the United States. Amtrak operates trains over more than 22,000 miles of track in the United States, but owns only 730 miles of track (mostly on the Northeast Corridor between Washington, D.C. and Boston, and in Michigan). All other tracks are owned either by freight railroads or by the states. \* Multi-state compacts are not new. Multi-state coalitions are already operating intercity rail services, and some are planning for future high-speed rail operations. The Administration believes these cooperative partnerships between the states, the federal government and freight railroads, will improve the efficiency of intercity passenger rail service as a viable alternative to air and highway travel in some corridors.

#### Federal Swift Act gives states the primary power to develop and operate HSR

Prok, 09 – legal analyst at Lexis Nexis, Chief Executive and General Counsel at FRONT RANGE ENERGY EFFICIENCY LLC ( Joshua, “High Speed Rail: Planning and Financing the next Fifty Years of American Mobility” 36 Transp. L. J.48)

The Swift Rail Development Act of 1994 (Swift Act) might well be considered the heart of federal regulation of high speed rail. In the Swift Act, Congress declared high speed rail to be an environmentally advantageous alternative to other intercity transportation, and acknowledged that federal funding would be necessary to develop the technology necessary to make high speed rail a reality in the U.S.2 The purpose of the Act was "to encourage farsighted State, local, and private efforts in the analysis and planning for high-speed rail systems in appropriate intercity corridors." The Swift Act put the onus on "State and local governments" to develop the technology with federal planning support when necessary, and states that "new high-speed rail service should not receive Federal subsidies for operating and maintenance expenses.” The Secretary of Transportation delegated authority under the Swift Act as it related to high speed rail to the Federal Railroad Administrator. Congress, therefore, directed the States to develop and operate high speed rail services with preliminary guidance from the Federal Railroad Administration(FRA). Accordingly, codified portions of the Swift Act provide "high-speed rail assistance" for continued corridor development through "eligible activities," including: environmental study, economic analysis, financial planning, and acquisitions. The assistance provides "matching funds not to exceed fifty percent of the costs of qualifying eligible activities. In terms of financing for fiscal years 2006-2013, the federal government makes $100,000,0009 available to State and local governments for corridor development and technological improvements. The FRA publishes an annual "Notice of funding availability; solicitation for applications" for State and local governments to apply for high speed rail assistance.

#### States have empirically been successful in enhancing passenger rail services

**Perl, ’10** – Director of Urban Studies Program at Simon Fraser University (Anthony, “Integrating HSR into North America’s Next Mobility Transition,” June 16, 2010, p. 9-10, https://wagner.nyu.edu/files/rudincenter/Perl.pdf

The passenger rail analog to LCC’s steady rise in air travel market share can be found in the efforts of some state governments to enhance Amtrak operations within, and even beyond, their borders to provide service innovations that draw more riders to the rails. Just as LCC’s drew some travel from cars and buses through their enhanced value proposition, as well as inducing demand for trips that had previously been priced beyond discretionary travel budgets, state sponsored passenger rail enhancements sought to grow rail travel through a mix of modal shift and induced demand. A significant difference between the LCC business model and the state-led passenger rail development initiatives was that airport terminals were usually better integrated into local road and transit networks than were passenger rail stations. State-sponsored passenger rail service enhancements have occurred through increased speeds (though still well below the global understanding of high-speed), increased frequencies, and enhanced connections with buses that bring service closer to travelers’ origins and destinations. Providing these local bus connections has usually proven easier than convincing local transit agencies to provide greater access to intercity train stations. Table 2 presents recent ridership for these specialized state services, which have on the whole grown faster than Amtrak’s overall ridership.

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#### **Multi-state compacts already exist and can create dedicated funding**

Puentes ’10 – Senior Fellow with the Brookings Institution’s Metropolitan Insfrastructure Initiative (Robert, “Intermetropolitan Passenger Rail: Considerations for State Legislatures” – April 9th – http://www.brookings.edu/research/speeches/2010/04/09-rail-transportation-puentes)

The next point is that if a particular corridor extends beyond individual state borders, close coordination—both formal and informal—with your neighbors is essential. More than just backroom deals, these are lengthy relationships that bear real fruit in the form of finalized plans, environmental reviews, and dedicated shared funding agreements. This appeared to have been a significant advantage for those who received ARRA funding and a hindrance for those who did not as, by design, several of the award-winning corridors involved multi-state compacts. For example, the eight-state Midwest Regional Rail Initiative was established as far back as the mid-1990s. In consultation with the federal government, the states worked to develop a rail plan that was released in 1998 and updated in 2004. Last summer, the eight governors, along with the mayor of Chicago, signed a Memorandum of Understanding in anticipation of joint applications for ARRA funding that laid out plans for collective high-speed rail priorities and planning. Partly as a result, the projects in and around the Chicago hub received nearly as much funding ($2.16 billion) as did California ($2.34 billion.) Similarly, the Virginia-North Carolina Interstate High-Speed Rail Commission, created in 2001, agreed to recommend to its respective parent legislatures the enactment of an interstate rail compact. Both state legislatures passed laws establishing the Compact in 2004. The North Carolina—Virginia corridor received a total of $620 million spread among three investments.

## Answers to Pro Arguments

### General Solvency Answers

#### Reasons US HSR is limited

Richard Nunno, July 19, 2018, Transportation: Fact Sheet | High Speed Rail Development Worldwide, https://www.eesi.org/papers/view/fact-sheet-high-speed-rail-development-worldwide

Several reasons can be listed for this disparity between U.S. and foreign HSR developments:

the lower population density of U.S. cities compared to those in Europe and Asia makes it difficult to give high-speed rail large enough numbers of people to make it economically viable;

stronger property rights in the United States compared to other countries, which make it difficult for governments to purchase land for new railroads;

America’s car culture and emphasis on driving (total automotive marketing spending in the United States is about $35 billion per year and climbing);

the difficulty of shifting to public transit once city/county infrastructure has already been built and been designed for automobile accessibility rather than train stations;

U.S. long distance railways are mostly owned by freight companies, forcing passenger rail carriers to yield priority to freight trains;

the greater distance between many U.S. cities allows many transportation needs to be more conveniently served by commercial airlines; and

political interference by some extremely wealthy individuals who want to suppress interest in railroads to maximize fossil fuel use.

#### Many practical problems with HSR in the US

Stephen Zetchik, November 18, 2021, Washington Post, All this money pouring into infrastructure should be a boon for high-speed rail, right? Not so fast, https://www.washingtonpost.com/technology/2021/11/18/infrastructure-bill-high-speed-rail/

Then **there’s America’s greater** **decentralization — both in government oversight, creating a mess of approvals, and residential trends.**

“**The reason high-speed rail is such a delusion is that Americans just don’t live close enough to downtown cores — we’re too dispersed,” said Mitchell Moss, director of the Rudin Center for Transportation Policy & Management at New York University. “It’s getting to the station that’s the problem.”**

Randal O’Toole, of the libertarian Cato Institute, has offered some of the most sharply worded arguments for abandoning HSR. It’s “like wanting to be the world leader in electric typewriters, rotary telephones, or steam locomotives,” he wrote in April**. He cites a lack of useful freight on the tracks and the relative cost-efficiency of airplane**s, though supporters point out HSR co-exists alongside sophisticated air travel in China and Western Europe.

#### You’d still need a car after you get off the HSR

Glenn Luk, 15 years of PE/VC and Public Market Investing Experience, Forbes, March 11, 2017, <https://www.forbes.com/sites/quora/2017/03/11/why-doesnt-the-united-states-have-high-speed-bullet-trains-like-europe-and-asia/?sh=636f12e5c080>, Why Doesn't The United States Have High-Speed Bullet Trains Like Europe And Asia?

Suburban sprawl vs. Town squares. Most Americans live in suburbs which are dominated by single-family homes sitting on single tracts of land extending for miles (i.e. "suburban sprawl"). This contrasts sharply with the way towns were developed in the pre-automobile era, which is when most European towns and villages first came into existence -- these were designed around the primary mode of transportation of the era, a.k.a. "your feet". One consequence of this is the greater use of mixed-use development strategies where commercial and residential interests are located in close proximity i.e. the traditional European village/town square.

For most of America, this makes what should be a fairly easy decision quite difficult: Where the heck do you put the train station? Furthermore, in the U.S., even if you arrive at your destination via train, you still need a car because most cities don't have convenient metro systems in place that can comfortably ferry people around to the places they need to go.

#### All the pro argues for is funding, property rights block expansion

Glenn Luk, 15 years of PE/VC and Public Market Investing Experience, Forbes, March 11, 2017, <https://www.forbes.com/sites/quora/2017/03/11/why-doesnt-the-united-states-have-high-speed-bullet-trains-like-europe-and-asia/?sh=636f12e5c080>, Why Doesn't The United States Have High-Speed Bullet Trains Like Europe And Asia?

Property rights. One of the most expensive parts of building new rail lines these days is securing land along a relatively straight path (you can't run trains at high speeds along too sharp a curve). The U.S. has strong property rights which makes securing land exceedingly expensive. Back when it was cheap to secure land, the U.S. had no problem building train tracks across the country.

In China, land is still largely controlled by the State which makes it much easier to secure.

#### Automobile culture blocks increased use

Glenn Luk, 15 years of PE/VC and Public Market Investing Experience, Forbes, March 11, 2017, <https://www.forbes.com/sites/quora/2017/03/11/why-doesnt-the-united-states-have-high-speed-bullet-trains-like-europe-and-asia/?sh=636f12e5c080>, Why Doesn't The United States Have High-Speed Bullet Trains Like Europe And Asia?

Culture. The automobile is deeply ingrained into the core fabric of American culture. Watch American Graffiti or its modern-day counterpart, The Fast and the Furious, and you will start to get a sense of why.

Even though this might be changing over time due to concerns about things like carbon footprint and the environment, our transportation future will most likely still revolve around cars. Case in point -- our most celebrated entrepreneur at the moment is a guy that runs a car company:

The investment of hundreds of billions of dollars into the Interstate Highway System also reinforces the critical role of the Automobile in American culture. Much of the suburban sprawl-type development discussed above was a direct offshoot of this massive investment.

Unlike the U.S. most other countries are far more willing to place heavy taxes on vehicles in an effort to curb demand. For example, in Singapore car buyers must pay an additional 150% on top of the price of the car in excise and registration duties. In Taiwan, taxes are not as high but still more than doubles the effective price of this beaut:

In the Taipei showroom pondering whether this baby was worth 100,000 bowls of beef noodle soup. It wasn't. I am too fond of beef noodle soup. Photo credit: Glenn Luk

In the Taipei showroom pondering whether this baby was worth 100,000 bowls of beef noodle soup.

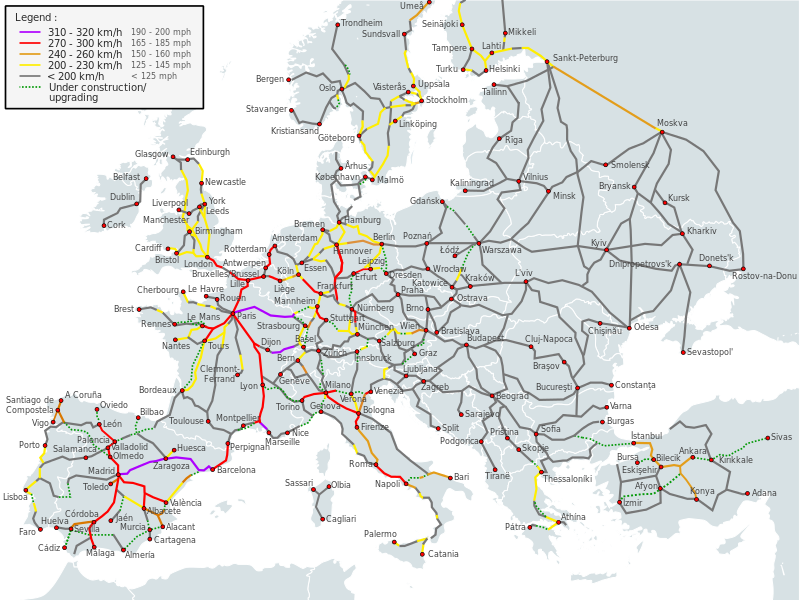
This all results in car ownership rates that are much higher compared to almost every other major country (as you can see in the data table above). Lower car ownership rates create greater demand for alternative transportation options and makes high-speed rail a much more attractive proposition in those countries.

#### Lack of networks makes it financially unfeasible

Glenn Luk, 15 years of PE/VC and Public Market Investing Experience, Forbes, March 11, 2017, <https://www.forbes.com/sites/quora/2017/03/11/why-doesnt-the-united-states-have-high-speed-bullet-trains-like-europe-and-asia/?sh=636f12e5c080>, Why Doesn't The United States Have High-Speed Bullet Trains Like Europe And Asia?

Network effects. Another important facet of high-speed rail is the value of network effects. It is a far more attractive proposition to build a HSR system that looks more like a web instead of a point-to-point line. This is because webs tend to result in much higher utilization than point-to-point systems. And utilization is the most important determinant behind the economics of high fixed-cost businesses like high-speed rail.

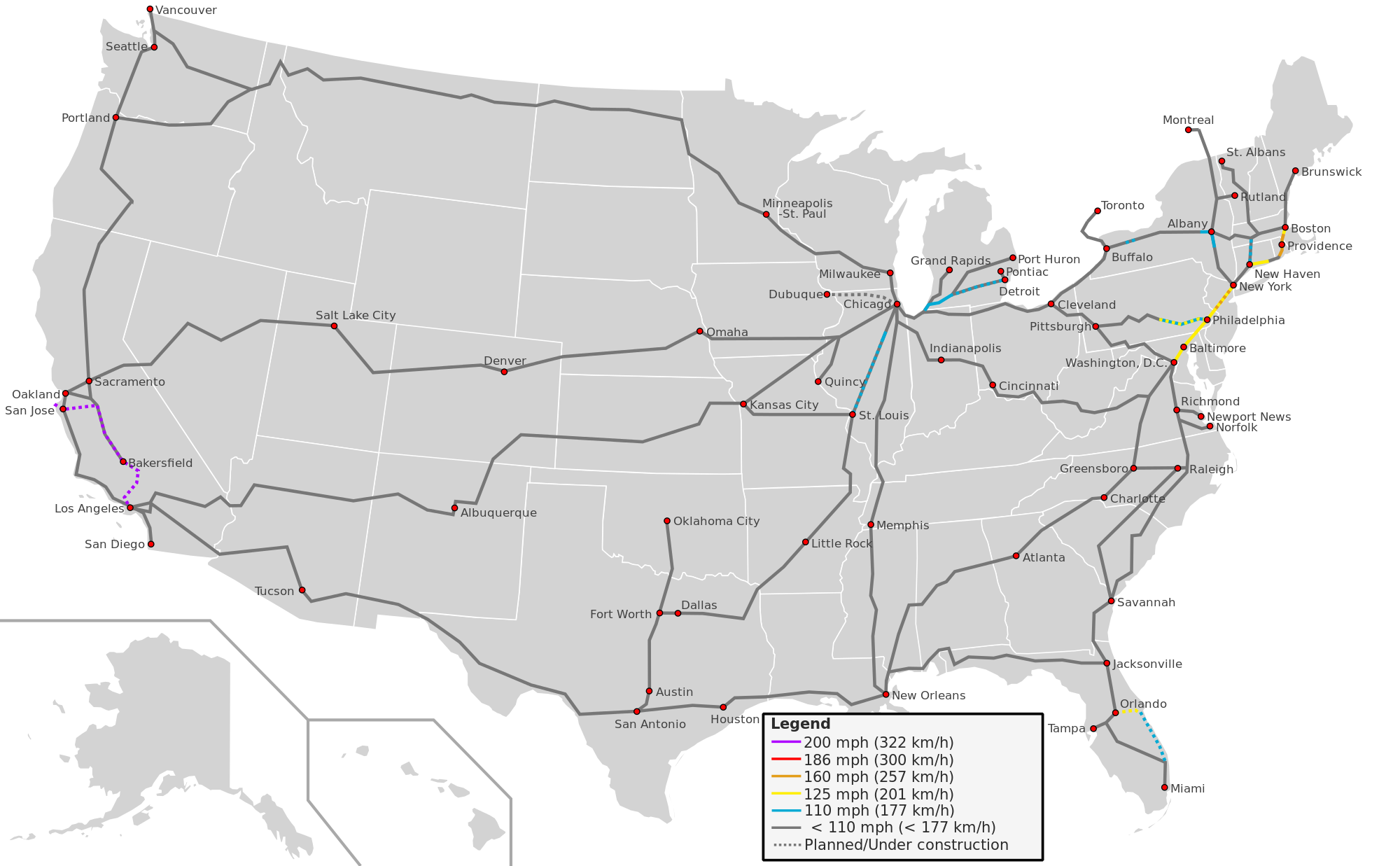
For example, look at the HSR rail map of Europe:



That's one tangled and messy spider web and is surely one contributor to the more favorable economics behind high-speed rail in Europe.

