

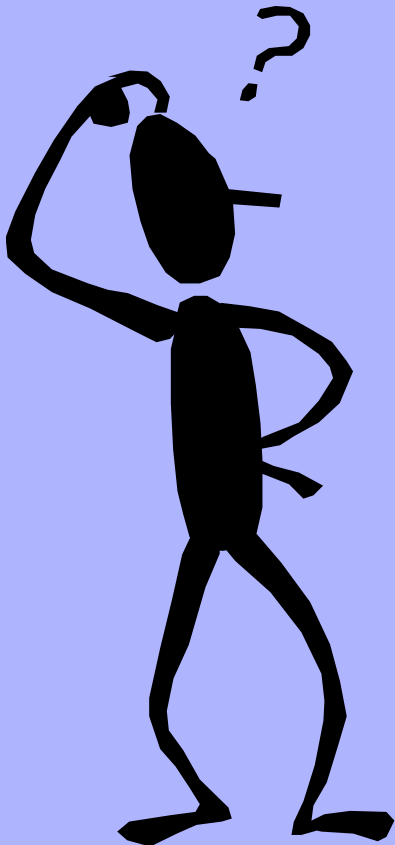
How Transport Revolutions could facilitate the transition to post-carbon mobilities

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Simon Fraser University

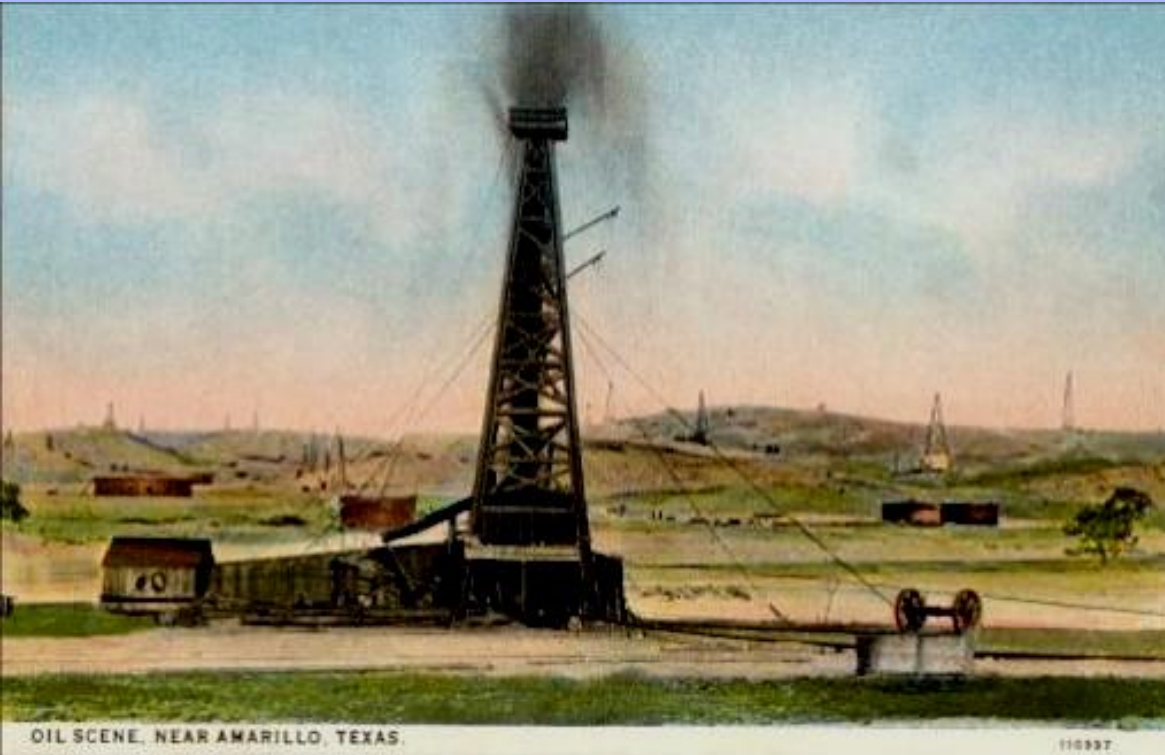


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Why will we see a shift in transport planning and policy by 2025?

