

ENVIRONMENTAL IMPACTS OF NON-RENEWABLE ENERGY SOURCES

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Abstract

In this paper, the use of non-renewable sources of energy has a variety of harmful impacts on our environment either due to the way they are extracted and processed or also in terms of how they are used and thereafter disposed of. The continued use of non-renewable resources has clear implications for our health and wellbeing, both of which are intimately connected with the impacts non-renewable resources on our environment. These are very much worth exploring and this article aims to do exactly that with a focus on the harmful effects of non-renewable energy resources on our environment. In addition to the greenhouse gas emissions released when things like natural gas, oil, and coal are burned, each of the fossil fuel energies below come with a world of other eco-woes. Below is a list of the most common non-renewable energy sources and their related impacts on human health and the environment.

Keywords: Environment, Non-renewable resources, Harmful effects

Introduction

Non-renewable energies are those that do not self-sustain naturally. Examples of non-renewable energies are coal, oil and natural gas. Unlike renewable energy sources like wind, water and sun--most of which are converted to power cleanly--the conversion of fossil fuels to usable energy can result in harmful emissions and its collection can disrupt local wildlife. The processing of fossil fuels emits harmful greenhouse gases into the air. These gases, primarily carbon dioxide, damage the ozone layer which protects us from the sun's radiation. The air pollution also negatively affects our respiratory health. Acid rain is created by the emission of sulfur and other chemicals into the atmosphere, often from the conversion of fossil fuels into electricity. It is corrosive to machinery and can disrupt local ecosystems. Harmful ash is stored in solid waste containment areas which are prone to rupturing and causing havoc in the surrounding areas. Oil spills are extremely damaging to nearby shores and ecosystems.

Objectives

Non-renewable energy sources are those sources that drain fossil reserves deposited over centuries. This results in depletion of these energy reserves. There are many countries, which have recorded significant reduction of these sources and are currently suffering from the side effects of drilling these energy reserves from deep underground. Examples of these countries include China and India. The environmental impact is so great that just by travelling to these two countries, you can get a firsthand experience on the case studies that are there to be seen by the naked eyes. This is a trend that has to be reversed if the world is to survive the degradation process that is going or happening at a much rapid pace.

Methodology

Nonrenewable energy sources including oil, coal, and natural gas. "tragedy of the commons". overgrazing animal example, everyone grazes more animals, takes more *resources*, and nobody takes care of the pasture because nobody owns it. *ecological footprint*. Finally, environmentally sensitive design and building practices often have more to do with political correctness than with real gains in not damaging the *environment*. Much is made of the *benefits* of replacing *non-renewable energy sources* with alternatives such as photo-voltaics and deep cycle batteries. *Nonrenewable and renewable energy sources. Energy sources* are

classified as *nonrenewable* because they do not form or replenish in a short period of time. Renewable *energy sources* such as solar and wind replenish naturally in a short period of time.

Fossil Fuels

Natural resources such as coal, petroleum (crude oil) and natural gas take thousands of years to form naturally and cannot be replaced as fast as they are being consumed. Eventually it is considered that fossil-based resources will become too costly to harvest and humanity will need to shift its reliance to other sources of energy such as solar or wind power, see renewable energy. An alternative hypothesis is that carbon based fuel is virtually inexhaustible in human terms, if one includes all sources of carbon-based energy such as methane hydrates on the sea floor, which are vastly greater than all other carbon based fossil fuel resources combined.^[1] These sources of carbon are also considered non-renewable, although their rate of formation/replenishment on the sea floor is not known. However their extraction at economically viable costs and rates has yet to be determined. At present, the main energy source used by humans is non-renewable fossil fuels. Since the dawn of internal combustion engine technologies in the 19th century, petroleum and other fossil fuels have remained in continual demand. As a result, conventional infrastructure and transport systems, which are fitted to combustion engines, remain prominent throughout the globe. The continual use of fossil fuels at the current rate is believed to increase global warming and cause more severe climate change.^[2]