Now let's look at China:



Again -- especially if you factor in the gray lines, many of which are candidates to be upgraded to high-speed rail lines -- this is a pretty intricate web of cities, and once again supports the economics of high-speed rail. Now you will notice a few lines (such as the ones extending out across the Silk Road to Urumqi or towards Lhasa) that are more point-to-point in nature. But these lines are probably subsidized to a large extent by the much more highly utilized lines in the Eastern half of the country.Finally, let's look at the United States:

Much less web-like, for sure. I can probably count on two hands the amount of demand for a 1,000 mile rail trip from Omaha to Salt Lake City that cannot be served better by existing options. I simply cannot see how many of these proposed routes -- especially in the middle of the country -- can sustain the minimum economics needed to justify the tens of billions per year necessary upkeep and operating costs let alone the hundreds of billions of dollars needed to build those lines in the first place.

The densest regions of the United States are located along the Eastern Seaboard. Based on this, running a single line from Boston down through New York and onto Washington D.C. makes the most economic sense. Indeed, this is where our limited high-speed lines exist as well as our most highly utilized regular passenger rail lines. However, I believe one of the limiting factors behind the economics of passenger rail in the United States is simply that we cannot take advantage of the network effects conveyed by web-like networks you see in Europe and China.

#### US population density is too low

Adam Milisap, April 15, 2021, Forbes, Biden’s High-Speed Rail To Nowhere, https://www.forbes.com/sites/adammillsap/2021/04/15/bidens-high-speed-rail-to-nowhere/?sh=2a504327108c

Rail was losing market share to cars prior to World War II and its market share fell throughout the 20th century. By the 1990s, the economics of HSR did not make sense and they make even less sense today. In 1994, Louis Thompson wrote a special feature in Japan Railway & Transport Review titled High-Speed Rail in the United States—Why Isn’t There More? In it, he points out all the things working against a U.S. HSR system—geography, relatively low population density, and greater competition from cars and planes than in other countries. These factors still present issues for HSR.

Thompson notes that “HSR does not perform well where population density is low or construction costs are exceptionally high.” At 87 people per square mile, America’s current population density is low compared to countries with extensive rail systems. According to recent estimates, Japan’s population density is 863 per square mile, the U.K.’s is 725, Germany’s is 603, Switzerland’s is 539, China’s is 378, and France’s is 319.

Some will argue that national population density is not the appropriate statistic to consider since HSR is designed to connect dense cities to one another. But U.S. cities are not very dense, either. New York is America’s densest big city at 27,000 people per square mile. San Francisco is second at just over 17,000 people per square mile. These cities are comparable to Beijing (almost 30,000 per square mile) or Tokyo (12,000 per square mile) but are well below Seoul (43,000 per square mile) Shanghai (35,000 per square mile) or Paris (53,000 per square mile).

Once you get outside New York and San Francisco, U.S. city population densities fall fast. Proposed rail hubs Denver, Nashville, and Atlanta have population densities of 4,700; 1,300; and 3,700 people per square mile, respectively.

America also has more competitive substitutes for trains. Air travel is much cheaper in America than in other countries with extensive rail systems. A 2017 analysis of air travel costs found that the average cost of short-haul low-cost flights (flights less than 800 miles or three hours, so many domestic flights) is $5.41 per 100 kilometers in America. Similar flights in France cost $6.58, or 18% more. The cost difference is even higher in Sweden (+37%), Japan (+73%), Finland (+222%), Germany (+39%), Canada (+108%), South Korea (+630%), Spain (+59%), and many other countries.

America also has a more extensive network of airports than most countries. America has more airports per million people (43) than many European and Asian countries, including Germany (7), France (7), the U.K. (7), Japan (1.4), and South Korea (2). Compared to many countries, it is easy to get to any metro area in America via a plane, and many of the flights between big metro areas are direct.

Planes are also much faster than trains. The fastest passenger train in the world is China’s Beijing to Nanjing line that travels at nearly 200 mph. The average commercial jet speed in America is more than double that at 500 mph, but it is possible to go much faster. As economist Eli Dourado points out, with better technology and the right regulation, we could have planes that regularly travel over 750 mph in the not-so-distant future. No train is going that fast

In addition to U.S. air travel being more convenient, faster, and relatively cheap by world standards, Americans also have cars and an extensive highway system for shorter trips. In Thompson’s 1994 article, he notes that America had 0.57 cars per person. By 2014, the number of motor vehicles per person had increased to 0.8. For comparison, the U.K. had 0.52 vehicles per person in 2014, while Canada had 0.61, Japan had 0.59, and Germany had 0.57.

For most people, riding a train with other people that only departs at certain times is less appealing for short to medium-length trips than driving a car that leaves according to your schedule, especially if you need a car at your destination anyway. This is the case in most U.S. cities since they are not built for pedestrian or other car-less modes of travel.

Moreover, travelling by car is only going to get better as autonomous vehicle (AV) technology improves. AV’s will mitigate congestion, improve traffic safety, decrease the cost of car ownership, and, if all goes according to plan, even allow people to do other things while traveling, just like trains. And given the time it takes to build rail in America—right California? —we will probably have AVs before the first HSR leg is complete

#### Sustaining HSR infrastructure isn’t economically feasible

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

The main disadvantage of high‐​speed trains, other than their slow speeds compared with air travel, is that they require a huge amount of infrastructure that must be built and maintained to extremely precise standards. Since the United States is struggling to maintain the infrastructure it already has—particularly its urban rail transit systems and Amtrak’s Northeast Corridor, which together have more than $200 billion in maintenance backlogs—it makes no sense to build more infrastructure that the nation won’t be able to afford to maintain.

#### Takes too long to build and the future transportation system will be different

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

The California legislature created a high‐​speed rail commission to study the possibility of a rail line in 1994. Construction didn’t begin until 2015.65 At that time, the authority projected it would be able to begin operating high‐​speed trains from Los Angeles to San Francisco by 2028.66 However, because of cost overruns and the pandemic, the authority now projects completion no earlier than 2033, nearly 40 years after planning began.67 Not all high‐​speed rail lines may take this long, but two decades seems a likely minimum.

A lot will happen in two or more decades that could completely nullify the claimed benefits of high‐​speed rail. The pandemic is likely to reduce people’s eagerness to use various forms of mass transportation even after most people are vaccinated.68 Driverless cars will reduce the cost of travel time because people will be able to work, socialize, or enjoy entertainment while they travel in personal vehicles.69 Electric aircraft could reduce the dollar and environmental cost of short‐​distance air travel.70 These and other uncertainties make big‐​budget, high‐​risk projects even less likely to succeed.

#### HSR can’t be built onto the existing rail network

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Commercial freight network. The U.S. rail system today is primarily used for long-haul shipping of bulk goods that are not sensitive. These would be commodities like crude oil, coal, timber etc. Over the years, this system has become very efficient at moving large quantities of goods over long distances very efficiently. Warren Buffett explained his purchase of the remaining stake in the Burlington Northern Santa Fe (BNSF) Railway that he did not already own by citing the fact that these trains could move a ton of goods 470 miles on a single gallon of diesel gasoline.

However, as everyone whose seen these big freight trains lumber by knows, these trains are slow and therefore unsuitable for passenger traffic. What this means is that one of the costs of having an efficient freight railway network is that you cannot have a strong passenger traffic network (absent building a completely separate network of course). This is also one major reason why European's commercial freight service is far less efficient than America's.

#### HSR has almost no utility

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Unlike high‐​speed trains, motor vehicles and aircraft required only incremental expansion of the infrastructure they used. In 1900, when the United States had only 8,000 registered automobiles, the country already had 2.3 million miles of road, mostly unpaved, for them to drive on.33 As autos became more popular, gas taxes and other fees paid by auto users covered the costs of paving roads and expanding the highway network. Similarly, when the first planes went into commercial air service, they could land in any open field. As air travel became more popular, airlines used their profits and air ticket fees to improve airports and air terminals.

In contrast, high‐​speed trains require that the high‐​cost infrastructure be put in place first. Moreover, unlike highways and airports, which are shared by passenger, freight, and national defense vehicles, high‐​speed trains can only be used for passengers, making them far less cost‐​effective. The incremental nature of highways and air travel made it possible to build infrastructure as revenues were collected without a serious risk to taxpayers that the projects would fail.

The differences in infrastructure requirements explain why air travel costs so much less than rail travel. For most of the lengths of their journeys, the only infrastructure modern airliners require is air traffic control. High‐​speed trains require extensive infrastructure that must be built and maintained to highly precise standards.

The requirement for dedicated, high‐​cost infrastructure is a problem common to the pipe dreams of many mass transportation enthusiasts, whether they are promoting light rail, monorails, maglevs, hyperloops, or personal‐​rapid transit. These systems are all far more expensive to build than highways and can’t do nearly as much.

#### HSR won’t reduce air and auto travel

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

The most heavily used high‐​speed rail lines in the world, including those in China, Europe, and Japan, gained their riders from conventional trains, not from autos or airplanes. The United States doesn’t have enough conventional train riders for high‐​speed rail lines to succeed.

When Japan opened its first high‐​speed rail line in 1964, nearly 70 percent of passenger travel was by rail and only 12 percent by automobile. Although Japan’s lines are considered highly successful, today only 25 percent of passenger travel is by rail and nearly 70 percent by auto.46

The three European countries with the most high‐​speed rail lines are France, which opened its first high‐​speed rail line in 1981; Germany, which opened its first in 1991; and Spain, which opened its first in 1992. Since then, all three have built many lines, with Spain’s system extending the most miles. Yet, as shown in Figure 1, none have seen rail reduce automobile or airline travel. At most, money‐​losing high‐​speed rail lines reduced the market share of profitable bus lines.

Rail advocates sometimes claim that the opening of high‐​speed rail lines has led to a reduction of air service in those corridors, as if the replacement of profitable airlines with unprofitable trains is to be applauded. But the reality is that air travel in Europe has massively increased thanks to the introduction and expansion of low‐​cost air carriers. While data sources are inconsistent for earlier years, between 2010 and 2019, air travel grew 260 percent faster than rail travel in France, 63 percent faster in Germany, and 56 percent faster in Spain.

Information available about China is not as detailed as about Japan or Europe, but automobile ownership in China is growing much more rapidly than rail ridership. In 2005, China had 21.3 million passenger cars.47 By 2019, this had increased by more than 10 times to 340 million, a growth rate of 19.2 percent per year. By comparison, rail ridership has been growing at only a third of that rate, or 6.4 percent per year. While China still has fewer cars per capita than the United States, it has more total motor vehicles.48 The rapid growth in auto ownership is likely mirrored by a similar growth in driving, showing that high‐​speed trains are not reducing auto driving. To enable these motor vehicles to travel around the country, China has built 40 percent more miles of freeways than the United States.

In both Asia and Europe, aggressive construction of new high‐​speed rail lines has failed to make a dent in driving or flying. At best, it has slowed the decline of the importance of rail travel in those regions. But if the goal is to save energy, reduce greenhouse gas emissions, or achieve other social goals, building cars that are more energy efficient would do more than building high‐​speed rail.

#### HSR won’t reduce driving

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Amtrak often brags that it carries more people than the airlines carry between New York and Washington, which are 230 miles apart. But it admits that it really has only 6 percent of the intercity travel market in the Northeast Corridor, with airlines carrying about 5 percent and the other 89 percent going by highway.51

The coronavirus has increased people’s willingness to take long auto trips as an alternative to mass transportation. At the same time, driver‐​assist systems such as adaptive cruise control are making driving less stressful and increasing people’s tolerance for such long trips. With the livery service Waymo having self‐​driving cars for hire in the Phoenix area and Ford, GM, and Tesla working hard to catch up, the time‐​cost of auto travel is likely to sharply decline before the United States can build much of a high‐​speed rail network.

#### Multiple barriers to HSR

Marily Waite, August 24, 2021, <https://www.greenbiz.com/article/why-us-needs-get-track-high-speed-rail>, Why the US needs to get on track with high-speed rail

The barriers to high-speed rail (and rail at lower speeds) are numerous in the U.S. The obstacles include local NIMBY-ism, construction cost overruns of previous rail plans and laws that disadvantage the majority public interest and place small municipalities at the center of power of what are state or multi-state level infrastructure decisions.

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#### Other countries’ HSR systems are not analogous – auto travel is significantly more expensive in places like Japan

**United States Government Accountability Office, ’09** – the audit, evaluation, and investigation arm of the United States Congress (“High Speed Passenger Rail: Future Development Will Depend on Addressing Financial and Other Challenges and Establishing a Clear Federal Role,” Report to Congressional Requesters, March 2009, p. 20, http://www.gao.gov/new.items/d09317.pdf?source=ra) // SP

In the countries we visited, automobile travel also tends to be significantly more expensive than in the United States, resulting from tolls on intercity roads and higher gas prices and taxes, which makes high speed rail a more cost-competitive option.20 For example, according to Japanese government officials, to drive between Tokyo and Osaka—a distance of approximately 318 miles by automobile—can cost almost $200 each way, including over $90 in tolls, and between $70 and $105 in fuel costs, depending on the fuel economy of the vehicle (in August 2008, the average price of gasoline in Japan was $6.50 per gallon).21 This cost compares with a high speed rail fare of about $130 per passenger. By comparison, to travel one-way between Los Angeles and San Francisco by automobile, a distance of 432 miles, will require a $4 toll to cross the Bay Bridge, and roughly $25 to $40 in fuel costs (on Jan. 27, 2009, the average price of gasoline in California was $2.10 per gallon, although at gas prices over $4 per gallon, at which they were recently, fuel costs could be over $80 and could rise over the long term). This cost compares with an average air fare of about $108, and the California High Speed Rail Authority is anticipating a high speed rail fare of about half the air fare, or about $60 in this example

#### HSR would only divert a small number of passengers at best – nonpartisan study proves

**NCPA 10** (the National Center for Policy Analysis is a conservative think tank. “Calif. Rail Project Is High-Speed Pork” https://www.freemarketfoundation.com/article-view/california-rail-project-is-high-speed-pork

High-speed trains connecting major cities are a perfect example of wasteful spending masquerading as a respectable social cause. In reality, they would further burden already overburdened governments and drain dollars from worthier programs, says Robert Samuelson. Let's suppose that the Obama administration gets its wish to build high-speed rail systems in 13 urban corridors. The administration has already committed $10.5 billion, and that's just a token down payment. California wants about $19 billion for an 800-mile track from Anaheim to San Francisco. Constructing all 13 corridors could easily approach $200 billion. Most (or all) of that would have to come from government at some level. What would we get for this huge investment? Not much. Here's what we wouldn't get: any meaningful reduction in traffic congestion, greenhouse gas emissions, air travel, oil consumption or imports, says Samuelson. High-speed intercity trains (not commuter lines) travel at up to 250 miles per hour and are most competitive with planes and cars over distances of fewer than 500 miles. In a report on high-speed rail, the nonpartisan Congressional Research Service examined the 12 corridors of 500 miles or fewer with the most daily air traffic in 2007. Los Angeles to San Francisco led the list with 13,838 passengers; altogether, daily air passengers in these 12 corridors totaled 52,934. If all of them switched to trains, the total number of daily airline passengers (about 2 million) would drop only 2.5 percent, and any fuel savings would be less than that. High-speed rail would subsidize a tiny group of travelers and do little else. With governments everywhere pressed for funds, how can anyone justify a program whose main effect will simply be to make matters worse?

#### Only a small elite will use HSR

**O’Toole 10** (senior fellow at the Cato Institute “High-Speed Rail” http://www.downsizinggovernment.org/transportation/high-speed-rail June 2012) CANOVA

Thus, the costs of a true high-speed rail system would be far higher than the costs of a medium-speed system on existing tracks, as envisioned by the Obama administration**.** To build a 12,800-mile system of high-speed trains would cost close to $1 trillion, based on the costs estimates of the California system.12 It is unlikely that the nation could afford such a vast expense, particularly since our state and federal governments are already in huge fiscal trouble. Also, consider how the costs would rise even higher once a new rail system gets underway. The 12,800-mile FRA network reaches only 42 states and only a handful of cities in those states. Every excluded state and city is represented by senators and representatives who will wonder why their constituents have to pay for a rail system that only serves other areas. And even in the 42 states in the plan, routes are discontinuous, with no high-speed links between many pairs of major cities such as New York and Chicago. Groups representing all the excluded routes would lobby for rail lines, and overall costs would balloon over time. And the costs mentioned are only the capital costs. Most high-speed rail lines wouldn't cover their operating costs, so there would have to be billions of dollars in ongoing subsidies to the system. If the ridership on an expensive new rail system was very large, the high costs would seem more reasonable. But, unlike the interstate highway system, which is heavily used by almost all Americans, only a small elite would use high-speed rail. In 2007, the average American traveled 4,000 miles and shipped 2,000 ton-miles of freight over the interstate highways.13 By comparison, total annual use of a high-speed rail system would not likely be much more than 100 miles per person. And considering the premium fares charged to ride high-speed rail, most users would likely be higher-income white-collar workers.

#### Too many jurisdictional conflicts for this to work in the US

Andre Gumble, May 29, 2022, Train to nowhere: can California’s high-speed rail project ever get back on track?, The Guardian, https://www.theguardian.com/us-news/2022/may/29/california-high-speed-rail-bullet-train

High-speed rail in California was always going to be a moon shot. Many transportation experts point out that high-speed rail systems are tricky to deliver because of high start-up costs and long construction schedules, and the costs are often compounded by the complications of purchasing land, building stations, blasting through mountains and bridging rivers. Countries that have moved fastest on such systems tend to have a highly centralized governmental system, like France’s, if not an out-and-out authoritarian one, like China’s.

