



Energy Co2 : Transportation

Transport and Climate: On the Road to Nowhere?

Transportation is the fastest-growing source of greenhouse gases. See how different modes of transportation are affecting the climate, and how they could become more sustainable.



German company SkySails is currently testing a sail system on large cargo ships that they say could reduce fuel costs by 10 to 35 percent, depending on wind conditions (Photo: Copyright SkySails)

Planes, trains and automobiles are more than just means of transportation. They are necessities of any advanced economy. They also symbolize a way of life. Unfortunately, this freedom to go wherever we wish and get things from wherever we want is 95-percent reliant on burning oil.

According to the UN, the transport sector emits about 13 percent of global man-made greenhouse gas (GHG) emissions. Over the past decade, GHG emissions from transportation have increased faster than those from any other sector, while CO₂ emissions from transport are projected to be about 80-percent higher than current levels by 2030. Not all forms of transportation are equally carbon-intensive, but in almost all cases skyrocketing demand has outpaced the development of cleaner, greener vehicles.

With high oil prices, consumers and governments may force the transport sector to become more fuel-efficient and explore alternative fuels. Even road traffic, undoubtedly the most widespread form of transportation, has the potential to drastically reduce its carbon footprint.

Some of the examples that follow show that a mobile society does not necessarily lead to an environmental dead end. Lifestyles can change. In a few years, gas-guzzling SUVs might be ridiculed as modern dinosaurs, while electric cars symbolize real freedom.

Road Transport

Between 600 and 700 million cars, trucks, and buses worldwide produce about three quarters of all greenhouse gas emissions from transportation. The United States has about 30 percent of the world's automobiles, and contributes 45 percent of the world's automotive CO₂ emissions, but car production in places like China, India, and Brazil is catching up fast.

Cars sold in the EU in 2004 emitted about 12 percent less fossil fuels than in 1995. The European Commission has proposed legislation that would reduce the average emissions of CO₂ from new cars further from around 160 to 130 grams per kilometer by 2012. Hybrid-electric engines or plug-in electric cars could lower the average even further.

Immediate emissions reductions, however, only result from changing consumer behavior. One key factor is the price at the pump. In June 2008, driving in the United States dropped by 4.7 percent. In the face of record gasoline prices, Americans drove about 12.2 billion miles less



InfoGraphic: Transportation Emissions Compared

Click on the image to see which modes of transportation produce the most CO₂ emissions per kilometer.

Shipping

Around 50,000 merchant ships cruise the world's oceans and seas. Even though shipping is the least carbon-intensive method of moving goods from A to B, ships have massive engines that burn lots of fossil fuels. According to the International Maritime Organization, ships emitted over 1.1 billion tons of CO₂ in 2005, about 4 percent of global CO₂ emissions, leaving a carbon footprint larger than that of Europe's biggest economy, Germany.

Most of these emissions stem from cargo vessels and oil tankers, the backbone of the global economy. Modern engines and propellers, and streamlined hull designs have improved fuel efficiency by up to 30 percent. The most advanced vessels, such as the world's largest ship the Emma Maersk, recycle their exhaust back into the engine. But the need for timely delivery has led many shipping companies to use these advances to increase speed and capacity rather than reducing carbon emissions. According to the OECD, increasing a ship's speed by about 4 percent entails a 13 percent increase in CO₂ emissions.

Between 1994 and 2004, maritime trade nearly doubled, and similarly staggering growth rates are expected for the years to come. Improving fuel-efficiency will be crucial to avoid rapidly rising greenhouse gas emissions.

Wind power, once the sole energy source for ships, might have a role to play. German company SkySails is currently testing a sail system on large cargo ships that they say could reduce fuel costs by 10 to 35 percent annually, depending on wind conditions. Another design from the past, the "Flettner ship," uses several spinning towers to create an effect similar to that created by the wings of an airplane and propel a ship forward.

Aviation

The shipping industry may claim to be the backbone of the global economy, but aviation has really established the global village. The world's airlines currently carry about 1.6 billion people and 30 million tons of freight each year. This service, however, comes at a price. Aviation is responsible for about 12 percent of CO2 emissions from all transport sources.

Since the advent of low-budget airlines, air traffic has increased significantly. CO2 emissions from aviation have grown by about 90 percent since 1990, according to EU figures. By 2020, if business continues as usual, they will have doubled. Meanwhile, the number of kilometers flown is expected to triple, and aircraft numbers double over the next 20 years.

Airplanes are not uniquely bad. On some journeys they are roughly comparable to cars in their fuel consumption per passenger mile. The problem is that airplanes pollute at high altitude where their emissions have more impact. Soot and water vapor from the planes create contrails, which have a warming effect. Nitrogen oxides released from the planes destroys methane, a potent greenhouse gas, but forms ozone, which also contributes to global warming. The UN estimates that the warming effect of aircraft emissions is nearly twice that of carbon dioxide alone.

According to Eurocontrol, the European Organisation for the Safety of Air Navigation, ensuring that aircrafts fly at their optimum flight level and over the shortest distance between airports could reduce emissions by 10 percent. New airframe and engine technologies could add another 40 percent reduction by 2020.

Rail

Trains are the least flexible mode of transportation, but also one of the most environmentally friendly. Rail is responsible for about two percent of all transport related CO2 emissions in the European Union. Despite the growth in transportation European railways managed to cut their CO2 emissions by more than 20 percent from 1990 to 2000. The refined aerodynamics of the latest Shinkansen high-speed trains used in Japan have reduced wind drag by 31 percent compared with first generation trains.

Passengers who fly between London, Paris, and Brussels generate ten times more CO2 emissions than those who use existing high-speed train services, according to the Eurostar train company. This is because trains run mainly on electricity from nuclear power plants that have virtually no carbon emissions.

Depending on the power source used, traveling by rail is on average 3 to 10 times less CO2 intensive compared to road or air transport, according to the International Union of Railways (UIC). Trains in the United States, for example, are often diesel-powered. Their combustion engines are less energy efficient than electric motors, and emit more carbon dioxide. Despite these disadvantages, even diesel-powered trains can transport heavy goods in a more environmentally friendly way than trucks.

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Rails provide less friction than a road, there is less wear and tear than on a road, and more cargo can be moved. Transporting 100 tons of cargo from Hamburg to Prague by truck produces three times more CO₂ than doing it by train, calculates the German Institute for Energy and Environmental Research.

Still, the lack of flexibility and a switch to high-value goods transported in small quantities has led to a shift from rail to road. Switzerland has levied a heavy vehicle fee to reverse the trend, and promote transporting goods traffic via rail. Five years after the levy was introduced, the total number of road kilometers traveled had dropped by 6.5 percent.

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Comments

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