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# Fossil Fuels, Rising Population, and Global Warming: The Interlinked Phenomena

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**Abstract**

Global warming is increasing due to accumulation of greenhouse gases (GHGs) in the earth's atmosphere. This is leading to devastating consequences causing floods and droughts in different areas of the globe. The exploitation and burning of fossil fuels on a tremendous scale is the main reason for rising global warming. The approach of sustainable development may help in controlling the rising temperatures. Hydrogen fuel is one such promising alternative clean fuel, that could change the scenario as per the vision of 'Hydrogen Economy'. A combined approach of switching to cleaner and greener fuel with increased natural sinks for $CO_2$ can provide better solution to global warming.

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**Keywords**

GHGs; Global Warming; Fossil Fuels; Hydrogen Economy; Sustainable Development.

## Short Communication

The swift rise in the global population and its corresponding energy demandsleads to the ever-increasing exploitation of fossil fuels.[1–3] The world population crossed a whopping figure of 7.9 billion in August 2021 and will cross 8.5 billion by 2030, as per the UN projects world population report. This may further increase the burden on the world's fossil fuel reserves and speed up its exploitation and consumption. In developing countries like Brazil, South Africa, and the South Asian region, 12–24 GJ/cap of energy consumption is required annually to provide a decent standard of living.[4] Hence, the energy demand will undoubtedly increase in the future scenario, and still, 84% of the world's energy is generated from fossil fuels (Figure 1).[5–7] The exploitation of fossil fuels at such a fast pace is never seen before in the earth's history. The fossil fuels reserve, i.e., coal, oil, and gas, are formed and buried under the earth's crust for millions of years. These fossil fuels are now being exploited at such an abrupt rate that they are estimated to finish within next five decades.[8,9] Further, the exploitation of fossil fuels will eventually increase the concentration of greenhouse gases (GHGs) in the earth's atmosphere concisely.[10] The concentration of the GHGs (i.e., $CO_2$

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and $CH_4$) is rising continuously at very fast rate.[11,12] The concentration of $CO_2$ reached 419.13 ppm in June 2021 from 315 ppm in 1959. $CH_4$ is 27 times more potent to the greenhouse effect, and likewise, its concentration also increased from 1650 ppb in 1985 to 1893 ppb in June 2021.[13]

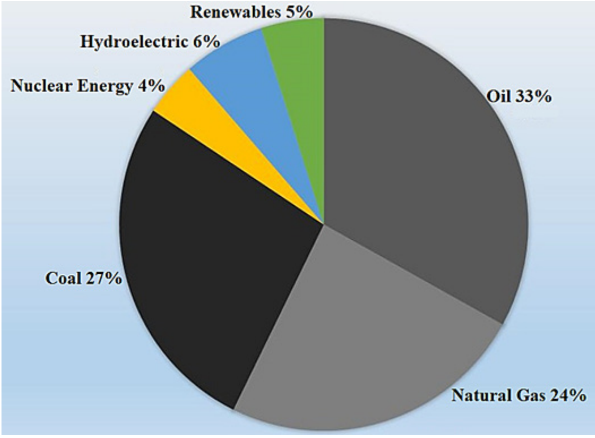


**Fig.1: The global energy consumption scenario (Courtesy: BP Statistical Review of World Energy 2019)[5]**

**Table 1: Energy content of different fuels.[18]**

| Fuel | Energy content (MJ/kg) |
|---|---|
| Hydrogen | 120 |
| Liquefied natural gas | 54.4 |
| Aviation gasoline | 46.8 |
| Gasoline | 46.4 |
| Diesel | 45.6 |
| Ethanol | 29.6 |
| Coke | 27 |

The rising global temperature is thus interfering with the ecosystems, causing havocs via flooding, draughts and sinking of lands in various regions.[14–16] The solution to the problem of global warming endures in the vision of sustainable development. In December 2015, 'The Paris Agreement' was signed between 196 countries to achieve sustainable growth and control the rising global temperatures. The goals of the Paris Agreement can be achieved if the dependency on fossil fuels is controlled. This poses another challenge for alternative fuel sources that could replace fossil fuels.[17] Hydrogen can be a promising alternative to fossil fuels due to its high calorific value and abundance of feedstock availability in nature.[18,19] The energy generated by hydrogen is highest compared when to carbonaceous fuels (cf. Table 1). Further, hydrogen produces only water on combustion and hence a non-carbonaceous and clean source of energy.[20,21]

Several world governments (including developing countries like Brazil and India) came forward and focusing on the vision of 'Hydrogen Economy' for sustainable development. The future demand of ever-increasing population can't be met by the fossil fuels alone, especially in the extremely populated countries like India.[22] Hence, there is a great need of an alternative and clean source of energy. However, sustainability can be achieved via reducing the carbon footprints and hence grey hydrogen production cannot actualize the goals. Recently, some researchers also focused on maintaining a carbon balance in the atmosphere. This further suggests creating more carbon sinks (i.e., planting forests and commercializing $CO_2$ capture techniques) tomaintain lower GHG concentrations of GHGs.[23] Therefore, it can be concluded that the rising world population, its parallel energy demand, and reliance on fossil fuels as the main source of energy are directly associated with one another. This is causing the accumulation of GHGs in the atmosphere rapidly. The remedies for global warming and sustainable development comprise of the all-round approaches, i.e.,(a) alternative economic and clean source of fuel to lower the dependency on fossil fuels,(b) enhancements in the sinks for GHGs including the increase in forest areas, and (c) investing in R & D for exploring techno-economic feasibility in renewable energy sources.

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**Conflict of Interest**
The authors do not have any conflict of interest.

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