The United States, by contrast, has a highly decentralized system of government, with multiple competing jurisdictions jostling over land, water, electricity and other vital resources, and a political tradition, especially in the west, that celebrates personal freedom and private property over collective enterprises in the public interest.

In the decades after the second world war, inter-city train travel faded fast because of the boom in car ownership, cheap gasoline and the interstate highway system. Today, it has a meaningful presence only on the northeastern seaboard, where Amtrak trains remain a popular, traffic-beating option between Boston, New York and Washington. In most places, Tom Zoellner writes in his 2014 book Train, the American railroad “is still regarded as a charming antique, an object of art for eccentrics and a last resort for the poor. Approximately 98% of the American public has never set foot on a city-to-city train.”

#### HSR in California is a total bust

Grimes, July 22, 2022, Katy Grimes, the Editor of the California Globe, is a long-time Investigative Journalist covering the California State Capitol, and the co-author of California's War Against Donald Trump: Who Wins? Who Loses?, https://californiaglobe.com/articles/californias-electric-high-speed-rail-no-power-no-money-no-high-speed/

“If it is built, California’s High-Speed Rail would be the largest public works project in state history. That fact alone appears be intoxicating to state officials, in a perpetual quest to have California be the first state to do anything,” I reported in 2011. That’s how long **California’s High Speed Rail has served only as a jobs program and a really bad joke** on California voters and taxpayers.

By 2011, it was apparent that the High Speed Rail Authority was violating important mandates in the 2008 initiative, passed by voters. **Proposition 1A, $9 billion in bonds for high-speed rail, included numerous mandates,** none of which can be legally bypassed on the way to building the massive train system.

**Top on the list is that the rail system must be high-speed**. “Electric trains that are capable of sustained maximum revenue operating speeds of no less than 200 miles per hour,” the law states. **However, much of the first segment between Fresno and Bakersfield is not high-speed; nor will high-speed be attainable** in dense cities.

“**Despite the warnings of a nearly $100 billion ballooning price tag, no track laid, no trains running**, decreasing legislative support and even opposition from diehard rail advocates, the High-Speed Rail Authority is steaming ahead full throttle with plans to build the most expensive high-speed rail system in history.” That is also from 2011 – 11 years ago. And **nothing has changed except more spending on the train to nowhere.**

A 2011 Field poll found that two thirds of Californians want a new referendum on the project. And by a two-to-one margin, they say they’d vote to derail it, only three years after passing Prop. 1A.

California Senate Republicans just issued a “Myths vs. Facts” report on California’s High Speed Rail debacle. They reported, “**14 years later, this ‘efficient’ bullet train was supposed to be completed in the early 2020s, but it is nowhere near completion, while the cost has ballooned to $105 billion from $33 billion.** In the 2022-2023 state budget, Legislative Democrats earmarked another $4.2 billion for the first phase of the project, which would run from Bakersfield to Merced.”

“Adding insult to California voters, the California High Speed Rail Authority (HSRA) has published a website peddling myths about the bullet train,” Senate Republicans said. “While they suggest they are trying to ‘dispel myths’ and separate ‘fact from fiction,’ their own website is rampant with more opinions than facts.”

Even in 2011, California’s High Speed Rail pushers were agitating for the $3.5 billion in matching federal funding for the rail plan. However, that federal money came with a requirement of use exclusively in the economically depressed Central Valley.

A 2011 report by the Legislative Analyst found that future High-Speed Rail funding sources were “highly speculative,” and the economic impact analysis included in the rail authority’s plan “may be incomplete and imbalanced, and therefore portrays the project more favorably than may be warranted.”

Ya think? **It’s 2022 and High Speed Rail from San Francisco to Los Angeles is still just a pipe dream – especially the “high speed” part.**

In February 2019, President Trump called for California to return all federal rail funding, following Gov. Gavin Newsom’s state of the state address where the Governor vowed to kill High Speed Rail saying, “there simply isn’t a path to get from Sacramento to San Diego, let alone from San Francisco to LA.”  However, Newsom flipped on his promise within the week, announcing he was allowing one odd segment of the rail project to be built in the Central Valley, nicknamed “the conjugal express,” going from prison to prison, Madera to Bakersfield.  The goal for the strange and unnecessary rail line was so California would not have to return $3.5 billion to the federal government.

California Senate Republicans take a deeper dive and break down the real myths vs facts:

Myth: High-Speed Rail will “establish a clean, efficient 220 MPH transportation system.”

Fact: “There has been nothing efficient about high-speed rail in California. The original cost of the project was projected to be $33 billion and is now expected to be at least $105 billion before it is completed. What is worse, the plan no longer even includes purchasing trains. So, the state doesn’t have a way to test if the system works, or if the trains can even go the promised 220mph.”

I reported in 2011, “Complicating matters, the first segment of the rail system won’t even run high-speed trains until the entire system is built. The initiative required the train to be only high-speed.”

Myth: High-Speed Rail will allow travel “from Los Angeles to San Francisco in about 2 ½ hours for about $50 a person.”

Fact: “Way back in 2015 the Los Angeles Times conducted a study and determined the cost to ride high-speed rail from Los Angeles to San Francisco under the best of circumstances would be between $83 and $105. With the cost rising from $33 billion to at least $105 billon and inflation at a 40-year high, the likely cost will be considerably more, if, (or when) the system is ever completed.”

Myth: High-Speed Rail will be completed as early as 2020.

Fact: **That date has come and gone. The first leg of high-speed rail, from Merced to Bakersfield, now has an estimated completion of 2029.**

**Remember, the initiative was passed by voters in 2008.**

According to to Proposition 1A, The California High-Speed Rail Authority must have all of the the funding ahead of time, before any construction starts on a new segment.

Pacific Gas &Electric and Southern California Edison will be providing the electricity for high-speed rail, with estimates of additional demands for electricity already coming in at 1 percent to 5 percent of the state’s total energy usage. “Even Cal ISO doesn’t have any estimates for the cost,” a Capitol staffer told me in 2012. “High-speed rail has got to consume a great deal of power. Where will the power come from?”

That question was never answered. And **with California’s deficient electricity grid, electric car owners are told not to charge their cars on hot summer afternoons. It’s clear the state can’t handle the energy requirement for the high speed train, or electric cars.** they are trying to convince everyone to purchase.

Here’s what lawmakers and the High Speed Rail Authority knew in 2011:

According to a July 2011 energy usage analysis prepared for the California High-Speed Rail Program Management Team, total electricity usage for the proposed rail system would be “8.32 million kilowatt-hours (kWh) per day,” and more than 3 billion kWh per year.

The average three-person household in California is about 6,000 kWh per year, or a little more than 2,000 KWh per person.

According to the California Public Utilities Commission, electricity customers in the state paid an average rate of about 15.2 cents per kWh.

At 15.2 cents per kWh, the total utility bill for high-speed rail would be nearly $1.26 million per day, and more than $460 million per year. And that’s probably a very conservative estimate.

**With California’s climate-change mantra of “no dirty coal,” “no natural gas,” no hydroelectricity” and “no nuclear power,” many wonder if the high-speed trains will be powered by windmills, solar panels, cooking oil and algae.**

Try not to seethe when you read California Senate Republicans’ Myth vs. Fact on High Speed Rail. The California Legislature has had 14 years to put a fork in this flagrant debacle, but punts every time because it is a bottomless pit of taxpayer funds, and a plethora of union jobs. It doesn’t matter to the majority party if anything is ever built.

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#### HSR projects filled with waste, fraud, abuse and cost overruns

Ralph Vartaben, July 18, 2022, Will a new oversight position help California's high-speed rail plans get on track?, https://paloaltoonline.com/news/2022/07/18/will-a-new-oversight-position-help-californias-high-speed-rail-plans-get-on-track

**After a decade of cost, schedule, technical, regulatory, personnel and legal problems, the California high speed rail project will be getting an inspector general s**oon as part of a deal between Gov. Gavin Newsom and the Legislature. The new investigative position is intended to intensify oversight and improve performance of the $105 billion railroad project. Enthusiasm for the change is high, but whether it will fix everything is uncertain, even among state leaders. **"There is nothing but problems on the project**," said Speaker Anthony Rendon, a Lakewood Democrat. "The inspector general provides oversight and some sense of what is going on with management. That has been missing for a long time." But will it work? "We don't know," Rendon said. "We need to be vigilant. The IG will provide what we need to carry that out." Until now, **a variety of outside agencies have advised the Legislature and the governor on the project, resulting in recommendations that often were not carried out. In some cases, they required changes that nobody had the power to make and in other cases carried too high a political price with outside interest groups**. In 2012, the Legislative Analyst's Office recommended against an appropriation to start construction, arguing the California High-Speed Rail Authority wasn't prepared. Gov. Jerry Brown lobbied the Legislature for it and won. Now, many agree the LAO was right. The Peer Review Group has long warned that the state needs a secure financing plan. But the project proceeds without one. Such **outside advisors have lacked the resources and the mission to intensively delve into the day to day work of the rail project, its army of consultants and its stable of international contractors.** "The IG will bring a level of oversight that we have not had before," said Helen Kerstein, the lone bullet train expert at the Legislative Analyst's office. "This is very powerful." The law creating the inspector general lists a wide range of authorities the new office will have: full access to all the project's records; authority to review contracts and change orders; and issuing subpoenas for witnesses and records, among much else. "It is not some person sitting in a basement," said Laura Friedman, chair of the Assembly Transportation Committee who is widely credited with pushing through the inspector general idea. "It is going to be staffed. It is going to be real." **That would include investigating waste, fraud and abuse, as well as working with law enforcement and prosecuto**rs, she said. What the position might look like How big an organization will it require? So far, there is no budget. But the inspector general for the high-speed rail project would be paid the same as the inspector general for the California Department of Corrections and Rehabilitation, who makes $192,382 and will have a staff of 212 in the coming fiscal year. Fred Weiderhold, a West Point civil engineer who served for 20 years as Amtrak's inspector general, said if he were taking the California job, he would want to start with a staff of at least 50 people, half auditors, 30% investigators and 20% inspectors and evaluators. "It is a daunting job," Weiderhold said about the California project. "You have to follow the money. I guarantee you **that on any project this large you will have fraud, product substitution and waste."** ■ Health care costs keep rising. A new California agency aims to fix that ■ Lisa Forssell makes it official. She is running for Palo Alto City Council ■ Around Town: Little League team makes strong showing at regional tournament ■ Man gets 40-year prison sentence for mailing bombs as revenge against law enforcement ■ Will a new oversight position help California's high-speed rail plans get on track? By the time Weiderhold left as Amtrak inspector general, he had helped put several hundred people in jail and caused 2,000 people to be fired. The high speed rail inspector general will not have authority to control actual spending, a decision that was considered and rejected by Newsom. A more aggressive plan was followed by the Massachusetts Bay Transportation Authority in 2015, when it faced a breakdown in Boston area service and spiraling capital cost overruns. State lawmakers fired the authority's existing board and installed a new Fiscal and Management Control Board. **Estimated construction costs on *a 4.3 mile extension* of a light rail line had grown from $1 billion to $2 billio** n, said Joe Aiello, the board's chair. The board stopped work, threw out existing contractors and put in an independent team to evaluate what was going wrong, he said. "There was outrageous scope creep," Aiello said. By the time the board was dissolved last year, the construction cost had been hammered back down to $1 billion, he said. State still needs actual train Even while increasing oversight, the deal doubles down on the bullet train mission. An appropriation will release $4.2 billion from a 2008 bond fund, but only for completing a 171-mile Central Valley segment from Bakersfield to Merced. "They need to deliver something soon that the public understands is a train," Friedman said. Newsom met another Assembly demand by adding $3.5 billion for transit projects in the Bay Area and Southern California, as well as $300 million to fix an Orange County Amtrak rail that is ready to fall into the Pacific. "You can't have enough oversight on a project like this," Friedman said. "This is not a minor change. It will be a very big change for the project.

### Extensions – Other Countries Are Different

#### U.S. cannot extrapolate from the adoption of HSR in other countries – regions were more densely populated and rails were already overcrowded

**Peterman, Frittelli, and Mallett ‘09** –Analyst in Transportation Policy, Specialists in Transportation Policy, from the Congressional Research Service- prepares information for members and committees of Congress (“High Speed Rail (HSR) in the United States” CRS Report for Congress, December 8 2009, p. 6, http://www.fas.org/sgp/crs/misc/R40973.pdf

Proponents of HSR often cite the networks in these countries, with the implication that their adoption of HSR makes the feasibility and desirability of building HSR lines in the United States unquestionable. But to extrapolate from the adoption of HSR in other countries to the conclusion that the United States should follow a similar path may not be warranted. The motives that led other countries to implement very high speed rail lines are varied; some, like Japan and China, did so originally in part to meet the demand on already overcrowded conventional rail lines, while others did so in part to try to preserve rail’s declining mode share in the face of the growing role of car and air travel. In most cases, the regions served were more densely populated than most areas in the United States.

#### Other countries’ HSR systems are not analogous – they have higher population densities, smaller land areas, lower levels of car ownership, higher gas prices

**Peterman, Frittelli, and Mallett ‘09** –Analyst in Transportation Policy, Specialists in Transportation Policy, from the Congressional Research Service- prepares information for members and committees of Congress (“High Speed Rail (HSR) in the United States” CRS Report for Congress, December 8 2009, p. 7, http://www.fas.org/sgp/crs/misc/R40973.pdf)

The relative efficiency of HSR as a transportation investment varies among countries, as its level of usage is likely to depend on the interplay of many factors, including geography, economics, and government policies. For example, compared to the United States, countries with HSR have higher population densities, smaller land areas, lower per capita levels of car ownership, higher gas prices, lower levels of car use (measured both by number of trips per day and average distance per trip), and higher levels of public transportation availability and use. Also, there is a significant difference in the structure of the rail industry in these countries compared to the United States. In virtually all of those countries, high speed rail was implemented and is operated by state-owned rail companies that operate over a state-owned rail network, a network on which passenger rail service was far more prominent than freight service even before the introduction of high speed rail. By contrast, in the United States the rail network is almost entirely privately owned, and freight service is far more prominent than is passenger service. Yet even with the introduction of HSR, and with other factors that are more conducive to intercity passenger rail use than in the United States, in most of these countries intercity rail travel (including both conventional and high speed rail) represents less than 10% of all passenger miles traveled on land.18

#### U.S. and Europe and too different for HSR to be successfully replicated

**McKendrick, ’10** - independent analyst who tracks the impact of information technology on management and markets. He is the author of the SOA Manifesto and has written for Forbes, ZDNet and Database Trends & Applications (Joe, “High-Speed Rail Helps the European economy; Can it Help the US?”, smartplanet.com, 3/10/10, https://www.zdnet.com/article/high-speed-rail-helps-european-economy-can-it-help-the-us/

However, the impressive impact of high-speed rail across the European continent may not be seen as widely across North America. For one, the residents of European nations have always been more closely tied to their rail systems as primary transportation networks.  In the US, the Amtrak system has been a bare-bones system connecting major hubs, but rarely seen outside the Northeast corridor as a significant mode of transportation. European cities are denser and more centralized than North American cities, and therefore more in reach of train stations. Over the past 50 years, North American urban areas have decentralized to the point where residents are scattered across areas up to a hundred miles in distance from urban or suburban cores.

#### **Europe and Japan are not analogous – land uses are denser, cities are closer together, and regulated transportation sectors were less competitive**

Levinson et al 1997 (David, Fellow at the Institute of Transportation Studies, “The full cost of high-speed rail: an engineering approach”, <http://128.101.119.3/Courses/Cases/CE5212/F2009/CS2/cba.pdf>, LCS)

It is doubtful that without considerable subsidy high-speed rail could be constructed, much less profitable *in California.* These subsidies are anticipated to be higher than *those* required *in other countries.* **The conditions in Europe and Japan during the early stages of high-speed rail are significantly different than most parts of the United States. Land uses are denser and cities are closer together.** *Furthermore, constraints on federal spending in the 1990’s hinder the development of new infrastructure.* **A last key distinction is that the regulated transportation sectors in Japan and Europe prevented competition from air travel to the same degree as in the United States when the HSR lines were planned and deployed. Had air travel been deregulated and privatized at the time, the decision to proceed with high-speed rail, particularly in Europe, may have been different***. As an illustration of this, Southwest Airlines is a major opponent of high-speed rail in Texas (Krumm 1994). As with all rail modes, there is a significant amount of inflexibility associated with the system design.* The high-speed networks are limited, and the rails require very specific vehicles. Compared with the greater flexibility afforded the untracked air travel system or the ubiquitous highway system, high-speed rail faces serious difficulties*. However, should such a system be built, it can be expected to increase the commuter sheds of both the San Francisco Bay area and Los Angeles to include Central Valley cities. A one hour commute, while on the long end of acceptable, would now be much farther away through the use of lo- cal high-speed trains. On the other hand,* total travel between the two metropoles would likely increase very little, since the time and cost savings of even non-stop high-speed rail against the existing frequent air service from the three Bay area and five Los Angeles airports are minimal*.*

### Climate Answers

#### Electricity that powers the HSR will be produced with fossil fuels

Martin Engel, 6-25, 2021, A Summary Reality Check of Why High-Speed Rail is a Bad Idea, https://patch.com/california/menlopark-atherton/bp--a-summary-reality-check-of-why-high-speed-rail-ised91096912

It promises to be a panacea but can't and won't deliver on any of those promises. It won't reduce traffic grid-lock in our population centers. It won't reduce air pollution, only re-locate it to coal-fired power plants. It's construction will create air pollution we will "pay for" for generations. Due to high speeds and high power consumption, it will consume fossil fuels in massive quantities elsewhere. It will be a very modest job creator and it's benefits to the economy are highly questionable.