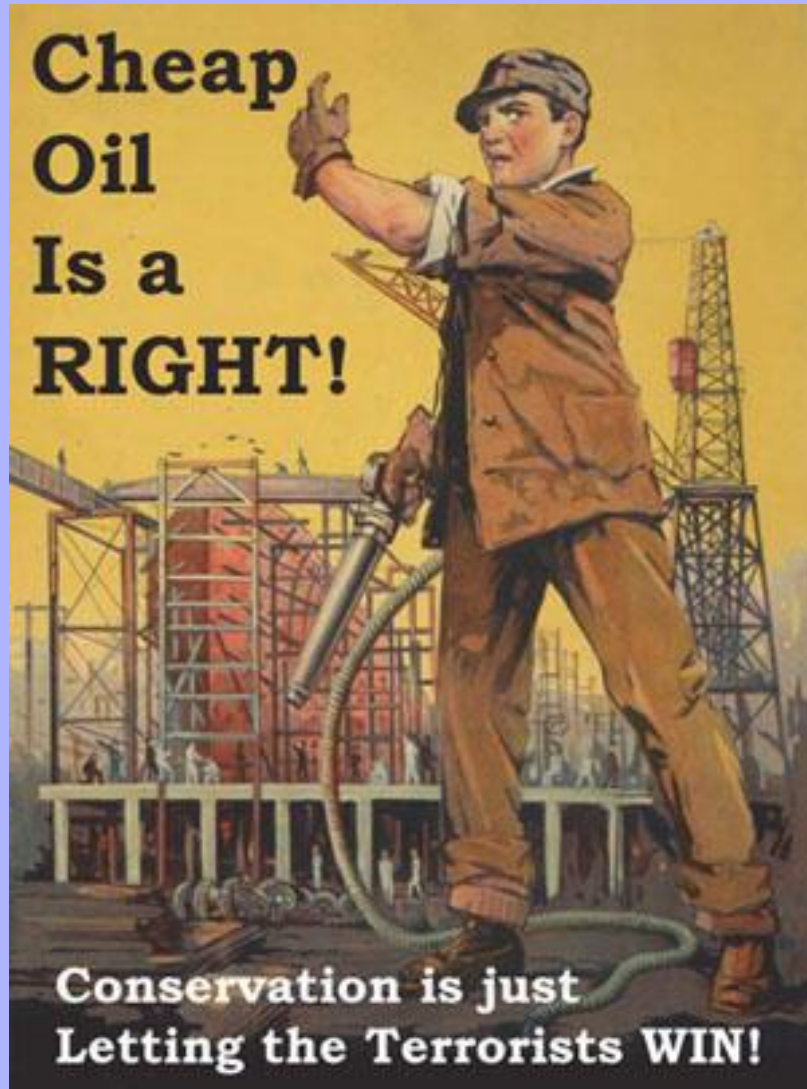


We have reached the end of the 'Beverly Hillbillies' oil story

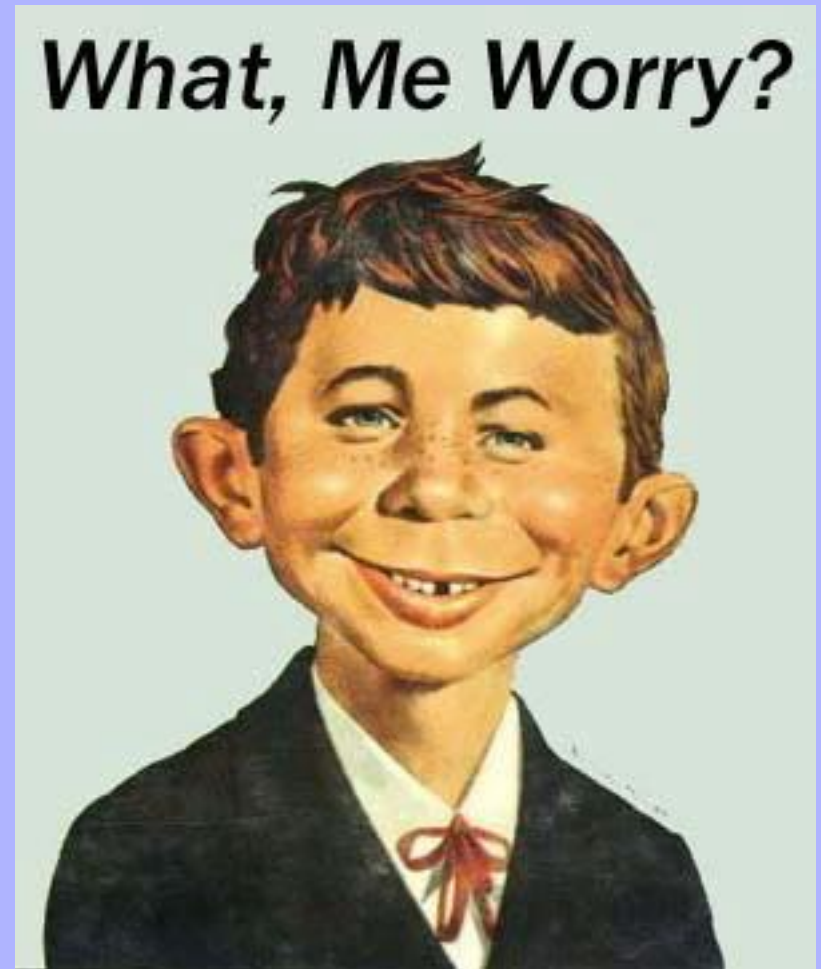


Conventional oil was the ideal
fuel for moving people and goods in the 20th century

When the cost of producing oil was \$5 - \$10 per barrel: self-restraint was a message that did not make sense to many



Conventional wisdom: the world's mid-life of petroleum availability and the early signs of climate crisis leave plenty of time to plan adjustments



The second half of the world's oil endowment is ***physically different***

Athabasca Oil Sands Project

Currently one of the largest construction projects on the planet, the Athabasca Oil Sands Project is the first new fully integrated oil sands project in 25 years.



Producing this oil requires **different** know-how, infrastructure, and investment than what went into conventional oil production

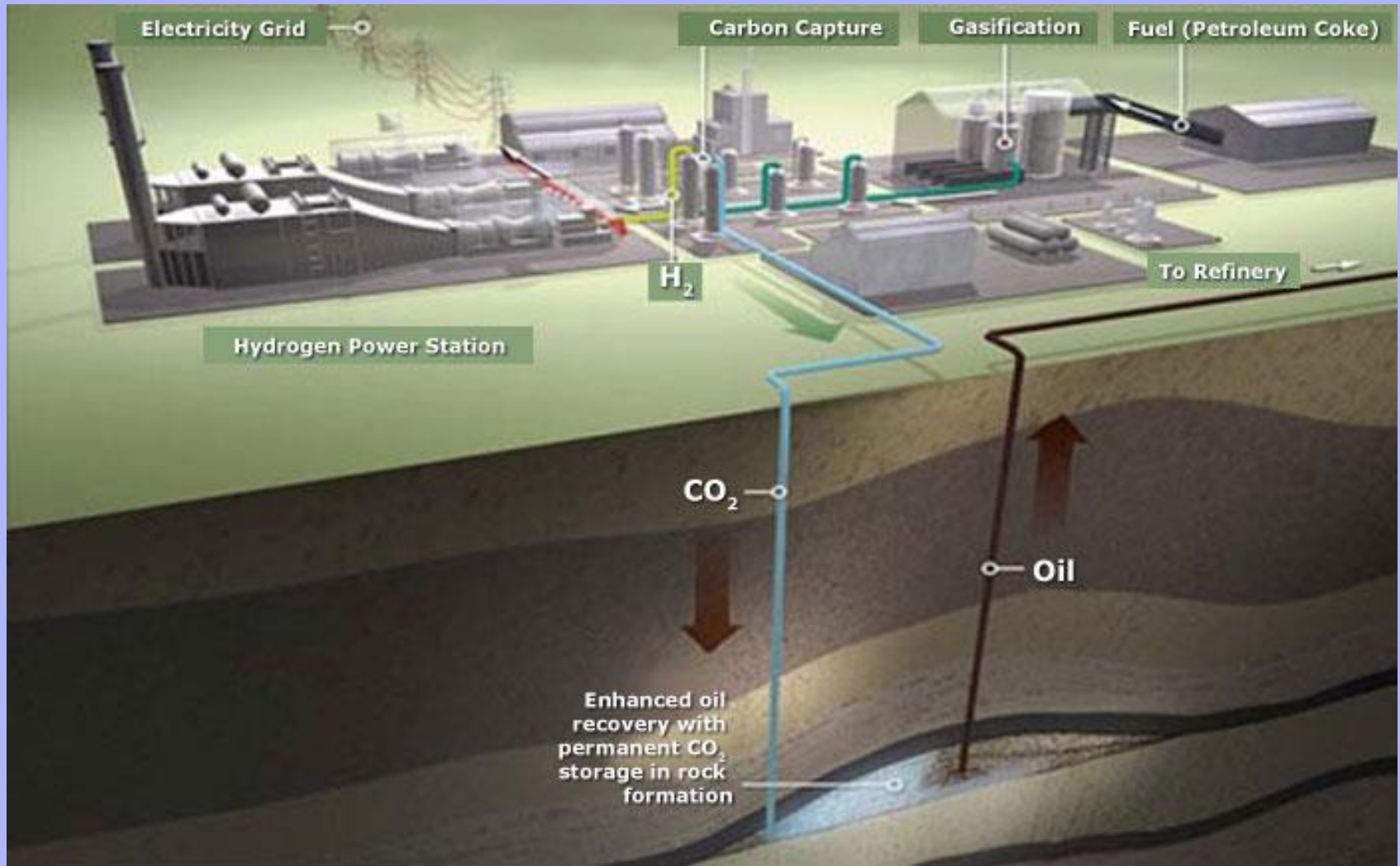
We have to take **greater risks** and go places that are **remote**, environmentally **fragile** and **dangerous** to extract the “new” oil out there



