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Issue:

Establishing environmentally friendly forms of transportation

Forum:

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Introduction

With the increasing amount of greenhouse gasses (and especially with the increasing amount of carbon dioxide), our planet has started to experience climate change and global warming, both of them having a detrimental effect on the ecology of Earth. Eversince the admission of this phenomenon by world governments, they have been trying to reduce the emissions they cause.

Transportation, being one of the "areas" where governments can take some steps to become more eco-friendly, was among the governments' first focuses. Especially the European countries are successful in this effort. However, as there is with everything, much more can be done.

Throughout this chair report, the question as to why the government's plan on fixing the already-existing forms of transportation will be discussed, what is wrong with the already-existing forms of transportation, and some of the projects regarding transportation will be explained as well as previous solution attempts and possible solutions.

Definition of Key Terms

Form of transportation

A form of transportation, in its most basic usage, refers to how or with what a passenger goes from one place to another. Some examples would be metros, planes, boats, etc.

Environmentally friendly

Environmentally friendly means 'not harmful to the environment' according to the Longman Dictionaries. Some of its synonyms would be eco-friendly, green, clean, carbon-neutral, and so on. It is one of the 'magical' words of our modern world along with words like sustainable, renewable, etc.

Fossil fuel

Fossil fuels are fuels that were formed from organic material over the course of millions of years, with immense pressure applied to them. Since the Industrial Revolution, they have been supporting the development of industries, and therefore, the world economy. However, it is now a known fact that they cause most of the greenhouse gas emissions caused by humans.

Greenhouse gasses

Greenhouse gasses are gasses that allow the light from the Sun to pass and prevent it from escaping the atmosphere. By doing so, they prevent the Earth from cooling down. They kept the Earth's climate habitable for eons. However, due to human activities (mainly by burning and extracting fossil fuels), the amount of those gasses is out of balance, and we are facing climate change. Some of the greenhouse gasses include CO₂, CH₄, N₂O, SF₆, NF₃, water vapor, and O₃.

Biofuel

Biofuels are designed to replace the fossil fuels for the source of power with those made from plant material or other feedstocks that are renewable. The ideas and attempts are promising; however, much research and work are needed to make biofuels a more viable option compared to fossil fuels.

General Overview

I. Background Information

Plant and body tissues of dinosaurs and plants, that go back to the age of dinosaurs, stayed under the pressure of layers and layers of rock for millennia to produce, as we call them today, carbon-rich fossil fuels. There are three main types of fossil fuels: coal, oil, and natural gas.

Coal provides $\frac{1}{3}$ of global energy need, and top coal users are China, India, and the United States. Burning coal is calculated to cause 44% of carbon dioxide (CO₂) emissions, and it is the biggest source of emission in the world. Even though in the more-developed industries, the usage of coal is decreasing, under-developed industries, such as India, are expected to use more coal every year until 2023.

Oil is used in motor vehicles such as cars and buses, apart from its many areas of use. Top oil-producing countries are the United States, Saudi Arabia, and Russia. Petroleum causes $\frac{1}{3}$ of the CO₂ emission worldwide and nearly half of in the United States. Apart from the pollution and greenhouse emission it causes when it is burnt, there were many drilling and transportation accidents such as Exxon Valdez spill (1989), the Deepwater Horizon (2010), the Lac Megantic oil train derailment (2013), and thousands of pipeline incidents.

Natural gas, despite being cleaner than both coal and oil, accounts for $\frac{1}{5}$ of the world's total CO₂ emissions. The United States, Russia, and Iran are the countries that lead natural gas production in the world.

Because of the high carbon dioxide and other greenhouse gas emissions they cause, most of the developed industries and countries are trying to reduce their greenhouse gas emissions. One of the 'sectors' or aspects of life that uses fossil fuels the most is transportation. Many cars, buses, and planes use fossil fuels to fulfill their energy needs. Because of these reasons, environmentally-friendly forms of transportation should be established.

II. Existing Forms of Transportation

By explaining the shortcomings and the problems with the already used forms of transportation, it is believed that the main incentive to establish new and eco-friendly forms of transportation will be achieved.

Cars are the most common mode of transportation, and therefore, they are the ones that impact the environment the most. Even before they hit the roads, their production steps harm the environment. Automotive production causes a great carbon emission as materials like steel (which needs coal or natural gas to melt), rubber (which is petroleum, in the most basic sense), glass, plastics (which is petroleum, in the most basic sense), paints (which are plastics), and many more must be created to make the car. Also, they mostly use fossil fuels, oil, to provide the energy need, which later on increases the carbon dioxide emission as well as other greenhouse gasses'. In addition to these, cars cause air pollution, especially in cities, where pollution is the most noticeable and intense.



Busses, being very large cars, have the same drawbacks that cars have: they cause a high amount of carbon emission even during their production, and they use oil as their fuel. However, they carry a large number of passengers every time they travel and contribute to public transportation. Because of this, they are more efficient than cars with a lower carbon emission per passenger.