#### HSR does not reduce greenhouse gas emissions – building infrastructure increases emissions and the electricity will be produced by fossil fuels

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

High**‐​speed rail construction also releases a huge amount of greenhouse gases, particularly for concrete ties, steel rails, and other construction materials**. One study predicted that building California’s 520‐​mile line would release 9.7 million metric tons of greenhouse gases, or 18,650 tons per mile. Assuming that California’s high‐​speed trains would fill, on average, 50 percent of their seats, the study estimated that operating those trains would reduce greenhouse gases but that it would take 71 years to repay the construction cost.40 **Since rails, concrete ties, and other infrastructure must be replaced or rebuilt every 30–40 years—and even more frequently on lines with frequent train service—and since such replacements would require the release of more greenhouse gases,** the savings would never make up for the cost. Even if we ignore construction emissions, high‐​speed rail does not appear to offer any environmental benefits. Outside of the West Coast and a few other states, **most of the electricity that would power U.S. high‐​speed trains is generated by burning fossil fuels, so rail wouldn’t significantly reduce greenhouse gas emissions at all**. While green‐​energy advocates hope to eventually replace fossil fuels, adding trains to electrical demands would simply increase the time and effort required to build a non‐​fossil‐​fuel electrical system.

#### Alternative energy is not used to power transportation

Matt McGrath, June 15, 2022, Climate change: Green energy 'stagnates' as fossil fuels dominate, https://www.bbc.com/news/science-environment-61802802

**A new study says that the world is using more fossil fuels than ever as the transition to green energy stalls**. The Renewables 2022 Global Status Report says **the share of wind and solar in the global energy mix has risen minimally in the last decade.** While renewables boomed in the electricity sector last year, they didn't meet the overall rise in demand. ***In transport, which accounts for a third of energy, renewables provided less than 4%.*** Their 17th annual status report draws on over 600 experts to produce a snapshot of what is really happening in terms of renewable energy. The study says that the transition to renewables, in essence, has stalled. **The use of coal, oil and gas continues to dominate total energy consumption. "And since the energy demand is rising, this actually means that we are consuming more fossil fuels than ever."** As the world rebounded from Covid-19 in 2021, there was a significant rise in overall energy use, most of which was met by fossil fuels. **This resulted in a major rise in carbon emissions,** which increased globally by around 2 billion tonnes. Since then, as supplies have struggled to keep up with demand, the prices of oil, gas and coal have risen sharply. The Russian invasion of Ukraine has added to the uncertainty and seen governments scampering to find alternative sources. As energy prices have risen for consumers, some countries, including the UK, have imposed new taxes on the profits made by oil and gas producers. However**, many nations have also enacted new subsidies for fossil fuels.** "We're spending globally $11m per minute on subsidising fossil fuel. In 2020, this was 7% of the global GDP," said Rana Adib. "This obviously creates a system which is unbalanced, because even though renewable energy is an economic alternative to fossil fuels, it's not playing in a fair market." **While renewable energy had reached 10% of global electricity production in 2021, the problems lie in challenging areas such as transport.** Cars, lorries, ships and airplanes account for 32% of total final energy consumption, but green energy only had a 3.7% share last year. According to Rana Adib, the slow progress underlines the critical importance of policies in moving markets and attitudes. "The reality is with a ban of the internal combustion engine, there's a regulatory obligation to move away from this, so we see a trend in electric mobility, which is ramping up in quite an exponential way, and I think this is quite encouraging." There's also been a lack of progress on the political promises made at COP26, the big international climate conference last year. Growing crops in the shade of solar panels is termed agrivoltaics While 135 countries had net zero emissions targets for 2050 in the run up to the meeting in Glasgow, only 84 had economy-wide targets for renewables. But that was before the world changing events of the past six months. The surging prices of energy mean governments are now reaching for every tool to ease the burden on their citizens. And that could possibly see a big rise in spending on greener sources, as they are not just much cheaper than fossil fuels, they are more attractive for other reasons as well. "The energy transition is our lifeline," said Teresa Ribera, a vice president in Spain's government. "It will enable innovative business models and forms of organisation, transform value chains, redistribute economic power and shape governance in new, more people-centred ways. "With the right investments in technology, renewables are the only energy sources offering every country in the world a chance for greater energy autonomy and security."

#### There isn’t enough copper for a renewable energy transition

Maxime Joselow, July 14, 2022, Washington Post, Climate goals face major headwinds, two reports say, https://www.washingtonpost.com/politics/2022/07/14/climate-goals-face-major-headwinds-two-reports-say/

Meanwhile, **the S&P Global study highlights that global net-zero goals are heavily dependent on the supply of copper, which is essential to electric vehicle batteries, offshore wind turbines, solar cells and other green technologies**. The report looks at two scenarios: a “rocky road” scenario in which current trends continue, and a “high ambition” scenario in which copper mines increase their output and countries ramp up their recycling of copper from discarded equipment. Under the “rocky road” scenario, the study predicts annual copper shortfalls of nearly 10 million metric tons in 2035. **Even under the “high ambition” scenario, it projects a deficit of nearly 1.6 million metric tons in 2035**. “People talk a lot about lithium and cobalt, but **copper is the metal of electrification**,” Dan Yergin, vice chairman of S&P Global and a co-author of the study, told The Climate 202. “And even under an optimistic scenario, we see a significant shortfall." **The looming copper shortage imperils not only governments' climate pledges, but also automakers' commitments to selling more electric vehicles, the study says. The average EV uses roughly 2½ times more copper than an existing internal combustion engine car, according to the analysis.** “EVs are definitely the big drivers of the copper demand increase in the clean-energy transition,” Olivier Beaufils, director of energy transition consulting for S&P Global Commodity Insights and another co-author of the study, told The Climate 202.

#### HSR construction increases CO2 emissions

**Lin, 2020**, Jianyi Lin,1 Shihui Cheng,1,2 Huimei Li,1 Dewei Yang,3 and Tao Lin1,\*, 1Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China; nc.ca.eui@nilyj (J.L.); nc.ca.eui@ilmh (H.L.) 2University of Chinese Academy of Sciences, Beijing 100049, China 3School of Geographical Sciences, Southwest University, Chongqing 400715, China; Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line, Int J Environ Res Public Health. 2020 Jan; 17(1): 105, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6981942/>,

Only CO2 was considered for greenhouse gases during the construction of the Beijing–Tianjin intercity HSR. At this stage, CO2 emissions were mainly derived from the upstream production of the materials and energy consumption of the construction equipment. As depicted in Figure 2, the CO2 emissions from the different subsystems and sectors were calculated, and the total emission caused by the construction period was 3451.7 kt. Among the different subsystems, bridges contribute the largest CO2 emissions in the entire stage with 2186.4 kt CO2, accounting for 63.3%. Considering the straight route, road settlement, and land savings, the construction of HSRs results in a large number of bridges. The Beijing–Tianjin intercity HSR line used 100.6 km of bridges to overcome the above factors, corresponding to 83.8% of the length, thereby leading to large volumes of materials and energy consumption. Rail systems rank second, with 518.6 kt CO2, accounting for 15.0%. The emissions from EMUs rank third, with 339.3 kt CO2, accounting for 9.8%. The remaining subgrade, station, and electric subsystems contribute 131.9, 228.8, and 46.6 kt CO2, respectively, accounting for a total of 11.8%.

For the emission sources, the CO2 emission caused by the upstream production of materials was 3094.5 kt, accounting for 89.7%. The metal smelting and rolling industry sector was the largest emitter with 1775.5 kt CO2, accounting for 51.4%. The non-metallic mineral production sector was the second largest emitter with 736.4 kt CO2, accounting for 21.3%. The third largest emitter was the transport equipment manufacturing sector with 450.2 kt CO2, accounting for 13.0%. A large number of metal products, organic raw materials, and earth and stones were used in the construction, leading to huge amounts of CO2 discharge in these sectors. Direct energy uses emit 357.2 kt CO2, accounting for 10.3% in the construction stage. The direct energy uses of bridges contribute the highest CO2 emission with 295.1 kt CO2, accounting for 82.6% of the entire direct energy uses. Subgrades rank second with 33.6 kt, accounting for 9.4%. The third largest contributor was rail systems with 18.0 kt CO2, accounting for 5.0%, and the remaining subsystems emitted a total of 10.5 kt CO2, accounting for 3.0%.

#### Industrial sector overwhelms transportation sector for CO2 emissions

Maxime Joselow, July 14, 2022, Washington Post, Climate goals face major headwinds, two reports say, https://www.washingtonpost.com/politics/2022/07/14/climate-goals-face-major-headwinds-two-reports-say/

But “uncertainty reigns,” the study says, when it comes to Democrats' long-stalled budget reconciliation bill and the Environmental Protection Agency's regulation of power plants following a recent Supreme Court ruling. Other sector-specific findings include: **The industrial sector is expected to overtake the transportation sector as the nation's largest source of greenhouse gas emissions in the early 2030s.**

#### US military emissions mean no CO2 solvency

Martinson, July 14, 2022, Sue Ann Martinson is a member of WAMM’s End Military Madness Against the Earth action group and an associate member of Veterans for Peace, Chapter 27. She edits and publishes an online alternative news and news analysis source, Rise Up Times: Media for Justice and Peace (riseuptimes.org), Ignoring How Militarism Fuels Climate Change Will Be the Death of Us, https://scheerpost.com/2022/07/14/ignoring-how-militarism-fuels-climate-change-will-be-the-death-of-us/

U.S. Military CO2 emissions make the U.S. #1 polluter worldwide. [Costs of War / Banner by Bruce Berry, Veterans for Peace] **There’s a Pentagon-sized hole in President Biden’s plans to cut government CO2, carbon, and greenhouse gas emissions**. Biden signed an executive order in January 2022 directing the government to reach 100 percent carbon-free electricity by 2030 and net-zero emissions by 2050 in line with COP26 goals. It also calls for eliminating climate pollution from federal buildings and vehicles. As E&E News reports: “But **the executive order exempts anything related to national security, intelligence, or military combat and training. That means Biden’s order covers only a fraction of federal emissions**. While military leaders insist they share the president’s decarbonization goal there is no plan for them to meet it.” **The military has actually done very little to decrease CO2 emissions and other pollutants, greenwashing their actions to end climate change. “Since 2001, the military has accounted for 77 to 80 percent of federal energy use**, according to the Costs of War 2019 study released by Brown University’s Watson Institute for International and Public Affairs.” Costs of War Screen Shot 2022-06-10 at 6.00.38 PM.png In the April 2022 webinar “The Ecology of War,” Prof. Neta Crawford, co-director of the Costs of War project at Brown University’s Watson Institute and Prof. Alan Robock, co-director of the Rutgers Impact Studies of Climate Intervention (RISC) lab, discuss the role of the military in the climate crisis. Crawford says most technological innovations the military produce are only useful for military purposes: “I wouldn’t want the military leading us to the green transition that we need. Commercial, that is civilian technology, would be much better suited to making a rapid transition.” Prof. Robock elaborates: “There’s enough wind and sun on the earth to power the whole earth with solar panels and windmills, and we just need a little bit better storage and ways to transmit it. So we don’t need them to help, we need them to get out of the way and stop emitting CO2.” Neta Crawford goes on to say that “the climate crisis will kill people: it already is.” The solution to global warming is to leave the fossil fuels in the ground and switch as quickly as we can to renewable sources: “We are up against two massive power centers though, the fossil fuel industry and the military-industrial complex. They make lots of money and have armies of lobbyists going to Congress telling them other things and giving them money so that they can run for re-election. It’s very frustrating fighting against that, but that’s what we’re up against.” Addressing the climate crisis requires holding the military-industrial-congressional complex accountable and dismantling that complex, as well as holding President Biden accountable for exempting the military from cutting federal emissions. Michael T. Klare, a founder of the Committee for a Sane U.S.-China Policy whose latest book is “All Hell Breaking Loose: The Pentagon’s Perspective on Climate Change,” offers a bleak view in TomDispatch of what will happen if we follow the warfare state instead of choosing to save the planet—a track the leaders of state are now pursuing instead of cooperating around the climate crisis. **While Biden frames perpetual war as being about freedom and democracy, others see it as raw imperialism—as U.S. corporate wars of hegemony and empire—and continued oppression by the ruling elites to maintain their own power and profits at great expense to the poorer countries on earth in the Global South.**

### Extension – Construction Increases CO2

#### Construction with concrete emits CO2

Rebecca Leber, April 4, 2022, VOX, What’s really holding the world back from stopping climate change, https://www.vox.com/23009894/un-ipcc-climate-mitigation-report-ar6-summary

At the same time, **materials like cement also inherently produce greenhouse gases. Every pound of concrete made with cement emits about 0.93 pounds of carbon dioxide**. That means the main ways to reduce emissions from making these materials is to use less of them, invent a new way of making them, or to soak up their equivalent emissions directly from the air. All of these pose huge technical and cost challenges.

### Extension – Can’t Solve Emissions

#### Can’t solve coal and China

Ben Adler, March 23, 2022, Yahoo News, The world has less than 10 years to avert climate change catastrophe, report finds, https://news.yahoo.com/the-world-has-less-than-10-years-to-avert-climate-change-catastrophe-report-finds-210017930.html

Among the worrisome trends for climate change, **coal use surged in 2021**, accounting for 40% of the increase in emissions, according to a recent report by the International Energy Agency (IEA). Transportation was the only economic sector for which emissions remained well below 2019 levels, but that was due to an overall decrease in driving due to the coronavirus pandemic rather than improved fuel efficiency. “**The emissions reduction impact of record electric car sales in 2021 was canceled out by the parallel increase in sales of SUVs**,” the IEA noted. **With its population of more than 1.4 billion and its rapid economic growth, China is particularly responsible for growing emissions.** According to the IEA**, “electricity demand in China jumped by 10% in 2021, adding the equivalent of the total demand of all of Africa.”**

### Extensions – HSR Won’t Reduce CO2

#### HSR will barely have an effect on CO2

**Morris**, 7/24/**2009** (Eric A. – researcher at University of California, Los Angeles’s Institute of Transportation Studies, High-Speed Rail and CO2, Freakonomics, p. http://www.freakonomics.com/2009/07/24/high-speed-rail-and-co2/

This is a long list and the blog is a short medium. So for now let’s just consider the final point about HSR’s environmental benefits. Under some conditions, there is no doubt that an HSR system would reduce greenhouse emissions. Unfortunately, a study undertaken by the consulting firm Booz Allen Hamilton for the U.K. Department for Transport raises some troublesome questions about whether these conditions can be met in reality. Booz Allen considered two potential U.K. HSR lines (London-Manchester and London-Edinburgh/Glasgow). They found that the CO2 emissions required to move HSR passenger seats were about the same as those required to move automobile seats — hardly a slam dunk for rail. In fact, intercity bus came out considerably cleaner than HSR on a per-seat-mile basis. HSR would emit less on a per-seat mile basis than air travel. But the major caveat is that all of these figures consider emissions from operations only, without taking into account the very large amount of pollution that will be created in the construction of the HSR system. When the emissions spewed by all those earth movers, tunnel boring machines, bulldozers, trucks, cranes, etc. are taken into account, the carbon advantage for HSR vis a vis air travel largely evaporates

#### HSR will not reduce CO2 emissions --- population density and construction costs

**Upham**, 7/29/**2009** (BC, High Speed Rail? Not so Fast., Triple Pundit, p. <http://www.triplepundit.com/2009/07/high-speed-rail-not-so-fast/>)

A recent study by Booz Allen Hamilton, commissioned by the UK Department for Transport, suggests that the net CO2 emissions of a proposed HSR line from London to Manchester would be greater, over 60 years, than if it was never built at all – even if every air passenger switched to rail. Currently, rail holds a 54% share of the air/rail market between the cities. For a proposed line from London to Edinburgh, Scotland, CO2 emissions would drop below “doing nothing” only if 62% of passengers took the train, up from 15% now. Taking the train is still cleaner than flying, but the study takes into account not only emissions during operations, but also CO2 emitted in the building of a new HSR line: the pollution from cranes and bulldozers, building new stations, and everything else required in laying down new tracks. For the United States, the same analysis could be even further weighted towards planes over trains, because this country is not as densely populated as the UK, and thus rail is less likely to capture the market share necessary to reach the same levels of emissions (“emissions parity”) as doing nothing.