Getting the oil we'll need in future requires big investments today



Including climate protection technology would add 100s of billions more in costs



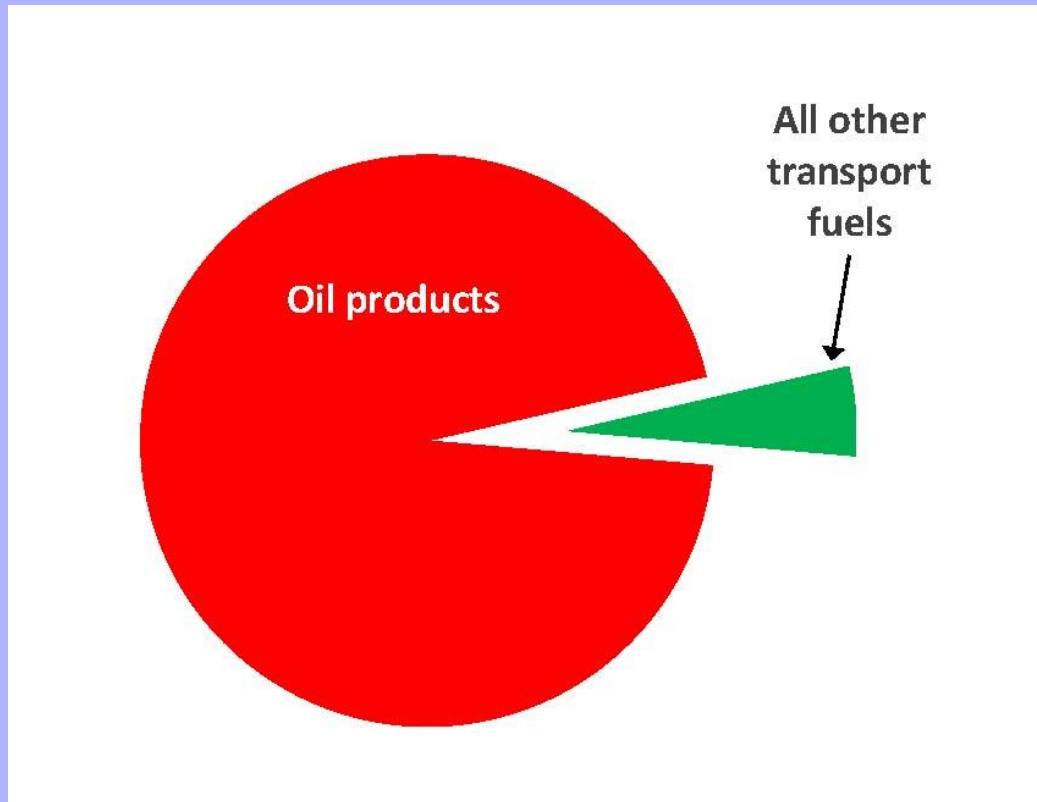
CO₂ capture consumes at least 1/4 of the energy

How much more money and energy will be required to expand global energy production to keep pace with future demand?



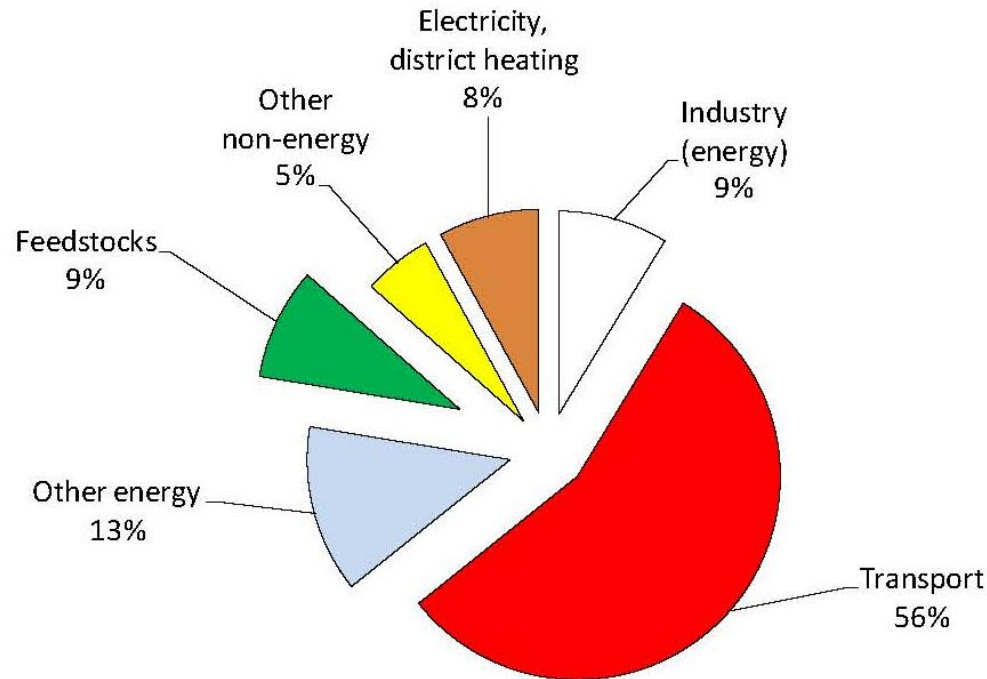
World Energy Council estimates **\$37 trillion needed for new energy investments by 2025.**

Transport revolutions will lead, not lag, the post-petroleum adjustment because:



Oil products power ~95% of global mobility

Transport also has the world's biggest appetite for oil



Data are for the world for 2005, from International Energy Agency, *Energy Balances of Non-OECD Countries, 2004-2005*, IEA, Paris, France, 2007. Canadian data show a similar share for transportation. (US data show a much higher share for transportation.)