Metros use electricity as their main source of energy. Because of this, it is possible to say that they produce nearly no greenhouse gas emissions. The only pollution they cause may be in their production stage, which is, compared to other forms, very little. Trams, likewise, have very similar benefits. The only difference between them is that one goes underground, and the other goes on the ground. This difference is actually a pretty significant one since tunneling for kilometers under meters of soil is very costly, which does not make the metros a very viable option for places that are not big cities.



Planes have bad effects on the environment as well. They cause more greenhouse gas per passenger mile, compared to most of the other forms of transportation. It was estimated that they made up around 13-15% of the total greenhouse gas emissions in the United Kingdom. Planes use fossil fuels (oil), and transportation, production, etc. of the planes are also not eco-friendly.

Major Parties Involved

Norway:

Norway is a country that has been especially successful in implementing eco-friendly transport being one of the first nations with a significantly high number of electric and hybrid cars being sold and used in comparison to the rest of the World. The Norwegian government has worked to promote alternative and renewable energy sources for transport. In contrast to countries increasing tax on fossil fuel vehicles Norway has taken it a step further by providing incentives for electric vehicles such as: zero tax, toll-free travel, public charging stations etc. As result of the aforementioned Norway currently boasts the highest number of all-electric vehicles per capita in the World. As of June 2018 electric vehicles make up 47 percent of Norway's new registered passenger vehicles. Even though electric cars may not be a viable solution for Norway's neighbors let alone the rest of the World this country certainly sets an example on the topic of eco-friendly transport.

France:

France aims to curb the use of fossil fuel through fuel taxation. In an effort to set a positive example in accordance with the implementation of the Paris Agreement, France announced that it would increase taxes on fossil fuel in late 2017 accompanied by rebates for the purchase of electric vehicles. This tax is expected to account for all the negative side effects of car use encompassing carbon emissions as well as traffic and noise pollution. This initiative was criticized due to its limitation of low-income workers. Therefore, should serve as a reminder that climate

policy must also account for social acceptability and practicality. Nevertheless, it can be said that France is among the European countries taking steps in the direction of more environmentally friendly transport.

Luxembourg:

Another European country taking steps to improve its transportation methods namely, Luxembourg has come up with a plan to eventually make public transportation cost free. This aims to reduce the use of cars and gradually provide services of trains, trams and buses without cost. Initiatives such as these give the public incentive to use modes of transportation that are environmentally friendlier and less expensive.



Timeline of Key Events

Date (Day/Month/Year)	Event

1997	The world's first mass-produced hybrid vehicle, the Toyota Prius is launched in Japan in 1997
2000	The Toyota Prius becomes popular in the United States as well, as the market penetration of hybrid and electric vehicles increases
2008	The first Tesla Roadster is built. This electric vehicle is designed and manufactured by the pioneer company Tesla which continues to lead the market on eco-friendly transportation technology in the coming years.
2010	In December 2010, Nissan releases the LEAF, an all-electric, zero tailpipe emissions car.
2016	Bertrand Piccard and André Borschberg, two pilots complete the first circumnavigation of the globe with no fuel
2017	As of January 2017, 12 million hybrid cars have been sold worldwide

Previous attempts to resolve the issue

One of the recent developments regarding transportation is the increasing use of hybrid cars. As cars and other motor vehicles start using electricity as their main source of energy, instead of oil, carbon dioxide emissions get decreased, and therefore, the cars become more environmentally friendly. However, due to the high price of electric cars, they are not used very much in the world as well as in Europe. Norway is the first country with a significant usage of electric cars. Almost 60% of new cars sold in the country are electrically-powered. Norway plans to stop the sale of fossil-fueled cars by 2025. Exceptions do not break the rule, and that is the case here as well. Even though Norway has a high amount of electrically powered cars, nearly none of the other countries have a high percentage of hybrid cars, especially due to their high prices. Because of this, more development and research should be done on the topic to make hybrid cars more viable options compared to 'traditional' cars.

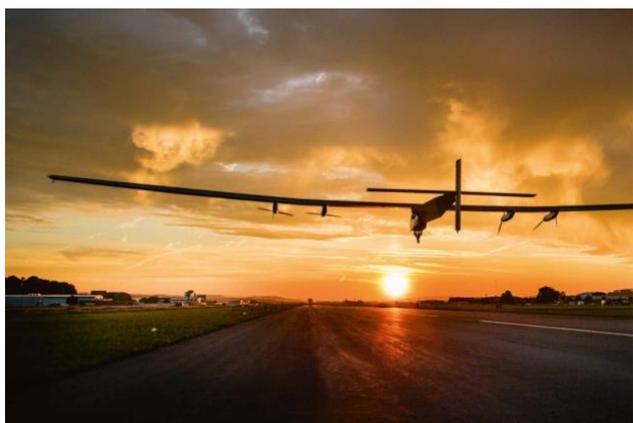
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In 2016, Bertrand Piccard and André Borschberg, two pilots completed the first circumnavigation of the globe with no fuel. They used an aircraft named Solar Impulse 2, which used nothing but solar energy as its energy source. The aircraft traveled around the world with no fuel, in a 'clean' fashion. The achievement is a remarkable and inspiring one and shows what the potential can



be. Even though not viable right now, with research, development, and investment on the aircraft and the concept in general, ideas like this can be actualized.