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### Extensions – HSR Increases CO2

#### Building HSR substantially increases CO2 emissions

**Jianyi Lin, 2020,** Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China, 2020, Environmental Footprints of High-Speed Railway Construction in China: A Case Study of the Beijing–Tianjin Line,

Only CO2 was considered for greenhouse gases during the construction of the Beijing–Tianjin intercity HSR. At this stage, CO2 emissions were mainly derived from the upstream production of the materials and energy consumption of the construction equipment. As depicted in Figure 2, the CO2 emissions from the different subsystems and sectors were calculated, and the total emission caused by the construction period was 3451.7 kt. Among the different subsystems, **bridges contribute the largest CO2 emissions in the entire stage** with 2186.4 kt CO2, accounting for 63.3%. Considering the straight route, road settlement, and land savings, **the construction of HSRs results in a large number of bridge**s. The Beijing–Tianjin intercity HSR line used 100.6 km of bridges to overcome the above factors, corresponding to 83.8% of the length, thereby leading to large volumes of materials and energy consumption. Rail systems rank second, with 518.6 kt CO2, accounting for 15.0%. The emissions from EMUs rank third, with 339.3 kt CO2, accounting for 9.8%. The remaining subgrade, station, and electric subsystems contribute 131.9, 228.8, and 46.6 kt CO2, respectively, accounting for a total of 11.8%.

For the emission sources, **the CO2 emission caused by the upstream production of materials was 3094.5 kt, accounting for 89.7%. The metal smelting and rolling industry sector was the largest emitter** with 1775.5 kt CO2, accounting for 51.4%. The non-metallic mineral production sector was the second largest emitter with 736.4 kt CO2, accounting for 21.3%. The third largest emitter was the transport equipment manufacturing sector with 450.2 kt CO2, accounting for 13.0%. **A large number of metal products, organic raw materials, and earth and stones were used in the construction, leading to huge amounts of CO2 discharge in these sectors**. Direct energy uses emit 357.2 kt CO2, accounting for 10.3% in the construction stage. The direct energy uses of bridges contribute the highest CO2 emission with 295.1 kt CO2, accounting for 82.6% of the entire direct energy uses. Subgrades rank second with 33.6 kt, accounting for 9.4%. The third largest contributor was rail systems with 18.0 kt CO2, accounting for 5.0%, and the remaining subsystems emitted a total of 10.5 kt CO2, accounting for 3.0%.

#### HSR will add CO2 emissions --- advancing fuel efficiency technologies guarantees the status quo will solve

**O’Toole**, 9/9/**2009** (Randal – senior fellow with the Cato Institute, High-Speed Rail Is Not “Interstate 2.0”, https://www.cato.org/sites/cato.org/files/pubs/pdf/bp113.pdf

Substituting more realistic assumptions greatly changes the results. In the 19 years between 1975 and 1994, automobile fuel economies increased by 33 percent and commercial airline economies increased by 44 percent. 54 If they achieve similar efficiencies in the 19 years between 2006 and 2025, and if the average auto carries 2.4 people in intercity travel and the average high-speed train fills only 51 percent of its seats, then rather than save 2.3 million metric tons of CO2 per year, high speed trains would instead add 220,000 metric tons of CO2 to the atmosphere each year. Moreover, not building high-speed rail would save huge amounts of energy and millions of tons of CO2 that would otherwise be used and released during construction. Even if all the Center for Clean Air Policy’s optimistic assumptions proved correct, high speed rail would not be a cost-effective way of reducing greenhouse gas emissions. McKinsey and Company estimates the United States can cut its greenhouse gas emissions in half by 2030 by investing in technologies that cost no more than $50 per metric ton of abated emissions. 55 But if high-speed rail costs $90 billion, then the cost per metric ton averages well over $3,000. For every ton abated through the use of high-speed rail, more than 60 tons of abatement could have been carried out using more cost-effective programs that reduce CO2 at a cost of $50 a ton or less. People who truly want to save energy should focus on intercity buses, which are far more energy efficient than high-speed rail, and on improving the energy efficiency of auto driving. 56 Traffic congestion wastes nearly 3 billion gallons of fuel per year, and low-cost solutions to congestion, such as traffic signal coordination, could save far more energy at a tiny fraction of the cost of high-speed rail. 57 Conclusion High-speed rail is a technology whose time has come—and gone. What might have been useful a century ago is today merely an anachronism that would cost tax payers tens or hundreds of billions of dollars yet contribute little to American mobility or environmental quality. The most ardent supporters of high-speed rail predict that the FRA plan would carry the average American less than 60 miles per year, and in most places outside of California the average would be even less. By comparison, the average American travels by automobile more than 15,000 miles per year. The environmental benefits of high-speed rail are similarly miniscule, and when added to the environmental costs of building high-speed rail lines the net result is certainly negative.

#### HSR emits more greenhouse gases than it saves --- electricity power and construction

**O’Toole**, 5/4/**2009** (Randal – senior fellow with the Cato Institute, High-Speed rail is No Solution, Cato Institute, p. <http://www.cato.org/publications/commentary/highspeed-rail-is-no-solution>)

Construction of such high-speed rails will consume enormous amounts of energy and emit enormous volumes of greenhouse gases. Since future cars and planes will be more energy efficient, there are likely to be no long-term environmental benefits from investment in high-speed rail. Electricity would power the California trains. But, because most U.S. electricity comes from coal or other fossil fuels, these high-speed trains won't reduce emissions of greenhouse gases. As we develop more renewable sources of electricity, we would do better using it to power plug-in hybrids or electric cars than high-speed rail.

#### HSR’s reduction in CO2 is small and may take decades to compensate for the emissions caused by construction

**Albalate 12**, assistant professor of economics at the University of Barcelona, (Daniel, “ High-Speed Rail: Lessons for Policy Makers from Experiences Abroad”, Public Administration Review, April 2009, Political Science Complete

Clearly, the overall impact of HSTs on energy consumption is heavily dependent on the source of its traffic—whether it is newly generated or attracted from previously existing modes (and, in the case of road transportation, whether it replaces cars or buses). However, **HSR is not a** particularly **useful tool for fighting carbon dioxide emissions**, **as it is less environmentally efficient than conventional modern trains**. Further, **building a new** and separate **HST line involves significant carbon dioxide emissions** that environmental **HST analyses do not take into account** (together with the environmental impact caused by land take, noise, and visual disruption). In fact, Kageson concludes, after presenting evidence comparing the environmental impact of different transport modes, that the **reduction of carbon dioxide through HSR building** **“is small and it may take decades** for it **to compensate for the emissions caused by construction** . . . Indeed, **it will take too long** fortraffi c **to off set the emissions caused by building the line.** Under these circumstances it may be better to upgrade an existing line to accommodate for somewhat higher speeds as this would minimize emissions from construction and cut emissions from train traffi c compared to HSR” (2009, 25).

**Tutton 11** (Mark is a staff writer for CNN.com, a credible news source. “How green is high-speed rail?” http://www.cnn.com/2011/11/18/world/how-green-is-hsr/index.html

The UK is currently mulling over a high speed rail link between London and Birmingham, a city about 160 kilometers north-west of the capital. But according to official estimates, is unlikely to lead to significant carbon dioxide cuts -- and may even increase climate-changing emissions. So what's stopping high speed rail being a major part of a greener transport future in Britain? First there's the electricity to power the trains. Over two thirds of the world's electricity comes from fossil fuels so until (or unless) power stations are weaned off fossil fuels, electric trains will still have a significant climate impact -- although rail travel is still better than flying or driving.

### Extensions – No Renewables

#### No transition to renewable energy now

Matt McGrath, June 15, 2022, Climate change: Green energy 'stagnates' as fossil fuels dominate, https://www.bbc.com/news/science-environment-61802802

**A new study says that the world is using more fossil fuels than ever as the transition to green energy stalls**. The Renewables 2022 Global Status Report says **the share of wind and solar in the global energy mix has risen minimally in the last decade.** While renewables boomed in the electricity sector last year, they didn't meet the overall rise in demand. ***In transport, which accounts for a third of energy, renewables provided less than 4%.*** Their 17th annual status report draws on over 600 experts to produce a snapshot of what is really happening in terms of renewable energy. The study says that the transition to renewables, in essence, has stalled. **The use of coal, oil and gas continues to dominate total energy consumption. "And since the energy demand is rising, this actually means that we are consuming more fossil fuels than ever."** As the world rebounded from Covid-19 in 2021, there was a significant rise in overall energy use, most of which was met by fossil fuels. **This resulted in a major rise in carbon emissions,** which increased globally by around 2 billion tonnes. Since then, as supplies have struggled to keep up with demand, the prices of oil, gas and coal have risen sharply. The Russian invasion of Ukraine has added to the uncertainty and seen governments scampering to find alternative sources. As energy prices have risen for consumers, some countries, including the UK, have imposed new taxes on the profits made by oil and gas producers. However**, many nations have also enacted new subsidies for fossil fuels.** "We're spending globally $11m per minute on subsidising fossil fuel. In 2020, this was 7% of the global GDP," said Rana Adib. "This obviously creates a system which is unbalanced, because even though renewable energy is an economic alternative to fossil fuels, it's not playing in a fair market." **While renewable energy had reached 10% of global electricity production in 2021, the problems lie in challenging areas such as transport.** Cars, lorries, ships and airplanes account for 32% of total final energy consumption, but green energy only had a 3.7% share last year. According to Rana Adib, the slow progress underlines the critical importance of policies in moving markets and attitudes. "The reality is with a ban of the internal combustion engine, there's a regulatory obligation to move away from this, so we see a trend in electric mobility, which is ramping up in quite an exponential way, and I think this is quite encouraging." There's also been a lack of progress on the political promises made at COP26, the big international climate conference last year. Growing crops in the shade of solar panels is termed agrivoltaics While 135 countries had net zero emissions targets for 2050 in the run up to the meeting in Glasgow, only 84 had economy-wide targets for renewables. But that was before the world changing events of the past six months. The surging prices of energy mean governments are now reaching for every tool to ease the burden on their citizens. And that could possibly see a big rise in spending on greener sources, as they are not just much cheaper than fossil fuels, they are more attractive for other reasons as well. "The energy transition is our lifeline," said Teresa Ribera, a vice president in Spain's government. "It will enable innovative business models and forms of organisation, transform value chains, redistribute economic power and shape governance in new, more people-centred ways. "With the right investments in technology, renewables are the only energy sources offering every country in the world a chance for greater energy autonomy and security."

#### China proves no solvency without renewable energy

Luo Wangshu, High-speed rail cuts greenhouse gas emissions, Nov 09,2021, http://english.www.gov.cn/news/topnews/202111/09/content\_WS6189b5f2c6d0df57f98e4b0e.html

China's high-speed railway network has led to a significant reduction in greenhouse gas emissions, a recent study has shown.

Published in the journal Nature Climate Change last month, the study was carried out by researchers from Singapore, Hong Kong and the Chinese mainland. The research found that the high-speed railway connection has led to an annual reduction of nearly 11.2 million metric tons of carbon dioxide equivalent greenhouse gas emissions by replacing road traffic, equal to 1.33 percent of greenhouse gas emissions in China's transport sector. Researchers explained that the mitigation came from more cargo being switched to greener regular-speed trains instead of roads. With the development of the high-speed railway network, passengers have more choices and opt for bullet trains, which opens up capacity on slower trains for freight shipments. **The research also found that the Beijing-Shanghai High-Speed Railway**－one of China's busiest high-speed railway lines and which opened in 2011－**led to the highest overall reduction of emissions of 2.39 million tons per year on average.** **The study also found the current electricity-powered high-speed railway network in China produces more emissions than cars since electricity production in the country relies heavily on coal.**

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### Air Pollution Answers

#### HSR does not reduce particulate

Guo, December 2020, XiaoyangGuoaWeizengSunbShuyangYaocSiqiZhengd China State Construction Engineering Corporation, Beijing 100029, China School of Economics, Central University of Finance and Economics, Beijing 100081, China Hang Lung Center for Real Estate, and Department of Construction Management, Tsinghua University, Beijing 100084, ChinaSustainable Urbanization Lab, Department of Urban Studies and Planning, Center for Real Estate, Massachusetts Institute of Technology, ransportation Research Part D: Transport and Environment, Does high-speed railway reduce air pollution along highways? —— Evidence from China, https://www.sciencedirect.com/science/article/abs/pii/S1361920920307938

To fill this gap, **this paper uses 23 HSR lines that were newly opened during 2015–2016 for an empirical investigation** on how HSR affects the air quality along the highways affected by those HSRs. There are two empirical challenges here. First, it is crucial to know the exact locations of the highways that are affected by HSR. In other words, the areas where the highway traffic flow decreases because of the opening of HSR are unknown. Second, the opening of HSR and its related air pollution may simultaneously be affected by some unobserved local economy factors, making it difficult to draw the causal inference. To address the first issue, we firstly use the optimal route planning function of Gaode Map to identify the highways that are affected by each newly opened HSR. Then we collect air quality monitoring data and identify monitoring stations located within 10 km of the affected highways as treatment monitoring stations, to estimate the changes in air pollution due to HSR’s opening. For the second issue, we use the opening of HSR as a quasi-natural experiment. The difference-in-differences (DID) method assists in addressing the omitted variable problem. In this way, the monitoring stations affected by each newly opened HSR line are taken as a treatment group, and monitoring stations within 10 km of highways that are affected by existing HSR lines which were opened before our study period are taken as the control group. Then we can estimate the difference in air quality around the two groups before and after the opening of HSR in 2015 and 2016.

The DID estimates suggest that, the monitoring stations within 10 km of affected highways saw a 0.047 mg/m3 reduction (4.3% of the mean) in the concentration of carbon monoxide (CO) relative to the control group after the opening of HSR, under the impact of temporal and spatial factors. Nevertheless, **the opening of HSR does not significantly affect the concentration change of particulate matter (PM) or ozone (O3**).

### Energy Efficiency Answers

#### HSR is not energy efficient

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Many comparisons of the energy efficiency of high‐​speed trains with planes assume both are equally full. But, prior to the pandemic, airlines filled 85 percent of their seats while Amtrak filled only 51 percent of its seats.38 That’s because most airline flights are nonstop, so the airlines can base the size of the plane on the projected demand for each individual route. Most passenger trains, however, make many intermediate stops, and the trains must be sized to meet the maximum demand along the route. As a result, many trains tend to be relatively empty for much of their journeys, greatly reducing their energy efficiency.

Rail proponents also generally assume that competing modes will be no more energy efficient in the future than they are today. In fact, the Department of Energy says that airliner fuel economy has improved at the rate of 2.9 percent per year since 1970 while intercity passenger trains have improved at only 1.7 percent per year.39 Because airplanes are not tied to one type of infrastructure the way high‐​speed trains are, they can make improvements much faster than railroads.

The biggest factor working against the energy efficiency of high‐​speed rail is the huge amount of energy required to build it as well as to periodically replace infrastructure such as rails and power facilities. Airports are practically the only infrastructure required for airlines, but high‐​speed rail lines need mile after mile of roadbed, ties, rails, power supplies, signals, and stations to operate. Even if high‐​speed train operations used somewhat fewer BTUs per passenger‐​mile than airlines, the high energy costs of building and replacing infrastructure would more than make up for that savings.