Societies face a critical choice



- Anticipate change by adapting transport systems to provide mobility using less oil
- React to mobility crises that will arise when climate and energy shocks disrupt existing technology and organization

Moving people and freight without oil
will require **transport revolutions**



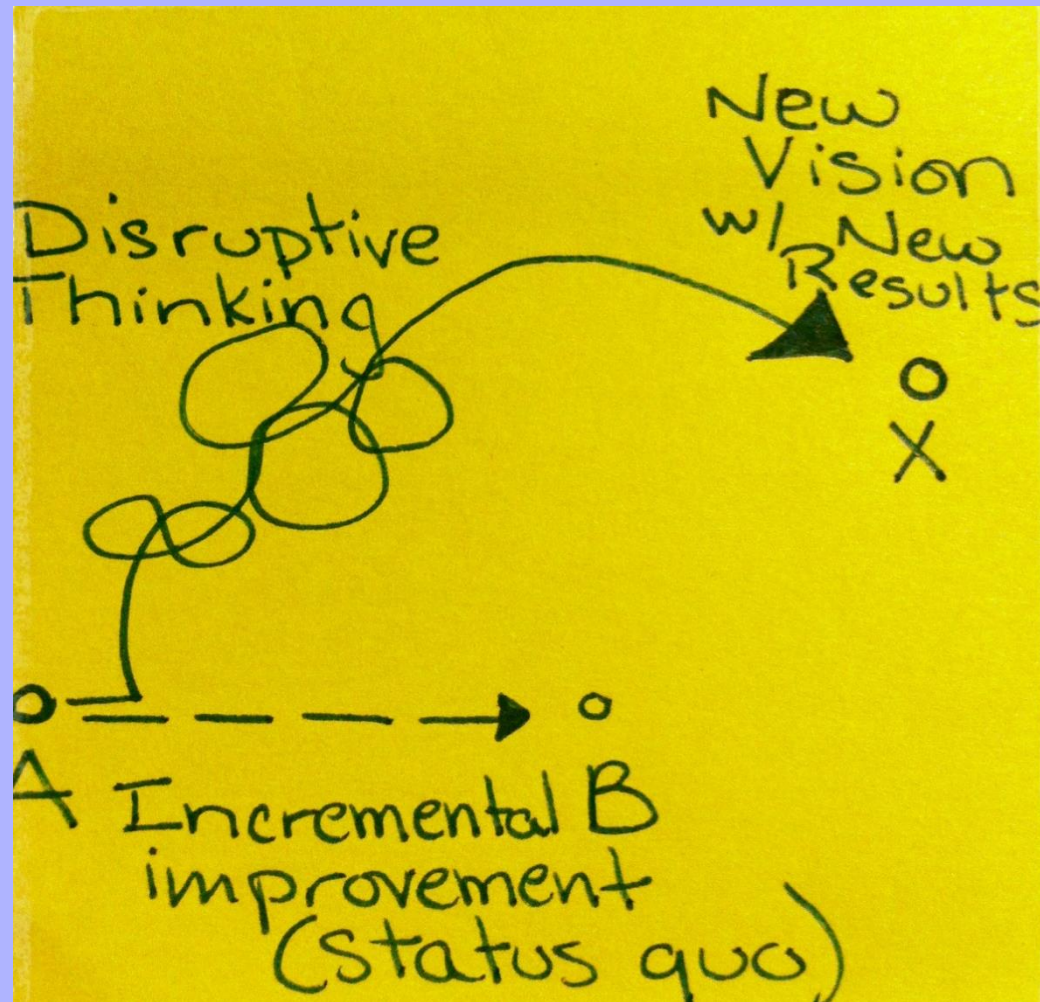
This is **not** a transport revolution

What is a transport revolution?



- A **substantial change** in a society's transport activity — moving people or moving freight, or both — that occurs in **less than 25 years**.
- Substantial change means a **50% increase or decrease** in transport activity or use of a new means of transport becomes part of the lives of 10% of the society's population.

Transport revolutions take society to a different place than incremental change



Three transition scenarios are possible



Can we still steer towards a soft landing today?



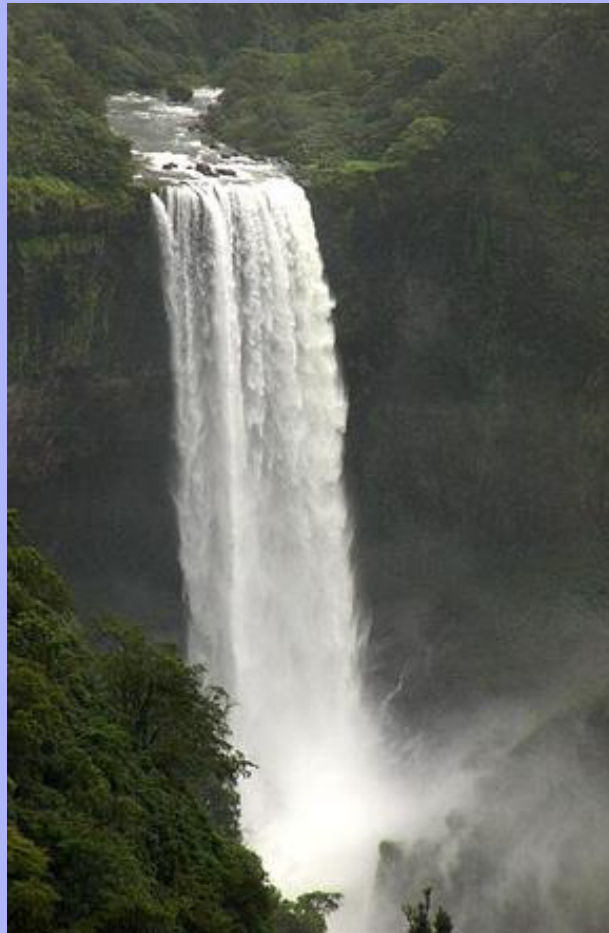
**Soft landing = similar levels of mobility
but by different means and using
different energy sources**



**The path to a soft landing
will require shifting quickly to :**

- **GREATER use of **electric motors**,
replacing internal combustion engines**
- **GREATER use of **rail and water**,
replacing road and air**
- **GREATER use of **collectively managed
travel**, replacing isolated individual
travel**

Electric mobility offers the key to a sustainable energy transition because it can blend multiple renewable sources



...

To incrementally replace nonrenewable energy sources



Grid-connected public transit vehicles offer mature technology to accelerate electric mobility