Another idea to replace fossil fuels is using biofuel. The concept is using biological wastes (garbage, etc) to produce energy. For example, gasoline contains a high percentage of ethanol, a biofuel, which can also be obtained using fermentation (wine-making). Also, scientists do pieces of research and 'biodiesel' which is a mixture of some 'real' diesel with fats such as vegetable oil, animal fat, and recycled cooking grease. Biofuels are also used in aviation and shipping sectors; however, they are, approximately, in trace amounts.



Finally, to produce renewable natural gas, or bio methane, methane can be

captured from landfills, livestock operations, wastewater, or other sources. This captured biogas then must be refined further to remove water, carbon dioxide, and other elements so that it provides the necessary energy.

All in all, the ideas developed by scientists are promising and can be useful in the future. However, more investment, development, and research are required to make those options be able to compete with already-used fossil fuels.

Possible Solutions

Despite the abundance of conventional fossil fuel reliant transportation, the options available to us to make the switch to eco-friendly transportation are continuing to improve. Apart from below mentioned solutions, sustainable urban planning can also be born in mind and it is advisable to also keep in mind the people and things that might be opposed to such matters, and those things that might keep governments from taking measures.

Hybrid and Electric Cars

Even though the widespread use is significantly more difficult to implement in comparison with other environmentally friendly modes of transport, hybrid and electric cars are a great middle-ground option as they preserve the comfort and accessibility of conventional cars with the goal of making less of an environmental impact.

Electric cars use electricity while hybrids use a combination of both gasoline and electricity. They reduce emissions through little to no reliance on fossil fuel and in the case of hybrids employ technologies such as power assist and regenerative braking. The technology used in hybrids not only reduce fuel consumption and increase energy efficiency but also make hybrids a sustainable option in cities.

Diesel and Biodiesel Cars

Diesel cars are thought to be more efficient for traveling long distances in contrast to hybrids better equipped for efficiency in the city. An article by the telegraph concludes that diesel cars are more energy-efficient than hybrids when traveling long distance or accelerating at high speeds.

An alternate renewable energy source is Biodiesel consisting of natural oils and fats. The United States Alternative Fuels Data Center states the following regarding biodiesel: "Biodiesel is a domestically produced, clean-burning, renewable substitute for petroleum diesel. Using biodiesel as a vehicle fuel increases energy security, improves air quality and the environment, and provides safety benefits." While biodiesel may not be as popular as conventional diesel or petroleum, its popularity is increasing

Public Transportation

One of the eco-friendliest methods of transportation especially in the city is public transportation. In terms of speed, trains and metro travel faster than passenger cars while buses match their speed. Meanwhile transporting large groups of people with less vehicles greatly reduces environmental consequences.

In the category of public transportation, it is important to note that planes in contrast to other transportation methods release a high level of greenhouse gas emissions and are not energy efficient as they rely solely on fossil fuel.

Motorbikes

Motorbikes are quite efficient due to their small weight and size.

According to the report of the IEA “they are barely more fuel-intensive than buses.”

Like with other modes of transport the electric option for motorbikes is also available. They of course have the benefit of being personal transportation as an alternative to public transportation. Aside from their dangerous nature motorbikes are a seemingly energy-efficient way to get around

Body Power

Last but certainly not least one the best ways to help the environment in terms of transportation is to rely on your own body to get around. Despite not being practical in many situation a number of countries have successfully increased the use of body powered transportation to lower their carbon footprints.

Alongside walking, biking is perhaps one of the best options in this category. Not only do bikes rely on human power to function their production and costs are also not too detrimental to the environment.

Advancements in eco-friendly technology aside it is always possible to trade comfort and luxury for more traditional methods of transportation like walking, biking or public transportation to preserve the environment.

All “eco-friendly” methods of transportation have their pros and cons but utilizing them in contrast to conventional methods is the path to a cleaner environment no matter how small of a difference we think it makes.

Appendix/Appendices

What is Green Transportation:

<https://www.conserve-energy-future.com/modes-and-benefits-of-green-transportation.php>

The Climate Action Policies of the European Commission:

https://ec.europa.eu/clima/index_en

Reducing CO2 Emissions:

https://ec.europa.eu/clima/policies/transport/vehicles/cars_en

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Eco-Friendly Transport: The Greener Way to Get Around:

<https://www.independent.co.uk/life-style/motoring/features/eco-friendly-transport-the-greener-way-to-get-around-5335967.html>

Timeline of Electric Cars:

<https://www.energy.gov/timeline/timeline-history-electric-car>

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