### Urban Sprawl Answers

#### HSR won’t reduce urban sprawl

Edward L. Glaeser, New York Times Economix Blog August 18, 2009, What Would High-Speed Rail Do to Suburban, https://www.manhattan-institute.org/html/what-would-high-speed-rail-do-suburban-sprawl-1895.html

Will the economic and environmental benefits of President Obama’s “Vision for High-Speed Rail” exceed the costs? Over the last three weeks, I have tried to put together figures for a hypothetical high-speed rail line between Dallas and Houston. A link between Dallas and Houston is not one of the designated corridors, but a link between the country’s fourth and sixth largest metropolitan areas is not obviously less sensible than many of the proposed links. In one blog post in this series, I estimated that if the rail link had the same ridership as all airlines now connecting the two cities (1.5 million), then annual costs would exceed the direct benefits to riders by $546 million. In another post, I estimated the environmental and other social benefits from 1.5 million riders to be $21.6 million, excluding the environmental costs of building the rail line. These numbers suggest that costs will exceed benefits each year by $524 million if the rail line has 1.5 million customers, and by $401 million if the region’s rail demand has a huge rate of growth and attracts three million riders. Now I turn the larger economic and environmental benefits that are not related to direct ridership, but rather come from rail’s potential reshaping of the American economy. The easiest argument to dispatch is that high-speed rail is sensible stimulus spending. There is an iron rule of infrastructure that it is impossible to build massive projects wisely and quickly. Serious rail projects take years to build, and it is impossible to tell whether that spending will come during a recession or a boom. A second economic argument for high speed rail is that it will revitalize troubled regions of the United States. This argument would never be made about Dallas or Houston, which are booming, but some argue that high-speed rail can save Buffalo, Detroit and Cleveland. Transportation can have a significant impact on urban growth. Josh Gottlieb and I estimated that counties with access to a rail line in 1850 grew 20 percent more over the next 40 years. Gilles Duranton and Matthew Turner found that a 10 percent increase in a metropolitan area’s stock of highways in 1980 caused a 2 percent increase in population growth over the next 20 years. But there are reasons to wonder whether rail’s impact today will be that large. Any transportation investment can create large economic ripples only if it significantly increases the speed at which an area with cheap real-estate gains access to a booming place that doesn’t have any comparable, closer available land area. For example, in Spain, the city of Ciudad Real seems to have gotten a big lift thanks to high-speed rail because people can now live in Ciudad Real, where housing is cheaper, and commute into Madrid. This logic has led some to think that high-speed rail will do wonders transforming Buffalo into a back office for Manhattan. Buffalo is 376 miles from Manhattan, so a 150-mile-an-hour rail line will take two and a half hours, which is not going to be significantly faster than air. Moreover, vast amounts of low-cost space are closer to Manhattan than the shores of Lake Erie. Faster connections between Buffalo and Toronto might do more, but in that case speed is hampered by the burdens of border crossing. Philadelphia is the more natural beneficiary of high-speed rail access to Manhattan; there are already people who live in Philadelphia and commute to New York. Yet even in this most propitious setting, the coming of Acela seems to have had little impact on the population decline of Philadelphia or growth of Wilmington. Perhaps the absence of any trend break in population growth around 2000 just reflects the incremental nature of the Acela investment, but there is little here to bring confidence that rail lines revitalize cities. Moreover, I don’t see why is it in the national interest to disperse economic activity from Manhattan to Buffalo or Philadelphia. I have long argued that the economic case for directing economic aid to declining regions is weak. A third possible benefit of rail is environmental. Can high-speed rail bring people closer to city centers and thereby reduce carbon emissions? My work with Matthew Kahn on the greenness of cities suggests that each household that moves from Houston suburbs to the central city reduces carbon emissions and creates $164 of global-warming-related benefits each year. Each household that switches from suburb to city in Dallas creates $133 of benefits annually. Those benefits represent both reduced electricity usage (associated with smaller urban homes) and reduced driving. But **there is little evidence documenting that rail has strong positive effects on land use.** Unfortunately, all of the evidence on this question comes from intraurban, not interurban rail lines. **Atlanta’s rail line had little impact on population or employment within the metropolitan area. BART, the Bay Area Rapid Transit system serving the San Francisco region, seems to have done more, but the effects are still modest.** Nathaniel Baum-Snow and Matthew Kahn have done the most comprehensive look at new intraurban rail systems in 16 cities. I asked them to examine whether population levels rose close to new rail stations, and they found no evidence for that. Moreover, the story of Ciudad Real should make us question the presumption that rail will centralize. **If a Dallas-Houston line stops somewhere between the two cities, and fosters the growth of a new exurb, the result will be more, not less, sprawl.** Despite the lack of any positive evidence linking centralization to high-speed rail, I certainly accept that there is a great deal of uncertainty. To give rail the benefit of the doubt, I’ll assume that high-speed rail will cause 100,000 households to switch from suburb to city in both Dallas and Houston. This change would create extra, annual environmental benefits of $29.7 million. These benefits would be real, but they would still do little to offset the $524 million or $401 million net annual loss discussed above. I’m going to write on something completely different for the next two weeks, but return to this topic in three weeks to revisit some of my main assumptions, and discuss other rail links besides Dallas and Houston.

### Jobs Answers

#### HSR doesn’t increase jobs in most areas

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Rail advocates argue that rail downtown‐​to‐​downtown times are competitive with planes, but this is only important where there are lots of downtown jobs. **New York has 1.9 million jobs near Penn Station, and Washington, DC, has more than 400,000 jobs near Union Station**, so this argument may be valid in this corridor. **But the jobs in most other American cities are far more dispersed, with an average of 8 percent of urban jobs located in central city downtowns, where many train stations would be located.42 Many major cities are also served by multiple airports, and when all the jobs and residences near those airports are counted, they can greatly outnumber those located in or near downtown**. The areas around the Los Angeles, Long Beach, and Burbank airports, for example, have twice as many jobs as downtown Los Angeles.43

### Economic Development Answers

#### HSR doesn’t result in net increase in economic development

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Studies have found that **high‐​speed trains can generate new economic development near the stations where the trains stop. However, the same studies show that economic development slows in communities not served by such trains**. On a nationwide basis, high‐​speed rail is thus a zero‐​sum gain: as a study of the proposed California high‐​speed rail line concluded, “The economic development impacts of the California HSR project are likely to be more redistributive than generative.”5

The paper adds that if higher‐​density development is more productive than low‐​density development, then the high densities encouraged by high‐​speed rail might result in a net gain. However, the COVID-19 pandemic has led people to question claims that high‐​density development is needed for economic productivity and whether they want to live and work in such densities.

**Realistically, to produce actual economic growth, new transportation infrastructure must generate new travel or shipping that wouldn’t have taken place without the infrastructure**. The Interstate Highway System, for example, stimulated billions of passenger‐​miles of new travel and billions of ton‐​miles of new shipping that weren’t taking place before the highways were built.

**To generate new travel, a new transportation system must be faster, more convenient, and less expensive than existing systems. High‐​speed rail fails all these tests, being slower than flying, less convenient than driving, and more expensive than both.** On that last point, airfares average less than 14 cents per passenger‐​mile,53 and Americans spend an average of 25 cents a passenger‐​mile on driving,54 while Amtrak fares for its high‐​speed Acela average nearly $1 per passenger‐​mile.55

**Far from boosting the economy, most countries that have built high‐​speed rail systems have gone heavily into debt to do so**. Even if the first lines make economic sense, political pressures demand that the countries build more and more lines that are less and less sensible. **Financing these lines requires huge amounts of debt that can significantly harm the national economies.**

China has built more miles of high‐​speed rail than any other country and has gone more into debt doing it. At the end of 2019, China’s state railway had nearly $850 billion worth of debt, and most of its high‐​speed rail lines aren’t covering their operating costs, much less their capital costs. As a result, China is slowing the rate at which it is constructing new lines.56

France’s state‐​owned railroad has piled up debts of more than $50 billion and has been repeatedly bailed out by the government. About half the debt is due to operating losses, and half is due to the expense of building new high‐​speed rail lines.57

Spain has built its high‐​speed rail system with an availability‐​payment public‐​private partnership. Officially, the private partner has gone into debt by $18.5 billion.58 While the country is obligated to pay the private partner enough money to repay its debt, the debt isn’t on Spain’s books, which allows it to evade eurozone debt limits.59 If the EU changes its rules, however, Spain would be in serious trouble.

Japan provides an object lesson for what happens when a country has a rail debt crisis. In 1987, state‐​owned Japanese National Railways had a debt of $550 billion (in today’s dollars), much of it due to political demands to build money‐​losing high‐​speed rail lines.60 The government privatized rail lines that were profitable, continued to subsidize those that weren’t, and hoped to recover some of the debt by selling railway property.61 But Japan was in the midst of a property bubble—at its peak, the few hundred acres making up the Tokyo Imperial Palace was estimated to be worth more than all the land in California.62 Government plans to sell former railway land contributed to the bubble’s collapse, and the government ended up absorbing more than $400 billion in railway debt. Together, these led to at least two decades of economic stagnation.63

Despite having to absorb the losses from lines built before 1987, the Japanese government has continued to build more high‐​speed rail lines. Typically, the national government pays two‐​thirds of the cost while local governments pay a third, and the lines are then leased to private railroads for a fraction of what it would take to repay those costs.64

#### Turn – We have to buy everything from abroad

Martin Engel, 6-25, 2021, A Summary Reality Check of Why High-Speed Rail is a Bad Idea, https://patch.com/california/menlopark-atherton/bp--a-summary-reality-check-of-why-high-speed-rail-ised91096912

4. It's not invented here. "Buy America?" Not really. We have no HSR construction or manufacturing capacity; we will need to import it all. We will be obliged to buy everything off the shelves of other countries. That's no way to stimulate our moribund job market or our economy. It's a flagrant example of the US being the credit card and Asia/Europe our shopping mall. Why are we not creating a new "Silicon Valley" for all future-generation transportation modalities?

#### No short-term stimulus effect –HSR will take decades to complete

Stegemeier 10 – Retired Chairman and CEO of Unocal (Richard, “Richard Stegemeier: High-speed rail economics bleak,” Feb 15, http://www.ocregister.com/articles/speed-234453-high-rail.html

High-speed ***rail*** *is a wonderful concept because it uses electricity and* ***c***ould reduce our dependence on fossil fuels sometime in the distant future. But it's also far more expensive than commercial airlines and will require a new source of electricity *from solar, wind or nuclear power. The president assures us there will be no pork in the $3.8 trillion federal budget for 2011. That may be true if we ignore the proposed $2.3 billion high-speed-rail grant for California. An undetermined amount of that money would be spent as a down payment on a $42.6 billion proposal to connect Anaheim with House Speaker Nancy Pelosi's San Francisco and Los Angeles with Senate Majority Leader Harry Reid's Las Vegas. That's an "oink-oink" if I ever heard one. I can understand the Las Vegas high-speed link to accommodate the thousands of Californians who want to flee to Nevada to escape California's high taxes.* High-speed rail as part of a short-term economic stimulus package is nonsense if it takes a decade or two to build. The environmental impact statement itself will take years***. Acquiring 680 miles of right-of-way will be***contested in thousands of eminent domain lawsuits and will take at least a decade to complete. *If high-speed rail serves intermediate cities then it will increase travel time, create noise and interrupt traffic flow at thousands of intersections. If it bypasses smaller cities to gain the advantage of speed, then it serves only the end terminals and disadvantages everyone in-between.*

#### No major economic boom – job estimates assume freight rail and don’t account for increased taxpayer subsidies

Staley 9 – Director of Urban Growth and Land Use Policy for Reason Foundation, (Sam, “Why High-Speed Rail Fails as a Jobs Program,” August 18 ,http://reason.com/archives/2009/08/18/why-high-speed-rail-fails-as-a)

Of course, rail proponents argue that spending money now on high-speed rail is a long-term investment *that will pay off in higher economic productivity over the long-haul.* ***But these*** job creation and income estimates they use are based on spending for freight rail, not passenger rail*. Freight rail in America is a crucial part of our transportation infrastructure, accounting for 43 percent of the shipment of goods and services from one city to the other. Thus, investments in freight rail have a direct impact on the bottom line for American businesses, increasing the speed and reliability of goods shipment and improving productivity.* Passenger rail in the U.S. is a different story. Passenger rail currently carries a very small portion of city-to-city travel*—the market targeted by high-speed rail—and it's likely to remain modest well into the future. In 2008, Amtrak carried 28.7 million passengers. By comparison, there were 687 million airline passengers in 2008, in part because air service provides frequent high-speed travel to geographically distant cities.* Then there's our well-developed highway network that makes automobiles very competitive with rail for distances under 200 miles*.* ***In most cases****,* once travel and wait times to train stations are factored in, travelers will spend as much time in route on the train as they will in a car*. Consider a trip from Los Angeles to San Francisco, or Chicago to St. Louis, for a typical high-speed train traveler. You'll likely have to drive to the train station and pay to park. Once arriving in downtown St. Louis or San Francisco, you will likely have to take a taxi or rent a car to get to your hotel or meeting place (which is likely to be outside the central business district). The reliable, diverse, and nimble transit system that many advocates envision surrounding high-speed rail stations simply doesn't exist in most cities today, limiting the appeal of trains.* ***To compensate for these disadvantages, taxpayers***will have to steeply subsidize train ticket prices for the business travelers and tourists that are most likely to use them. Ultimately, high-speed rail's impacts on American travel patterns and employment productivity are going to be negligible, and the actual job creation potential for high speed rail is much more modest than proponents admit*. Take, for example, the Ohio Hub corridor linking Cincinnati, Cleveland, Columbus, and Toledo to regional destinations such as Chicago and Toronto. Ohio is one of the nation's largest state economies, employing 5.3 million people. As an old-line manufacturing state, Ohio has lost 300,000 jobs just in the past year. Needless to say, Ohioans will be attracted to the optimistic rhetoric of rail's job creation potential. Moreover, preliminary estimates by independent consultants suggest the Ohio Hub may actually cover its annual operating costs (although supporters are counting on the federal government covering 80 percent of capital costs of the $3.7 billion project). Yet, even with these federal subsidies the consultant reports suggest that a $2.3 billion investment in building the rail corridor would generate only 54,540 jobs over the projected nine-year construction phase. That works out to 2,635 jobs per year at a cost of $42,170 per job. Further analysis found 16,700 permanent jobs would be created by the system once the system was up and running, assuming optimistically that ridership reaches forecasted levels and fares are set to cover its operating costs. While that might seem like a lot of jobs, the effort will do little to stem the economic tide turning against Ohio and other states facing the headwinds of global competition and a rising services-based economy.* For transportation investments to have a meaningful economic impact, they will need to cost-effectively improve America's ability to move goods, services, and people from one place to another. High-speed rail doesn't do that. It is an extremely costly way to achieve limited portions of these goals, and it inevitably fails as a broad-based solution to the country's transportation challenges.

### Competitiveness Answers

#### Turn – We have to buy everything from abroad

Martin Engel, 6-25, 2021, A Summary Reality Check of Why High-Speed Rail is a Bad Idea, https://patch.com/california/menlopark-atherton/bp--a-summary-reality-check-of-why-high-speed-rail-ised91096912

4. It's not invented here. "Buy America?" Not really. We have no HSR construction or manufacturing capacity; we will need to import it all. We will be obliged to buy everything off the shelves of other countries. That's no way to stimulate our moribund job market or our economy. It's a flagrant example of the US being the credit card and Asia/Europe our shopping mall. Why are we not creating a new "Silicon Valley" for all future-generation transportation modalities?

**Competitiveness not key to US leadership**

**Brooks and Wohlforth ‘8** - Brooks is Assistant Professor AND\*\*\* William C. Wohlforth is Professor in the Department of Government at Dartmouth College [Stephen G., “World out of Balance, International Relations and the Challenge of American Primacy,” p. 32-35]

American primacy is also rooted in the county's position as the world's leading technological power. The United States remains dominant globally in overall R&D investments, high-technology production, commercial first decade of this century. As we noted in chapter 1, this was partly the result of an Iraq-induced doubt about the utility of material predominance, a doubt redolent of the post-Vietnam mood. In retrospect, many assessments of U.S. economic and technological prowess from the 1990s were overly optimistic; by the next decade important potential vulnerabilities were evident. In particular, chronically imbalanced domestic finances and accelerating public debt convinced some analysts that the United States once again confronted a competitiveness crisis.23 If concerns continue to mount, this will count as the *fourth* such crisis since 1945; the first three occurred during the 1950s (Sputnik), the 1970s (Vietnam and stagflation), and the 1980s (the Soviet threat and Japan's challenge). **None of these crises**, however, shifted the international system's structure: multipolarity did not return in the 1960s, 1970s, or early 1990s, and *each* scare over competitiveness ended with the American position of primacy retained or strengthened.24 Our review of the evidence of U.S. predominance is not meant to suggest that the United States lacks vulnerabilities or causes for concern. In fact, it confronts a number of significant vulnerabilities; of course, this is also true of the other major powers.25 The point is that adverse trends for the United States will not cause a polarity shift in the near future. If we take a long view of U.S. competitiveness and the prospects for relative declines in economic and technological dominance, one takeaway stands out: relative power **shifts slowly**. The United States has accounted for a quarter to a third of global output for over a century. No other economy will match its combination of wealth, size, technological capacity, and productivity in the foreseeable future (tables 2.2 and 2.3). The depth, scale, and projected longevity of the U.S. lead in each critical dimension of power are noteworthy. But what truly distinguishes the current distribution of capabilities is American dominance in all of them simultaneously. The chief lesson of Kennedy's 500-year survey of leading powers is that nothing remotely similar ever occurred in the historical experience innovation, and higher education (table 2.3). Despite the weight of this evidence, elite perceptions of U.S. power had shifted toward pessimism by the middle of the that informs modern international relations theory. The implication is both simple and underappreciated: the counterbalancing constraint is inoperative and will remain so until the distribution of capabilities changes fundamentally. The next section explains why.

#### It’s not zero sum

Young 7 (John, Former Chair and CEO – Hewlett Packard, Founder – Council on Competitiveness, George Fisher, Retired Chair and CEO – Eastman Kodak Company, Paul Allaire, Chair Emeritus – Xerox Corporation "Competitiveness Index: Where America Stands" [http://www.compete.org/images/uploads/File/PDF%20Files/ Competitiveness\_Index\_Where\_America\_Stands\_March\_2007.pdf](http://www.compete.org/images/uploads/File/PDF%20Files/%20Competitiveness_Index_Where_America_Stands_March_2007.pdf))

Competitiveness is not a zero-sum game. The success of other economies is not a failure of U.S. competitiveness – a job created there does not mean a job lost here, a new R&D lab built there does not mean one lost here, a rise in another country's exports does not necessarily mean a decline in ours. As all nations improve their productivity, wages rise and markets expand, creating the potential for rising prosperity for all. There is no fixed pie of global demand to be divided, but almost unlimited human needs to be met.