RRJ - www.tr

LOHR

Electric railways offer proven technology for moving freight without oil



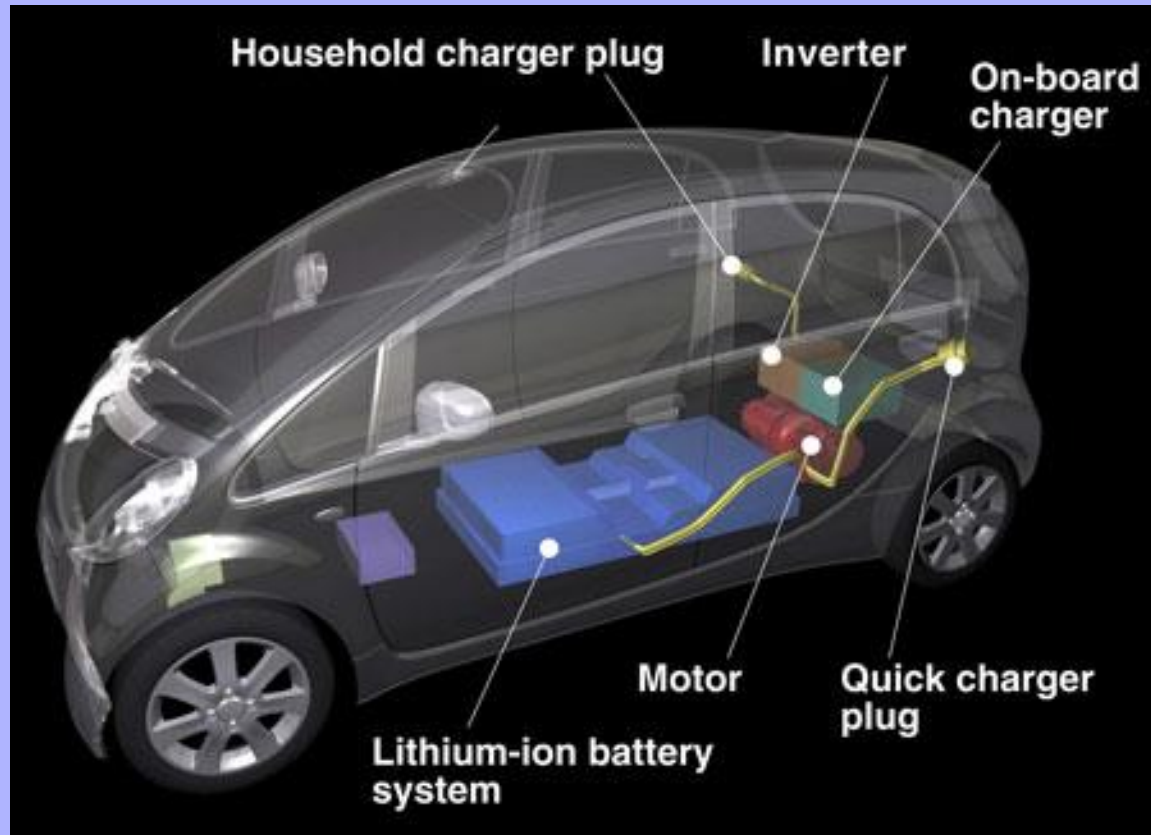
In 50 years, high-speed rail has grown to support travel without oil between cities up to 1,200 km. apart in Asia and Europe



**Tokaido
Shinkansen has
run since 1964
with ZERO
fatalities in Japan!**

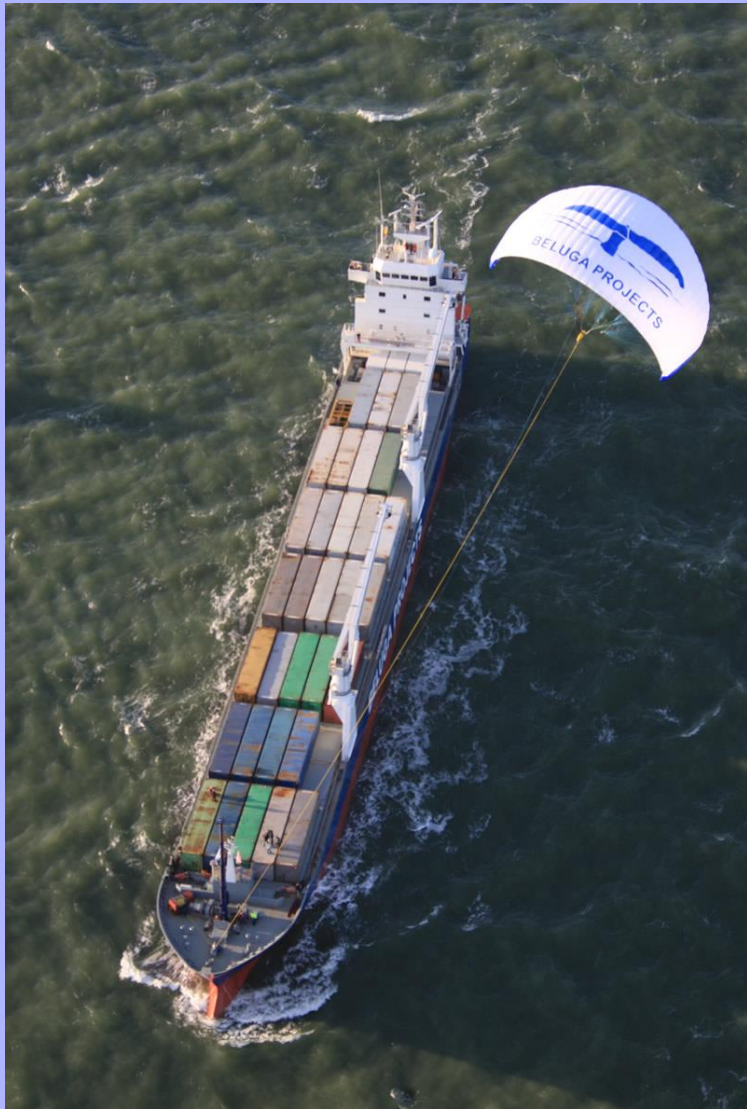


Batteries remain the electric road vehicle's 'Achilles heel'



Do we have to build a cheap battery for powering vehicles 300 km per charge by 2025?

Wind power can boost the world's most energy efficient transport mode



- 90% of global trade already moves by water
- Marine transport is the most carbon-efficient way of moving
- 'SkySails' technology can reduce marine transport's oil use by a further 50%

First step in preparing for a soft landing: Set aside plans for an unrealistic future



Will Rogers once advised Americans that to get out of a hole, the first thing one has to do is:

STOP DIGGING !

Why is it so hard to stop building more infrastructure that would be obsolete in a post-carbon future?

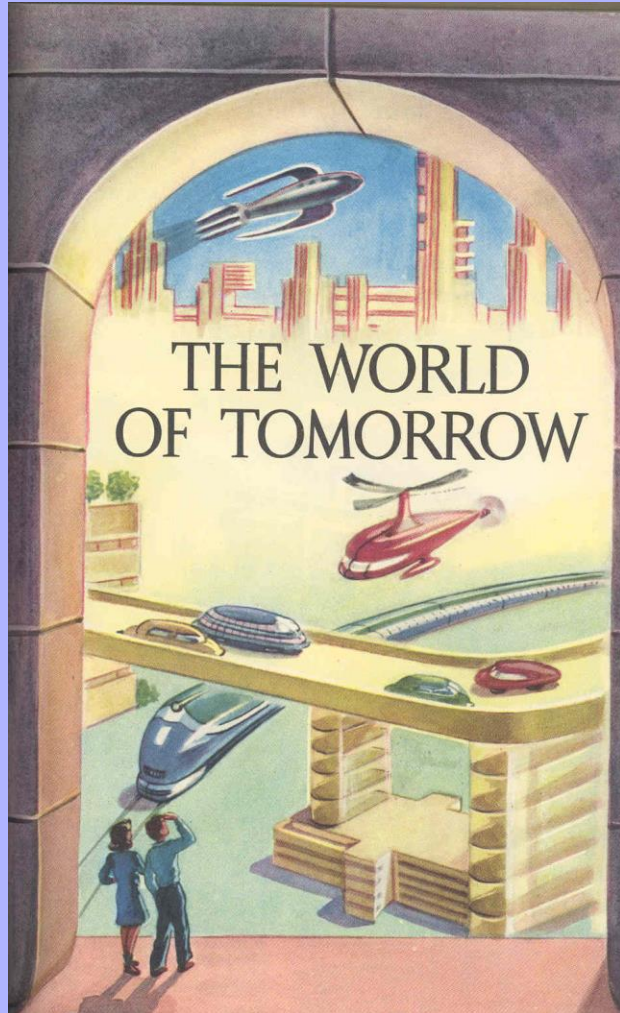


For every 1,000 engineers who can build more highways and airports, there might be one who can design an electric railroad or BRT corridor.