Nuclear Fuels

The World Commission on Environment and Development (WCED) an organization set up by but independent from the United Nations classified fission reactors that produce more fissile nuclear fuel than they consume -i.e. breeder reactors, and when it is developed, fusion power, among conventional renewable energy sources, such as solar and falling water.^[3] The American Petroleum Institute likewise does not consider conventional nuclear fission as renewable, but that breeder reactor nuclear power fuel is considered renewable and sustainable, before explaining that radioactive waste from used spent fuel rods remains dangerous, and so has to be very carefully stored for up to a thousand years.^[4] With the careful monitoring of radioactive waste products also being required upon the use of other renewable energy sources, such as geothermal energy.^[5] The use of nuclear technology relying on fission requires Naturally occurring radioactive material as fuel. Uranium, the most common fission fuel, and is present in the ground at relatively low concentrations and mined in 19 countries.^[6]

This mined uranium is used to fuel energy-generating nuclear reactors with fissionable uranium-235 which generates heat that is ultimately used to power turbines to generate electricity.^[7] As of 2013 only a few kilograms (picture available) of uranium have been extracted from the ocean in pilot programs and it is also believed that the uranium extracted on an industrial scale from the seawater would constantly be replenished from uranium leached from the ocean floor, maintaining the seawater concentration at a stable level.^[8] In 2014, with the advances made in the efficiency of seawater uranium extraction, a paper in the journal of *Marine Science & Engineering* suggests that with, light water reactors as its target, the process would be economically competitive if implemented on a large scale.^[9] Nuclear power provides about 6% of the world's energy and 13–14% of the world's electricity.^[10] Nuclear energy production is associated with potentially dangerous radioactive contamination as it relies upon unstable elements. In particular, nuclear power facilities produce about 200,000 metric tons of low and intermediate level waste (LILW) and 10,000 metric tons of high level waste (HLW) (including spent fuel designated as waste) each year worldwide.^[11]

Issues entirely separate from the question of the sustainability of nuclear fuel, relate to the use of nuclear fuel and the high-level radioactive waste the nuclear industry generates that if not properly contained, is highly hazardous to people and wildlife. The United Nations (UNSCEAR) estimated in 2008 that average annual human radiation exposure includes 0.01 millisievert (mSv)

from the legacy of past atmospheric nuclear testing plus the Chernobyl disaster and the nuclear fuel cycle, along with 2.0 mSv from natural radioisotopes and 0.4 mSv from cosmic rays; all exposures vary by location.^[12] natural uranium in some inefficient reactor nuclear fuel cycles, becomes part of the nuclear waste "once through" stream, and in a similar manner to the scenario were this uranium remained naturally in the ground, this uranium emits various forms of radiation in a decay chain that has a half-life of about 4.5 billion years,^[13] the storage of this unused uranium and the accompanying fission reaction products have raised public concerns about risks of leaks and containment, however the knowledge gained from studying the Natural nuclear fission reactor in Oklo Gabon, has informed geologists on the proven processes that kept the waste from this 2 billion year old natural nuclear reactor that operated for hundreds of thousands of years, from negatively impacting the surrounding plant and animal life.^[14]

Earth Minerals And Metal Ores

Earth minerals and metal ores are examples of non-renewable resources. The metals themselves are present in vast amounts in Earth's crust, and their extraction by humans only occurs where they are concentrated by natural geological processes (such as heat, pressure, organic activity, weathering and other processes) enough to become economically viable to extract. These processes generally take from tens of thousands to millions of years, through plate tectonics, tectonic subsidence and crustal recycling. The localized deposits of metal ores near the surface which can be extracted economically by humans are non-renewable in human time-frames. There are certain rare earth minerals and elements that are more scarce and exhaustible than others. These are in high demand in manufacturing, particularly for the electronics industry.