#### Doesn’t translate into power

Ferguson 3 (Niall–Tisch Professor of History at Harvard, Ziegler Professor at Harvard Business School, Professor of Financial History at NYU, Senior Research Fellow of Jesus College, Oxford University, Senior Fellow of the Hoover Institution, Stanford University, Foreign Policy #134, 1-2/2003, pp. 18-22, Carnegie Endowment for International Peace, “Power,” JSTOR)

But **GDP doesn’t stand for** Great Diplomatic **Power. If the institutions aren’t in place to translate economic output into military hardware—and if the economy grows faster than public interest** in foreign affairs—**then product is nothing** more than potential power. **America overtook Britain in** terms of **GDP in the 1870s, but it was not until the First World War that it overtook Britain as a global power.** In any case, national growth rates in the next 20 years are unlikely to match those in the past three decades. Depressed Japan’s will almost certainly be lower, while growth in the United States might conceivably be higher, if there is any truth to the claim that U.S. productivity was permanently increased by the investments in information technology during the 1990s. And China will have trouble sustaining average annual growth rates of more than 5 percent in the coming decades. Already the Asian behemoth is suffering some serious social growing pains as market forces rend asunder what was once a command economy. **Before 1914, Russia had the fastest growing economy in Europe. But the ensuing social polarization was the main reason Russia collapsed in 1917**

#### Competitiveness not key to heg

**Wohlforth et al., Dartmouth government professor, 2008**

(William, World out of Balance, International Relations and the Challenge of American Primacy, pg 32-5, ldg)

American primacy is also rooted in the county's position as the world's leading technological power. The United States remains dominant globally in overall R&D investments, high-technology production, commercial innovation, and higher education (table 2.3). Despite the weight of this evidence, elite perceptions of U.S. power had shifted toward pessimism by the middle of the first decade of this century. As we noted in chapter 1, this was partly the result of an Iraq-induced doubt about the utility of material predominance, a doubt redolent of the post-Vietnam mood. In retrospect, many assessments of U.S. economic and technological prowess from the 1990s were overly optimistic; by the next decade important potential vulnerabilities were evident. In particular, chronically imbalanced domestic finances and accelerating public debt convinced some analysts that the United States once again confronted a competitiveness crisis.23 If concerns continue to mount, this will count as the fourth such crisis since 1945; the first three occurred during the 1950s (Sputnik), the 1970s (Vietnam and stagflation), and the 1980s (the Soviet threat and Japan's challenge). None of these crises, however, shifted the international system's structure: multipolarity did not return in the 1960s, 1970s, or early 1990s, and each scare over competitiveness ended with the American position of primacy retained or strengthened.24 Our review of the evidence of U.S. predominance is not meant to suggest that the United States lacks vulnerabilities or causes for concern. In fact, it confronts a number of significant vulnerabilities; of course, this is also true of the other major powers.25 The point is that adverse trends for the United States will not cause a polarity shift in the near future. If we take a long view of U.S. competitiveness and the prospects for relative declines in economic and technological dominance, one takeaway stands out: relative power shifts slowly. The United States has accounted for a quarter to a third of global output for over a century. No other economy will match its combination of wealth, size, technological capacity, and productivity in the foreseeable future (tables 2.2 and 2.3). The depth, scale, and projected longevity of the U.S. lead in each critical dimension of power are noteworthy. But what truly distinguishes the current distribution of capabilities is American dominance in all of them simultaneously. The chief lesson of Kennedy's 500-year survey of leading powers is that nothing remotely similar ever occurred in the historical experience that informs modern international relations theory. The implication is both simple and underappreciated: the counterbalancing constraint is inoperative and will remain so until the distribution of capabilities changes fundamentally. The next section explains why.

#### US can absorb innovation from anywhere-ensures competitiveness

**Beckley, Harvard International Security Program research fellow, 2012**

(Michael, “China’s Century? Why America’s Edge Will Endure”, International Security 36.3)

In theory, globalization should help developing countries obtain and absorb advanced technology. In practice, however, this may not occur because some of the knowledge and infrastructure necessary to absorb certain technologies cannot be specified in a blueprint or contained within a machine. Instead they exist in peoples’ minds and can be obtained only through “hands-on” experience. The World Bank recently calculated that 80 percent of the wealth of the United States is made up of intangible assets, most notably, its system of property rights, its efficient judicial system, and the skills, knowledge, and trust embedded within its society. If this is the case, then a huge chunk of what separates the United States from China is not for sale and cannot be copied. Economies and militaries used to consist primarily of physical goods (e.g., conveyor belts and tanks), but today they are composed of systems that link physical goods to networks, research clusters, and command centers. 72 Developing countries may be able to purchase or steal certain aspects of these systems from abroad, but many lack the supporting infrastructure, or “absorptive capacity,” necessary to integrate them into functioning wholes. 73 For example, in the 1960s, Cummins Engine Company, a U.S. technological leader, formed joint ventures with a Japanese company and an Indian company to produce the same truck engine. The Japanese plant quickly reached U.S. quality and cost levels while the Indian plant turned out second-rate engines at three to four times the cost. The reason, according to Jack Baranson, was the “high degree of technical skill . . . required to convert techniques and produce new technical drawings and manufacturing specifications.” 74 This case illustrates how an intangible factor such as skill can lead to significant productivity differences even when two countries have access to identical hardware. Compared to developing countries such as China, the United States is primed for technological absorption. Its property rights, social networks, capital markets, flexible labor laws, and legions of multinational companies not only help it innovate, but also absorb innovations created elsewhere. Declinists liken the U.S. economic system to a leaky bucket oozing innovations out into the international system. But in the alternative perspective, the United States is more like a sponge, steadily increasing its mass by soaking up ideas, technology, and people from the rest of the world. If this is the case, then the spread of technology around the globe may paradoxically favor a concentration of technological and military capabilities in the United States.

### Convenience Answers

#### HSR is not convenient – not enough stops

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

The Obama administration’s 8,600-mile high‐​speed rail network was really designed as six different and disconnected systems. Even within each system, the routes were incomplete: travelers could get from Chicago to St. Louis and from St. Louis to Kansas City, but there was no planned direct route from Chicago to Kansas City.

USHSR’s proposed high‐​speed rail system would correct only a few of these problems. It still doesn’t include, for example, a 220 mph route from Chicago to Kansas City. The 220 mph network misses several urban areas with more than 500,000 people, and even the 110 mph system skips many urban areas with more than 100,000 people.

People driving on an interstate freeway can get off the freeway at any exit and access the nation’s other 4.1 million miles of roads. Once rail passengers arrive at a station, they must find some other mode of travel to reach their final destinations, greatly reducing the convenience of the system.

### Congestion Answers

#### Better ways to reduce congestion

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Buttigieg’s proposal is particularly poorly timed considering that the COVID-19 pandemic has made many people question mass transportation in general. One lesson of the pandemic is that the most resilient transportation system we have is motor vehicles and highways. **Rather than funding an obsolete system we don’t need, Buttigieg and Congress should find ways to relieve congestion, improve safety, and increase people’s access to jobs and other economic opportunities by improving existing roads and building more highways that could be paid for with user fees.**

#### HSR does not have a perceptible impact on road traffic- Japan proves

**O’Toole 9** (senior fellow at the Cato Institute “High-speed rail is expensive and inefficient” https://www.illinoispolicy.org/reports/taking-illinoisans-for-a-ride-high-speed-rail/

Moderate-speed trains whose average speeds are 60 to 75 mph are not going to relieve highway congestion. Even California predicts that its true high-speed trains will take only 3.8 percent of traffic off of parallel roads. Since traffic grows that much every two years, high-speed rail is an extremely costly and ineffective way of treating congestion. High-speed trains in Europe and Japan may be attractive to tourists, but neither have stopped the growth in auto driving. Residents of Japan travel as much on domestic airlines and almost as much by bus as by high-speed rail, and they travel by car 10 times as many miles per year as by high-speed rail. "Not a single high-speed track built to date has had any perceptible impact on the road traffic carried by parallel motorways," says Ari Vatanen, a member of the European Parliament. The average residents of Japan and France ride high-speed rail less than 400 miles a year.

#### HSR would only divert a small number of passengers at best – nonpartisan study proves

**NCPA 10** (the National Center for Policy Analysis is a conservative think tank. “Calif. Rail Project Is High-Speed Pork” https://www.freemarketfoundation.com/article-view/california-rail-project-is-high-speed-pork

High-speed trains connecting major cities are a perfect example of wasteful spending masquerading as a respectable social cause. In reality, they would further burden already overburdened governments and drain dollars from worthier programs, says Robert Samuelson. Let's suppose that the Obama administration gets its wish to build high-speed rail systems in 13 urban corridors. The administration has already committed $10.5 billion, and that's just a token down payment. California wants about $19 billion for an 800-mile track from Anaheim to San Francisco. Constructing all 13 corridors could easily approach $200 billion. Most (or all) of that would have to come from government at some level. What would we get for this huge investment? Not much. Here's what we wouldn't get: any meaningful reduction in traffic congestion, greenhouse gas emissions, air travel, oil consumption or imports, says Samuelson. High-speed intercity trains (not commuter lines) travel at up to 250 miles per hour and are most competitive with planes and cars over distances of fewer than 500 miles. In a report on high-speed rail, the nonpartisan Congressional Research Service examined the 12 corridors of 500 miles or fewer with the most daily air traffic in 2007. Los Angeles to San Francisco led the list with 13,838 passengers; altogether, daily air passengers in these 12 corridors totaled 52,934. If all of them switched to trains, the total number of daily airline passengers (about 2 million) would drop only 2.5 percent, and any fuel savings would be less than that. High-speed rail would subsidize a tiny group of travelers and do little else. With governments everywhere pressed for funds, how can anyone justify a program whose main effect will simply be to make matters worse?

#### High speed rail can’t get cars off the road

O’Toole, ’09 - American public policy analyst; senior fellow with the Cato Institute and author of The Best-Laid Plans: How Government Planning Harms Your Quality of Life, Your Pocketbook, and Your Future (Randal, “The High Cost of High-Speed Rail”, America Dream Coalition - Center for Economic Freedom Texas Public Policy Foundation, 8/09, [http://www.americandreamcoalition.org/transit/HSRinTX.pdf. Y](http://www.americandreamcoalition.org/transit/HSRinTX.pdf.%20%20%20Y)

The experiences of cities that have adopted these policies reveal two things. First, such policies do not significantly reduce driving. Second, the policies impose very high costs on the cities and urban areas that adopt them.Within the range of densities found in American urban areas, density alone has trivial effects on the amount of driving people do. Statistically, the correlation between changes in urban densities and changes in per-capita driving is very low, and to the extent there is a correlation, a doubling of urban densities reduces per-capita driving by just 3.4 percent. Nor do so-called transit-oriented developments—high-density, mixed-use developments near transit stations—significantly reduce driving. To the extent that people living in these developments drive less than others, it is because those people want to drive less so they decided to live near a transit line. After that market has been saturated, however, people living in such developments tend to drive as much as anyone else. Surveys have found that people living in Portland-area transit-oriented developments do not use transit significantly more than people in other Portland neighborhoods. Similar results have been found with transit-oriented developments in other cities. The failure of these policies to have much of an effect on driving might not be important were it not for the fact that the policies impose huge costs on urban residents. Numerous surveys show that the vast majority of Americans say they want to live in a single-family home with a yard. Yet livability policies deliberately make this housing unaffordable to low- and even middle-income families. Indeed, the housing bubble that led to the recent economic crisis was almost exclusively in states and urban areas that use smart growth or some other form of growth-management planning. Not coincidentally, a similar property bubble led to Japan’s economic crisis in 1990. The administration’s livability policies are likely to make America’s next housing bubble even worse than the recent one.

#### HSR would produce negligible benefits --- not enough riders

O'Toole, 10 (Randal, Cato Institute Senior Fellow working on urban growth, public land, and transportation issues, author of Gridlock: Why We’re Stuck in Traffic and What to Do About It, “High Speed Rail”, June, http://www.downsizinggovernment.org/transportation/high-speed-rail)

5. Mobility Benefits. The mobility benefits of high-speed rail are negligible. Despite huge subsidies, the average residents of France and Japan ride their TGVs and bullet trains just 400 miles a year. With slower trains connecting lower-density cities and regions, the Obama administration's proposed high-speed rail system would be lucky to reach even 100 miles per capita of travel. Even a much more comprehensive, truly high-speed network is unlikely to approach 400 miles per capita because, unlike Europe and Japan, the United States has few major city pairs located close enough for high-speed trains to compete with airlines. High-speed rail's inability to draw more riders should be no surprise considering rail's inherent disadvantages compared with driving and air travel. Driving offers point-to-point convenience, while rail drops most travelers miles from their final destinations. Air service is at least twice as fast as the fastest trains and—since most Americans no longer live or work downtown—leaves average travelers no farther from their destinations than downtown train stations. Though high-speed rail is somewhat competitive on trips of 200 miles or so, it is not the optimal transportation mode at any distance.

#### The public will continue to drive to work

**Glaeser**, 8/4/**2009** (Edward – economics professor at Harvard University, Running the Numbers on High-Speed Trains, New York Times, p. <http://economix.blogs.nytimes.com/2009/08/04/running-the-numbers-on-high-speed-trains/>)

How many riders will take high-speed rail between Houston and Dallas? Amtrak gets about 11 million customers in the Northeast Corridor, which has four large consolidated metropolitan areas together totaling 44 million people. If that four-to-one ratio held in Texas, then the high-speed rail link could expect three million riders, and more to come as Texas grows. But as President Obama has said one of the appeals of high-speed rail is “walking only a few steps to public transportation, and ending up just blocks from your destination.” That’s bad news for Texas. In Dallas less than 5 percent of the population takes public transportation to work, and more than 60 percent of all jobs are more than 10 miles from the city center. For these reasons, driving will continue to be extremely attractive for travelers who want to save parking fees and need cars once they arrive. I’ll go with 1.5 million trips a year (even including future growth), which would make the new rail line about as popular as all airplane flights between the two cities are today.

### US Leadership Answers

#### HSR is an obsolete technology

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Secretary of Transportation Pete Buttigieg wants to make the United States the “global leader” in high‐​speed rail.1 That’s like wanting to be the world leader in electric typewriters, rotary telephones, or steam locomotives—all technologies that once seemed revolutionary but are functionally obsolete today.

High‐​speed trains were rendered obsolete in 1958—six years before Japan began operating its first high‐​speed “bullet” trains—when airlines started commercially operating the Boeing 707 jetliner, which cruised at 600 miles per hour (mph).2 In comparison, Japan’s first bullet trains had a top speed of 130 mph.3 Today, the world’s fastest intercity trains have top speeds of about 250 mph.4 Since trains typically make multiple stops, their average speeds are much lower.

What made Japan’s trains appear feasible when they were introduced in 1964 was the fact that air travel cost more than rail travel: in the United States, average airfares per passenger‐​mile were more than twice average rail fares.5 In addition, three‐​fourths of all passenger travel in Japan was by train, so there was a ready source of customers.6

The situation in the United States today is completely different. Airfares averaged 13.8 cents per passenger‐​mile in 2019.7 By comparison, Amtrak (the only operator of intercity passenger trains in the United States) fares averaged 35 cents per passenger‐​mile while fares on Amtrak’s high‐​speed Acela were more than 90 cents per passenger‐​mile.8 Amtrak carried only 0.1 percent of all passenger travel in the United States, so existing rail customers provide a minimal market for faster trains.9

In 2009, President Barack Obama proposed an 8,600-mile high‐​speed rail system.10 With 22,000 miles of high‐​speed rail routes, China is currently the global leader. If Buttigieg’s idea of becoming the world leader means building more than China, it would take a massive effort.

#### The US would have to build a massive amount of HSR to be a leader

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

Several high‐​speed rail plans for the United States have been introduced in the past two decades. Obama’s 8,600-mile plan consisted of routes in six disconnected networks in the Northeast, South, Florida, Midwest, California, and Pacific Northwest.13 In 2010, Obama presented a revised plan that included several additional routes, including Phoenix–Tucson, Cheyenne–El Paso, and Minneapolis–Duluth, for a total of about 12,000 miles.14 In 2020, the U.S. High Speed Rail Association (USHSR) released a plan consisting of 17,000 miles of true high‐​speed rail (220 mph) in a single, fully connected network serving 43 states, supplemented by 11,000 miles of moderate‐​speed rail (110 mph) reaching those 43 states plus five more.15

At 22,000 miles of high‐​speed rail routes, China has roughly twice as many miles as the rest of the world combined.16 For the United States to become the world leader, as Buttigieg proposes, it would have to build even more miles of high‐​speed rail routes than the USHSR proposed.

#### China leads in freeways

Randal O’Toole, CATO Institute, 2021, “The High‐​Speed Rail Money Sink: Why the United States Should Not Spend Trillions on Obsolete Technology,” Policy Analysis no. 915, Cato Institute, Washington, DC, April 20, 2021. https://www.cato.org/policy-analysis/high-speed-money-sink-why-united-states-should-not-spend-trillions-obsolete#chinas-expressways

With growing recognition that China has become the United States’ main economic and political competitor, many people point to China’s high‐​speed rail system as evidence that the United States is “lagging behind.”115 But the real transportation gap between China and the United States is not high‐​speed rail; it is freeways. China has about the same number of motor vehicles as the United States. But where the United States has about 67,000 miles of freeways and is adding fewer than 800 miles per year, China has 93,000 miles of freeways and is growing its system by more than 5,000 miles a year.116

China began building freeways before it began building high‐​speed rails, and it has built more miles each year and spent more money on new freeway construction (though less per mile) than on high‐​speed rail. Highway travel has grown faster than rail travel, and the highway system has become particularly important for freight, as it moves about 2.5 times as many ton‐​miles as rail lines.