People in motion lack perspective on when they have reached the point of diminishing returns



People don't see the contradiction between their desire for more mobility and a better future



More \neq better

Better = better

Experts find it easier to recommend new fuels or end of pipe pollution controls than to consider more fundamental changes

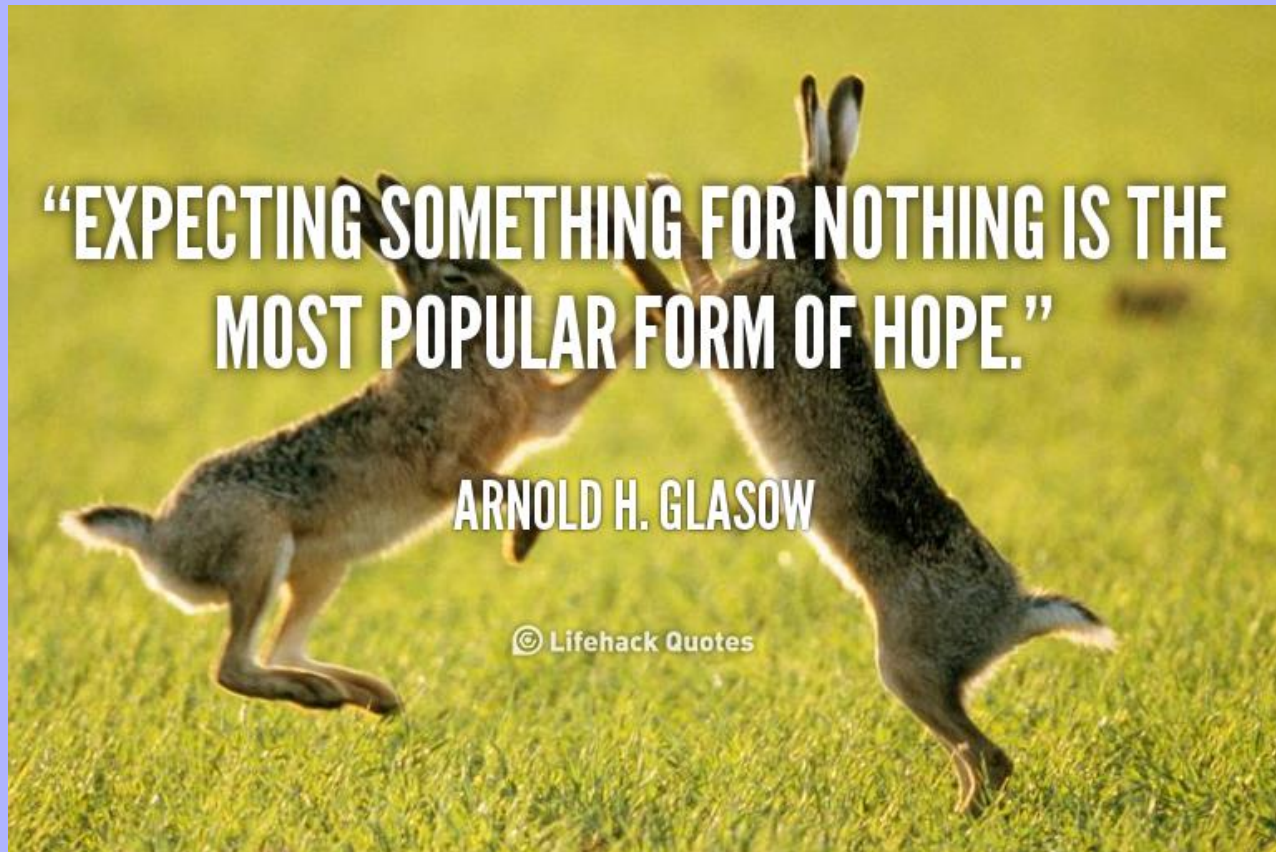


BIOFUELS FOR TRANSPORT: A ROADMAP FOR DEVELOPMENT IN AUSTRALIA

REPORT OF A STUDY BY THE AUSTRALIAN ACADEMY OF
TECHNOLOGICAL SCIENCES AND ENGINEERING (ATSE) 2008



**Most public officials get elected,
and stay in office, through
appealing to people's desire to
get more and give less**



How can we gear up for taking the path to a soft landing in post-carbon mobility?



- ✓ **New planning skills**
- ✓ **New priorities**
- ✓ **New policy**

Planning a soft landing will require new and different policy capacity

Launching a Transportation Redevelopment Agency creates an organizational home to build such capacity



TRA should develop an energy-first planning framework

- 1. Set the key parameters: a) how much to reduce liquid petroleum fuel use in transport, and;
b) what the time period to achieve this reduction.**
- 2. Estimate current transport activity and energy use.**
- 3. Anticipate future available modes that use less oil.**
- 4. Develop a plausible strategy for deploying future modes that meet desired activity and oil reduction targets.**
- 5. Continually refine and improve energy use estimates and proposals for transport activity.**

A plan is essential to supporting those who will have to go out on a limb authorize change

- **Launching major change in mobility requires taking political risk.**
- **Inspiring public confidence that new mobility priorities will yield widespread benefits is a necessity in democracies.**