Environmental Impacts Of Non-renewable Energy Sources

Greenhouse gas emissions

Perhaps the most well-known impact of using non-renewable energy sources is the emission of greenhouse gases, in particular CO₂ and methane, which contribute to climate change^[16]. Different types of non-renewable energy though emit different levels of greenhouse gases. For example, coal is considered the worst to emit the highest percentage of CO₂. In the US, CO₂ emissions from the electric power sector calculated in 2015 indicate that 71% were attributable to coal **versus** 28% attributed to natural gas^[16]. Indeed, natural gas emits a lot less CO₂, specifically 50-60% less compared to coal and it also emits 15-20% fewer heat-trapping gases compared to gasoline when used to power a vehicle^[17].

However, that does not mean that natural gas can help mitigate climate change as drilling and extracting natural gas from wells results in the leakage of methane, which is a much more potent greenhouse gas – it is 34 times stronger than CO₂ in terms of its potential for trapping heat^[17]. The concerns about greenhouse gas emissions and climate change are cross-cutting. It is not just about the direct impact of rising temperatures and changing weather patterns which impact human livelihoods as floods or dry seasons proliferate. Climate change is impacting ecosystems, diminishing their capacity to adapt to changing climates and as a result threatening biodiversity and the important ecosystem services our lives rely on.

Air pollution

Non-renewable energy sources are not just altering our Earth's atmosphere by increasing the amount of greenhouse gas emissions. They also emit a variety of pollutants that are impact people's health and the environment. For example, **coal-fired power plants are the single largest source of mercury emissions** in the US. When mercury is emitted into the air, it goes on to settle on the ground or blends with water. From that point it accumulates on organisms such as fish, passing through the food chain.

This has profound effects on our biodiversity but creates real risks for people as studies have found that exposure to mercury can lead to neurological and neuro-behavioural effects in embryos and young children ^[18]. Other air pollutants emitted due to fossil fuel combustion include sulphur dioxide, nitrogen oxides and particulate matter.

Acid rain and water pollution

But it is not just the air that we breathe that gets polluted. Dangerous pollutants that are emitted into the air can often follow the water cycle. This is the case of acid rain which is created due to the emission of sulphur and other chemicals into the atmosphere. Because of this cocktail of chemicals, the rain becomes mildly acidic. Acid rain is corrosive to machinery and can disrupt local ecosystems. In terms of the environment, acid rain changes the acidity of lakes and streams which can be very harmful to fish and other aquatic organisms; it would also be damaging to trees thereby weakening forest ecosystems ^[19].

Conclusion

Globally, buildings are responsible for approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, cooling, and air conditioning. Increasing awareness of the environmental impact of CO₂ and NO_x emissions and chlorofluorocarbons triggered a renewed interest in environmentally friendly cooling and heating technologies. It was therefore considered desirable to reduce energy consumption and decrease the rate of depletion of world energy reserves and pollution of the environment. One way of reducing building energy consumption is to design buildings that are more economical in their use of energy for heating, lighting, cooling, ventilation, and hot water supply. Passive measures, particularly natural or hybrid ventilation rather than air conditioning, can dramatically reduce primary energy consumption. However, exploitation of renewable energy in buildings and agricultural greenhouses can also significantly contribute toward reducing dependency on fossil fuels. Therefore, promoting innovative renewable applications and reinforcing the renewable energy market will contribute to preservation of the ecosystem by reducing emissions at local and global levels. This will also contribute to the amelioration of environmental conditions by replacing conventional fuels with renewable energies that produce no air pollution or greenhouse gases. The provision of good indoor environmental quality (IEQ) while achieving energy and cost efficient operation of the heating, ventilating, and air-conditioning plants in buildings represents a multivariant problem. The comfort of building occupants is dependent on many environmental parameters including air speed, temperature, relative humidity, and quality in addition to lighting and noise. Anticipated patterns of future energy use and consequent environmental impacts (acid precipitation, ozone depletion, and greenhouse effect or global warming) are comprehensively discussed in this paper. Throughout the theme several issues relating to renewable energies, environment, and sustainable development are examined from both current and future perspectives. It is concluded that renewable environmentally friendly energy must be encouraged, promoted, implemented, and demonstrated by full-scale plant especially for use in remote rural areas.

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