### Oil Dependence Answers

#### HSR would have a minimal effect on oil dependency

**Druce**, 6/29/**2011** (Paul, Bad Arguments for High Speed Rail: Oil Consumption, Reason and Rail, p. http://reasonrail.blogspot.com/2011/06/bad-arguments-for-high-speed-rail-oil.html

One of the ancillary benefits which is often inappropriately highlighted as a primary benefit by high speed rail proponents is that of reducing American oil consumption. Often, our reliance upon foreign oil, including some from Middle East nations such as Saudi Arabia, is seized upon by such proponents and the defense costs added to the price of oil. This, however, is a flawed notion that ignores the interconnected nature of global trade. Even if we were completely independent from foreign oil, or at least oil not from North America and Europe, including our shipping, we would still fund foreign militaries and place troops in these areas. A sudden lack of oil shipments from Saudi Arabia would cause major oil price shocks globally, not merely to those depending on oil from Saudi Arabia. Even if we were, by perhaps some magical free energy device, completely free from oil use except in raw industrial processes, we would still be gravely damaged economically because our economy depends on foreign trade. Major economic recessions or depressions in our trading partners will cause the same problems here as well. Now, for the actual matter at hand, that of high speed rail's role in reducing our dependence on oil. The California High Speed Rail Authority estimates that, by 2030, the high speed rail system will be saving 12.7 million barrels of oil per year. This, however, represents only sixteen hours worth of US consumption in 2009 and only 1.9% of California's annual consumption (one week's worth). Clearly it would have minimal, if any, effect on oil prices or oil dependence.

#### Global prices mean US is still vulnerable

John Aziz ’14, economics and business correspondent at The Week, 6-20-14, The Week, “The lessons of Iraq: The U.S. economy is still way too vulnerable to oil price shocks”, http://theweek.com/article/index/263515/the-lessons-of-iraq-the-us-economy-is-still-way-too-vulnerable-to-oil-price-shocks

With Iraq facing an incipient civil war, the issue is coming back into focus. A big enough oil spike translating into soaring energy prices could once again squeeze American consumers and businesses, leaving the economy vulnerable to a recession. Of course, the U.S. is in a better position to weather the storm than in 2007. Interest rates remain near historic lows, giving debtors some breathing room. The total level of debt relative to the size of the economy is lower, too. And the U.S. — thanks to a shale oil and natural gas boom — is much less dependent on energy brought in from abroad. But just because the U.S. is importing a lower proportion of its energy doesn't mean that it isn't vulnerable to energy shocks. The U.S. energy market is part of the global energy market. If oil supplies are cut off or impeded in the Middle East (or elsewhere) the U.S. will still be affected, because the rest of the global marketplace will still need to buy oil. That means that the price of oil for Americans will still rise. All of which is to say that true energy independence isn't as simple as pumping more hydrocarbons at home. That may relieve both American and global energy pressures to a certain degree, but only in a transitional sense. It is not a real solution. A real solution would be a renewable energy economy in which energy and transportation are fuelled by local sunlight, wind, and water. If you're capturing the bulk of your energy needs on your rooftop, driving an electric car, and storing excess power in a battery in your garage, you're far more insulated against geopolitical turmoil in oil-producing regions.

#### Can’t solve oil dependence if we consume any oil because markets are intertwined

Lindsay Maizland and Anshu Siripurapu, Council Foreign Relations, August 11, 2022, How the U.S. Oil and Gas Industry Works, https://www.cfr.org/backgrounder/how-us-oil-and-gas-industry-works

**The debate over U.S. energy independence has shifted in focus over the decades**, shaped by changes in geopolitics, technological advances, and growing concerns about climate change. Much of the debate in the last decades of the twentieth century centered on the strategic risks of U.S. dependence on foreign oil. Energy crises, such as the 1973 oil embargo, demonstrated how quickly external price shocks could throw the U.S. economy and political leadership into turmoil. In response, politicians called for the United States to ramp up domestic production to meet its needs and improve its energy security. Proponents of achieving energy independence also argued that relying on energy imports undercut U.S. foreign policy because it forced many administrations to keep commercial relationships with some undemocratic oil-rich countries Today, some U.S. lawmakers point to high gasoline prices amid the war in Ukraine as a reason to boost fossil fuel production and restrict exports. But analysts say that **because oil is a globally traded commodity, there is little that the United States can do to control prices.** They also question whether trying to achieve self-reliance on fossil fuels is even desirable. “Energy self-sufficiency may seem like a route to security, but it would be highly inefficient and impose unnecessary costs,” Columbia University’s Jason Bordoff and Harvard University’s Meghan L. O’Sullivan write for Foreign Affairs. For example, the United States often relies more on oil imports when major hurricanes hit the Gulf coast, where much of the United States’ energy resources are located. Renewable energy sources, such as solar and wind power, are increasingly part of the debate. Experts say that boosting capacity for renewables would help the United States achieve greater energy security. “We need to accelerate the clean energy transition. That’s what will give us real energy independence,” says the Environmental Defense Fund’s Mark Brownstein.

#### **Independence doesn’t solve shocks --- oil is too globalized**

Evans, 2013 (Beth, senior managing editor at Platts with 20 years of experience in energy reporting, “The myth of US energy independence in the global world of oil”, Platts, 9/27/2013, http://blogs.platts.com/2013/09/27/us-independent/)#JShelts

No man is an island, not even a man who has grown his oil and gas production exponentially. Case in point: the US, which in the past five years has boosted oil production by around 35%, changing the discussion of its “energy independence” from a “what if” to a “when” scenario. If that’s the case, then why should the country care so much about peace and stability in the Middle East and the protection of global energy supplies and maritime transit corridors? “We absolutely have to care,” said Carlos Pascual, the US State Department’s special envoy and coordinator for international energy affairs. There is a “fundamental point” the US takes into account when looking at its global energy priorities: “Oil and increasingly gas are global commodities,” Pascual said this week at an event sponsored by Columbia University’s Center on Global Energy Policy. That means the price of oil outside the US impacts the price of oil within the US, and that can have a knock-on economic effect. “When we see disruptions in [global] markets, when we see disruptions in maritime transit, it has a direct impact on the price that we pay in the US for energy, the price that we pay at the pump, it has a direct impact on our economic productivity,” he said. Pascual noted the “inelastic” nature of oil supply and demand: “If you have a major disruption, the potential for a huge price increase is huge.” The key is to keep enough spare capacity around. That’s the amount of production that can come online within 30 days and sustained for 90 days. “You have to work with those countries that are the big producers because if they don’t sustain the production it has an impact on the vulnerabilities in the overall marketplace,” said Pascual. In addition, “we have to work with those countries which are the potential big new suppliers coming into the market,” he said. “Countries like Iraq become absolutely essential swing factors that can go on the one side to very sharp increases of production or if they have disruptions bring the market down. If you can’t maintain stability in that base production, then you’re putting pressure on that spare capacity.” He noted China’s growing importance to US oil price interests. In the past, US diplomats would say China was not on their priority list, but times have changed. “Today we have a changing environment where we have to take that into account,” said Pascual. “It puts us into an interesting situation, that China’s ability to satisfy its demand becomes in the national security economic interest of the US.” “There is no one stop shop in assuring energy security and price stability,” said Pascual. “You have to work across the range of these markets.”

#### **Their analysis of independence is wrong --- prefer the most qualified analysis**

Cordesman, 2013 (Anthony H., holds the Arleigh A. Burke Chair in Strategy at CSIS and frequent consultant to the U.S. State Department, Defense Department, and intelligence community, former adjunct professor of national security studies at Georgetown University, and has twice been a Wilson fellow at the Woodrow Wilson Center for Scholars at the Smithsonian, Ph.D. from the University of London, “THE MYTH OR REALITY OF US ENERGY INDEPENDENCE”, Center for Strategic and International Studies, 1/2/2013, http://csis.org/files/publication/130103\_us\_energy\_independence\_report.pdf)#JShelts

US “independence” from energy imports has been a key source of political dispute ever since the October War in 1973 and the Arab oil embargo that followed. Much of this debate has ignored or misstated the nature of the data available on what the US options are, as well as the uncertainties involved in making any long range projections. This situation has become more critical during the last year as it becomes increasingly apparent that the US has far more commercially exploitable oil and gas reserves than most previous estimates have indicated. Some estimates go so far as to project the US could actually become an energy exporter in the future. Keeping US “Energy Independence” in Perspective There is every reason to develop US domestic energy resources, and to explore the degree to which the US can cost-effectively reduce its dependence on imports, while carefully considering the longer-term impact of such measures in depleting US supplies for the future. There are also highly respected US analysts who believe that the US can virtually eliminate imports at some point between 2020 and 2030, under best case assumptions. Such estimates should, however, be kept in perspective. They do not affect the US near-term dependence on direct energy imports for at least the next decade, even under the most optimistic assumptions. These estimates do not affect the fact the US must pay world oil prices in an energy crisis, nor do they take into consideration the fact the US is dependent on the health of a broader global economy that is becoming steadily more dependent on the security Gulf energy exports. In fact, accurate estimates on the true nature of US import dependence should include metrics of how much oil and other energy America imports from Europe and Asia that are directly dependent on Gulf and other MENA oil and gas exports. Moreover, these estimates do not adequately consider the wisdom of a “deplete America first” approach to oil and gas procurement.

#### Reducing oil dependence kills the economy of the gulf states, triggering instability and US military intervention in the region

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**Or the Middle East could collapse into economic misery. Social scientists like to talk about ^the oil curse,**:— when countries **have lot of oil to sell and hence lots of money sluicing around to fund misgovemment and corruption—and yet not being able to sell their oil would be even worse. That outcome would not produce a peaceful and stable Middle East we can forget about. On the contrary, we would then face a far unrulier region dominated by conflict and extremism. That would make life harder for Israel as well as Europe, which not only sits next to the Middle East but has many people of Middle Eastern origin within its borders. If our allies suffered from Middle Eastern problems, we would hurt too. The sham of a ""hands off the Middle East1\* policy would swiftly become apparent, and we'd be back in the region in no time.**

#### If we reduce our dependence on oil then China will become integrated with the Middle East, threatening our leadership

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**If neither us nor our vital allies bought oil from the Middle East, so we could claim to have no more direct or nearly direct dependence on oil, the Middle East could move into someone else's orbit, probably China's or Russia's, which would erode our standing in the world and disturb the global balance.**

#### Middle East United States energy independence is the worst thing ever – it kills hegemony, causes economic collapse, proliferation, and collapse of transatlantic relations

Hulbert 11-12 (Matthew, "Ten Reasons to Be Concerned About US Energy Independence," Forbes, www.forbes.com/sites/matthewhulbert/2012/11/12/ten-reasons-to-be-concerned-about-u-s-energy-independence/)

4) U.S. Policy Suffers Structural Paradox

Needless to say, this makes a total mockery of ongoing US external support for oil supplies coming from the Middle East. It makes zero sense for Washington to be paying billions in tax payers’ money maintaining the 5th Fleet in Bahrain only to watch OPEC states internally implode from the prospect of lower oil prices driven by American supply growth. It also points to a very awkward conundrum for State Department interests in the Gulf – this is ultimately about U.S. global power, not just oil.¶ 5) All Points On The Compass Look East¶ The more damaging geopolitical problem is that anywhere ‘East of Nigeria’ will be looking to China and India for security of demand and geopolitical cover. China will stake its claim to regional dominance far more aggressively and expand its influence into the Gulf. The Asian ‘pivot’ will lose its bearings, and the dollar put on borrowed time if China no longer sees fit to keep bankrolling the Fed for its own security ends. What’s worse, Washington will still be intrinsically connected to global oil prices but have zero influence in the Gulf, Caspian, Russia or East Africa to influence material outcomes. That’s on anything ranging from nuclear proliferation to delicate succession issues. China will be calling the shots, able to split the world in two by laying claim to the Middle East, the Caspian, Australasia, Russia and East Africa as vital interests.¶ 6) America Might Lose Friends Closer To Home As Well¶ Well, when we say ‘split the world in two’, it’s not going to be quite that neat for the Americas. There’s no way Canada, Mexico, Colombia, Ecuador, Venezuela, Brazil or Argentina will be happy relying on a single source of supply and a single source of demand from Washington. Far from selling oil into a saturated U.S .market, they’ll redouble their efforts to export energy to Asia, a hedge that could significantly reduce Washington’s long term influence in ‘Monroe’s playground’. Brazil could end up joining OPEC; Canada will be very tetchy about Arctic developments. As for Europe, with the trans-Atlantic relationship dead, they’ll go looking for new friends to help with energy supplies. The most likely of which is China to align consumer interests on the Eurasian land mass. The Western Hemisphere shrinks; for China, the sun never sets.¶ 7) America Will Struggle To Keep Pace¶ Having lost most its friends (or ‘frenemies’) as some like to put it, America has a bigger problem. Can it really follow through towards 2050 as the biggest energy player in the world? The geological data is unsure. America’s 482tcf of gas and 25.2bn barrels of oil will start to look very small, and particularly if other producers follow America down an unconventional path. That’s by no means unlikely when you consider U.S. benchmark pressures could force traditional producers to give up trying to control prices, and go for a volumes strategy instead. We’re already on the verge of that happening in the natural gas world, there’s no reason why it wouldn’t be any different for oil. 110mb/d by 2020? Probably doable in a risk free, care free world; call it ‘OPEC’s unconventional bounce’. In a race to the bottom of the barrel, the Middle East is always going to trump the U.S. mid-West.¶ 8 ) But Fear Not, America Can End Up A Chinese Lake¶ If that happens, fear not, the one country that will keep investing in U.S. liquids production is China. It’s in direct Chinese interests to make sure America fulfils its oil potential to help forge a structurally cheap and abundant energy world, not to mention hedging Beijing’s supply side portfolio. China has pumped $17bn into America since 2010, $10bn into Brazil, $16bn into Venezuela, and $18bn into Canada. And that’s before you consider the prospective $15.1bn Nexen mega deal. Many think it’s farfetched, but look closely at the U.S. natural gas scene. China’s not only happy ploughing money into economically disastrous dry shale plays, it’s providing supply side contracts and finance for U.S. LNG export growth. Ask Cheniere down at Sabine Pass. Cheap U.S. gas on international markets is exactly what China wants to secure preferential contracts across the board, and it’s precisely what they’re now eyeing for oil.¶ 9) Blunt Conclusion: China Gains Most From Cheap U.S. Oil ¶ The core reason is China knows it gains most from a world of cheap and abundant energy. America ‘wins’ a ten to fifteen year tactical victory from enhanced liquids output, but in doing so, loses the long term battle for superpower status against China. Beijing gets to drive through its industrial revolution on the cheap, all while the economic gains for America remain marginal. Beijing leverages U.S. production gains to break the pricing game and force producers into a volumes future. Despite 80-85% import dependency, China picks up the pieces in a perennial buyer’s market. America goes home, broke.

#### Oil Dependence establishes leverage over threat countries

Fisher 10 — Max Fisher, master's in security studies from Johns Hopkins University, 2010 (“The Upside of Depending on Foreign Oil”, *The Atlantic*, April 2nd, Available Online at <http://www.theatlantic.com/international/archive/2010/04/the-upside-of-depending-on-foreign-oil/38380/>, Accessed 7/31/14)

As a result, buying Saudi oil gets us a lot more than just energy. It gets us a dedicated ally that wields unparalleled influence in a part of the world where we desperately need it: the Middle East. The Saudi royal family has put their wily intelligence service at our disposal and allowed sprawling U.S. military bases onto their soil. In 1992, the Saudis even exiled one of their own on America's behalf: A prominent, wealthy, and popular humanitarian and freedom fighter named Osama bin Laden. Saudi royalty risked a violent backlash by expelling bin Laden to Sudan, but U.S. officials had demanded his ouster. That's no small favor. It would be almost as if the United States deported Google CEO Eric Schmidt to Honduras at the request of angry Chinese officials. The Saudis came to our aid again in 1996 when they convinced the Sudanese regime to themselves deport bin Laden. Bin Laden's anti-American terrorism did not begin until he fled to Afghanistan, where the United States then had little influence. In the decade since, he has moved between there and Pakistan, two countries with which the U.S. has no meaningful economic ties save foreign aid. Unlike with Saudi Arabia, our pleas to those governments to help us rout bin Laden went largely ignored. If our oil-greased relationships with other top producing states are half as close as the U.S.-Saudi partnership, it will give us much-needed leverage over some of this century's biggest emerging threats. In Nigeria, we can pressure the government to peacefully contain the state's alarming increase in terrorism. For Iraq, the economic ties with America would be an important counterbalance to Iran's religious and political influence. As for Venezuela, no matter how antagonistic President Hugo Chavez gets, he would be a lot worse if we didn't take close to a million barrels off his hands every day.

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