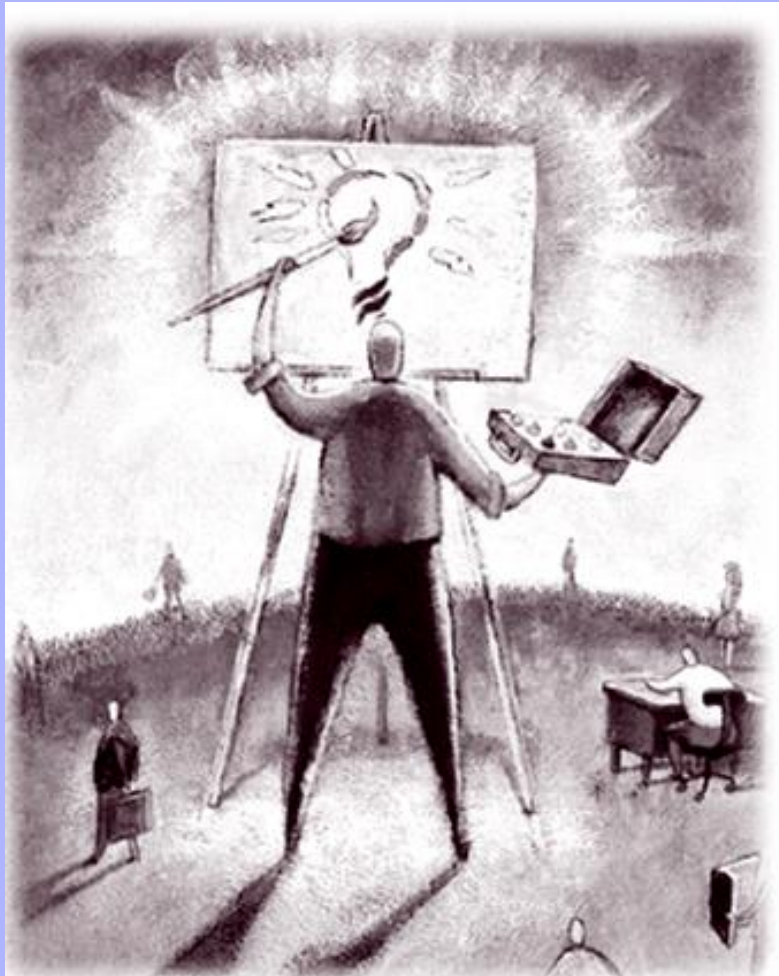


TRA's plan could guide future investment, both public and private



- Govt. spending on highways and airports would likely decrease, while rail, transit, and cycling and pedestrian infrastructure would increase.
- Private spending on transportation would also decline over time.

Policy tools needed to fast-track post-carbon mobility

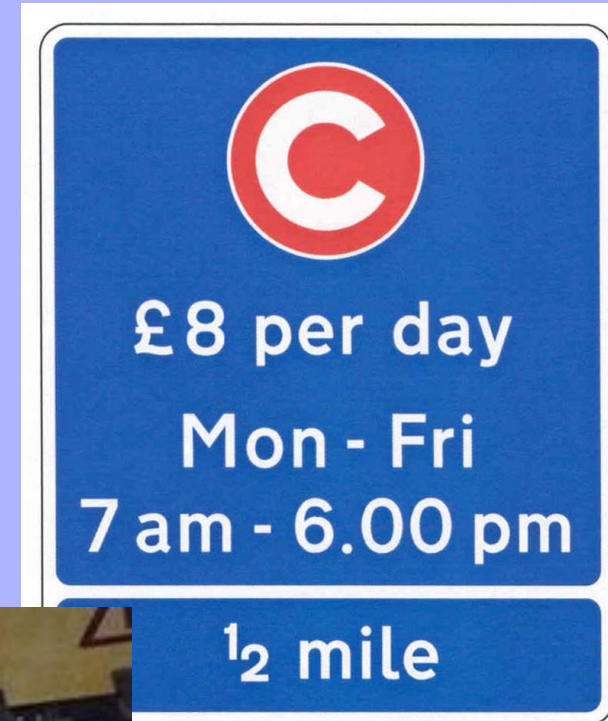


- Introduce fiscal options that move beyond ‘road socialism’
- Enable public-private partnerships through infrastructure condominiums
- Encourage carbon sunsets through acquiring and repurposing ‘stranded assets’

Pricing road use quickly shows people how to move more sustainably



Time of day	Tax
00:00 – 06:29	0 SEK
06:30 – 06:59	10 SEK
07:00 – 07:29	15 SEK
07:30 – 08:29	20 SEK
08:30 – 08:59	15 SEK
09:00 – 15:29	10 SEK
15:30 – 15:59	15 SEK
16:00 – 17:29	20 SEK
17:30 – 17:59	15 SEK
18:00 – 18:29	10 SEK
18:30 – 23:59	0 SEK

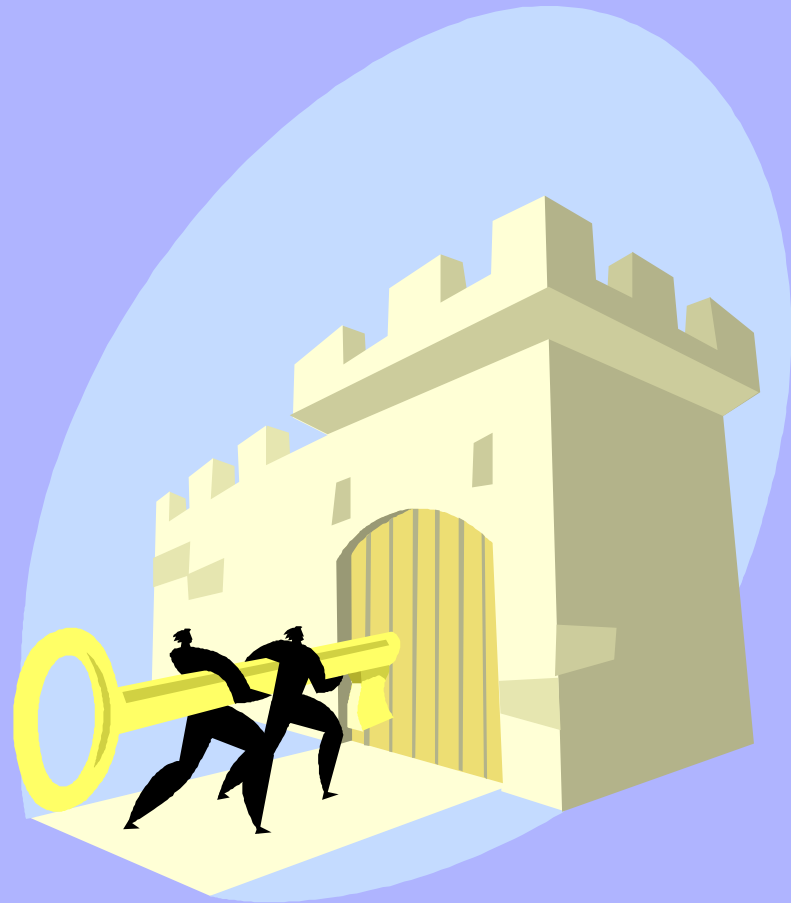


Future electric mobility corridors will need to support multiple modes



New designs for electric rail transport could unlock a barrier to EV usage

- **One of the EV's biggest limitations is the lack of infrastructure for charging batteries.**
- **Railroad & transit electrification does not have to power just one mode.**



Electric cars could recharge at rail and transit stations



TRA can also manage stranded assets from carbon dependent mobility and wind down or repurpose these facilities



Multi-modal airports like Lyon Saint Exupéry show how to “future-proof” infrastructure for post-carbon mobility



What might happen if we take the path to a hard landing?



Hard landing = rapid reduction in mobility through destruction of either demand and supply (or both)



Transportation modes that can only run using large amounts of oil will be most vulnerable to a hard landing



Trying to suddenly use a lot less oil in these modes will be very disruptive



Best case scenario: new technology can cut aviation fuel use by 50% above 787



Will that be enough to keep flying cheap?

What might it cost to fly following a hard landing in the airline industry?

Tel Aviv (TLV) to New York (NYC) Sun, Mar 1 - Sun, Mar 15 1 Traveler

Select your departure to New York Sun, Mar 1

Prices are roundtrip per person, includes all taxes and fees.

Filter your results by

Sort by: **Departure** Arrival Duration Price

Airports

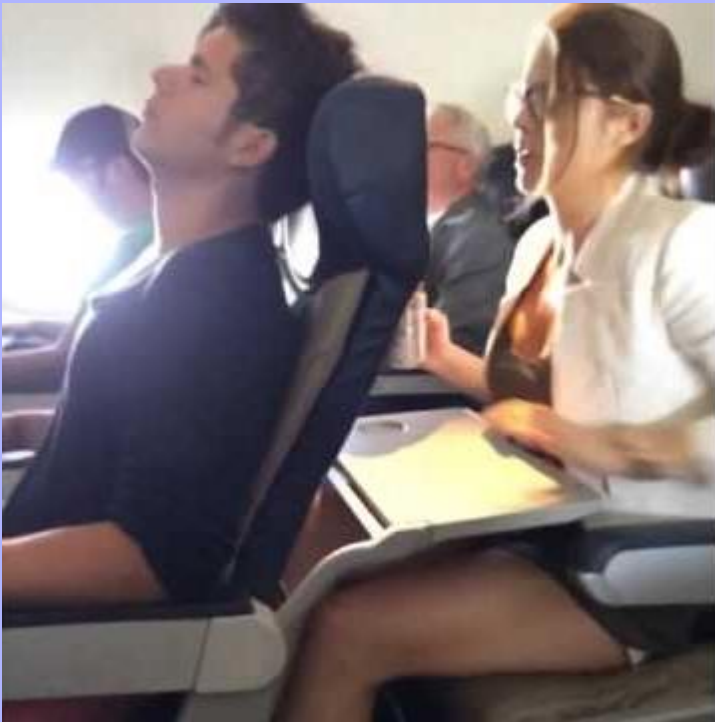
- From: \$2,572
- JFK (New York) (44)
 - EWR (Newark) (23)

Stops

- From: \$2,896
- Nonstop

	7:45a - 4:05p Air France 1 stop 1h 45m in CDG Air France 3634 operated by Delta Show Flight Details	15h 20m TLV - EWR	\$2,571.76 roundtrip Select
	7:45a - 4:20p Air France 1 stop	15h 35m TLV - JFK	\$2,571.76 roundtrip Select

Aviation as a 'mass transportation' mode would be unlikely to survive a hard landing



Some air carriers are doing their best to make sure we won't miss them when they are gone.

Trucking, and the supply chains that depend on it, will also be on the sharp edge of a hard landing



Angry truck drivers can be expected to demand solutions that only make the problem worse.

Commercial empires that rely on low cost goods movement will be hit hard



**Things that cannot go on forever,
usually stop,
and when they stop suddenly...**



**Having
alternatives
can make the
difference in
surviving
sudden
shocks.**

New York had encouraged the return of passenger ferries to provide an alternative to driving into Manhattan



Air temp.: - 7 °C

Water temp.: 2 °C

- **Jan. 15, 2009: US Air flight 1549 made an emergency landing in the Hudson River.**
- **All 155 souls on board survived because the first rescue boat arrived in 4 minutes.**

Hard landings will cause damage and pain, but they can also enable leadership to unlock a solution



Leadership has revolutionized transportation in hard times before



The man who told Detroit what had to be done in a military crisis



- Donald Nelson appointed Chair of U.S. War Production Board on January 16, 1942
- WPB Production Order #1 canceled civilian auto production on February 10, 1942

America's Great Pause in Motorization followed in 1942–43



- 3.8 million autos produced in 1941
- 143 autos produced in 1943
- Gas and tire rationing yielded 40% vkt drop in two years

ONE UNIT	BUY UNITED STATES WAR BONDS AND STAMPS	UNITED STATES OF AMERICA OFFICE OF PRICE ADMINISTRATION GASOLINE RATION CARD No 2471041	B-2
ONE UNIT	THE ACCEPTANCE AND USE OF THIS CARD CONSTITUTE AN AGREEMENT THAT THE HOLDER WILL OBSERVE THE RULES AND REGULATIONS GOVERNING GASOLINE RATIONING AS ISSUED BY THE OFFICE OF PRICE ADMINISTRATION		
ONE UNIT	OWNER'S NAME	Mr. Isaac Schmidt.	
ONE UNIT	STREET ADDRESS	2745 Reservoir Av.	
ONE UNIT	CITY OR POST OFFICE	STATE	N.Y.
ONE UNIT	MAKE	BODY STYLE	Pontiac Sedan
ONE UNIT	VEHICLE REGISTRATION NO.	STATE OF REGISTRATION	12 B-90 N.Y.
ONE UNIT	READ INSTRUCTIONS ON REVERSE SIDE OF THIS CARD		
ONE UNIT	ONE UNIT	ONE UNIT	ONE UNIT

(SIGNATURE) Isaac Schmidt 10-27954-1b

Auto industry took full credit for a strategy they had bitterly opposed



The Toughest Fords Ever Built!

Hard-Hitting M-4 Tanks and M-24 Tank Destroyers
Built, Armored and Powered by Ford — Praised by Army
for Performance Under Fire!

The M-4 Sherman tank is the most versatile and reliable of all tanks. It is built on a Ford chassis and is powered by a Ford engine. The M-24 tank destroyer is also built on a Ford chassis and is powered by a Ford engine. Both tanks are built to withstand the toughest conditions of battle.

**1945 BEST PRODUCTION LINE
DELIVER FLUKE OF WEAPONS**

Ford

FULL PRODUCTION FOR VICTORY

What about a crash landing?



Extreme energy and climate shocks could trigger global conflict



Tens, perhaps hundreds, of millions of refugees should be expected



**Change would be extreme, but so would
the suffering that preceded it**

A quote by Deepak Chopra is centered on a rectangular background with a textured, painterly appearance. The background features a mix of warm, earthy tones including shades of brown, gold, and dark green, with a soft, glowing light effect emanating from the left side. The text is written in a clean, white, sans-serif font.

"ALL GREAT
CHANGES ARE
PRECEDED BY
CHAOS."

-DEEPAK CHOPRA

**Transport revolutions will arrive –
whether we are ready for them or not**



**The sooner
we let go of
obsolete
plans and
outdated
priorities, the
lower the
risk of a
worst case
scenario**