Journal of Ecology and Toxicology

Research Article Open Access

Global Warming is Exacerbated by Australian Wood Heaters

Sahil Roy*

Department of Earth Science, National Centre for Rural Greenhouse Gas Research, Greece

Abstract

If the carbon dioxide released when burning the wood is taken up by new trees, the production of firewood is frequently regarded as being CO2-neutral. However, burning firewood in the household heaters that are now accessible in Australia results in the production of methane and black carbon particles, which contribute to global warming. The purpose of this study was to calculate the amount of global warming caused by wood heating in Australia and assess potential solutions. According to estimates, the average wood heater in Brisbane, Perth, or Sydney emits methane that contributes to global warming at least as much as 160 m2 of centrally heated home heated by gas. Additionally, it is believed that a wood heater in the living room combined with additional heating in other rooms will contribute to more global warming in Canberra and Melbourne's colder climates than either gas or reverse cycle air conditioning. If the 4.5 to 5 million tonnes of firewood currently burned in domestic wood heaters were to be substituted for coal in power plants and domestic wood heaters were to be replaced by gas or reverse cycle air conditioning, Australia's annual contribution to global warming would be reduced by at least 8.7 million tonnes of CO2-equivalent [1-5]. A switch to pellet heaters will also lessen the impact of PM2.5 emissions on global warming and the projected $3,800 annual health cost associated with each wood heater. Reviewing the debate about how to attribute global warming between the IPCC and non-governmental IPCC While NIPCC emphasises natural variability, the IPCC maintains that anthropogenic activities—rather than natural variability—are the primary cause of today's global warming. Since the middle of the 20th century, surface temperature observations have supported the idea that human activity has had an impact on the planet's climate. However, over the past century or so, natural forcings like solar activity, volcanic eruptions, and variations in the thermohaline circulation have also had a significant impact on the planet's climate, especially on interdecadal timescales. Evidence also points to a strong connection between the solar activity over the previous 1,000 years and both the Little Ice Age and the Medieval Warm Period.

Keywords: Thermohaline; Black carbon particles

Introduction

The Australian wood heating business currently touts wood heaters as being less climate-changing than other types of heating. However, a Swedish study found that methane emissions from older-style wood-fuelled burners could cause up to twice as much global warming as using oil-fueled heating, whereas modern Swedish designs had much lower methane and particle emissions. This is despite the fact that firewood harvested from a continuously renewed supply is thought to be CO2-neutral. With emissions comparable to those of older-style Swedish models, new wood heaters installed in Australian households raise the possibility that they may contribute to global warming. This study set out to calculate the amount of global warming caused by wood heating in Australia and assess possible mitigation measures. In order to compare wood heaters with other sources of heating, including more efficient wood heaters and other uses of biomass, data on methane emissions and firewood usage were merged [6-10]. This estimation provided a comprehensive picture of the global warming impact of wood heaters in Australia. One of the most talked-about and contentious issues in today's world is global warming. Beyond what we had initially anticipated, the debate practically touched on every aspect of global warming, including its origin, causes, effects, and even whether it had actually occurred. The current debate focuses on three main topics: the current state of global warming, its effects, and the anthropogenic effect. Its proponents argue that these three factors—human activity, natural variability, and its combined effects—are what cause global warming. In this essay, two seemingly incompatible theories about global warming from the Non-Governmental International Panel on Climate Change and the Intergovernmental Panel on Climate Change will be examined.

Material and Methods

Laboratory tests of wood heater emissions

Four Australian wood heaters, including two freestanding models that met the Australian Standard AS4013, a fireplace insert that met the Australian Standard AS4013, and a widely used heater manufactured in 1985, were subjected to an extensive laboratory study to measure emissions for a variety of fuels and burn rates. The average particle emissions per kilogramme of fuel in tests burning eucalypt hardwoods were 4.5 g. The bigger AS4013 heater was also put to the test on softwood, with particle emissions ranging from 7 to 29.4 g/kg. The range of combustion efficiency was from 68% to 98%. Several different carbon molecules, including CO2, carbon monoxide, methane, acetic acid, formaldehyde, benzene, and unidentified volatile organic compounds, were discovered in the smoke. Particle emissions and combustion efficiency had a constant connection.

Household Emissions

Unfortunately, the AS4013 laboratory test does not accurately represent how heaters are used in the domestic context, thus Australian heaters are made to pass the test. Residential emissions are consequently

***Corresponding author:** Sahil Roy, Department of Earth Science, National Centre for Rural Greenhouse Gas Research, Greece, E-mail: sahil@roy.gmail.com

Received: 05-Sept-2022, Manuscript No: jety-22-74785, **Editor assigned:** 07-Sept-2022, PreQC No: jety-22-74785 (PQ), **Reviewed:** 16-Sept-2022, QC No: jety-22-74785, **Revised:** 26-Sept-2022, Manuscript No: jety-22-74785 (R), **Published:** 30-Sept-2022, DOI: 10.4172/jety.1000138

Citation: Roy S (2022) Global Warming is Exacerbated by Australian Wood Heaters. J Ecol Toxicol, 6: 138.

substantially greater. Similar issues were discovered in New Zealand, where Scott found that emissions from five heaters installed in people's houses were 15.5 g/kg, more than 15 times their AS4013 average of 1.0 g/kg. In Launceston, Tasmania, where educational initiatives, such as a $2 million federally funded wood-smoke reduction programme, had made the public aware of the serious health risks associated with breathing wood smoke, emissions were also measured from 18 AS4013 heaters used by homeowners there [11-15]. As a result, 70% of households that had previously used wood for heating switched to non-polluting heating.

Greenhouse Gases

Researchers at NASA who modelled the interactions of gases and aerosols and came to the conclusion that the impact of methane on global warming has been underestimated have also looked at the global warming potentials for methane and CO. Jackson talked about the possibility of reaching irreversible points of no return, stating that time periods of the order of decades were becoming relevant as current levels of radiative forcing approach levels historically correlated with an ice-free Earth. As a function, 20-year GWP may serve as better gauges of the genuine influence than 100-year GWP.

The Theory of the Greenhouse Effect

When the First Assessment Report was published in 1990, the IPCC has continued to stand by its assertion that rising anthropogenic GHG concentrations are to blame for the warming of the current climate. In recent years, more scientific evidence has emerged that seems to support this view continuously. In general, measurements and model simulations provide the scientific support for the IPCC's position that global warming is caused by humans.

Model simulations

It would be highly likely that the warming of the 20th century was mostly brought on by human activities if the changes in the worldwide averaged temperature could be replicated in model simulations forced by the recommended anthropogenic GHGs. The atmosphere-ocean general circulation models were used to mimic the climate of the 20th century and were merged with forcings of GHGs, aerosol, volcanic eruptions, solar activity, ozone, etc. for a more realistic climate. Although some notable features before 1960s, such as one peak of the global temperature series from the late 1930s to the middle of the 1940s and two valleys in the early and middle of the 1950s, are not included in these climate models, they still perform well for the global temperature variations from the 1960s. Consequently, it is impossible to simulate the warming that began in the late 20th century without the forcings from anthropogenic emissions. Therefore, these studies suggest that the atmosphere's increased GHG concentrations are a major factor in the warming of the late 20th century. The IPCC AR4 also detailed model simulations of the previous millennium's climate changes, which were carried out between the years of 2002 and 2007. Twelve models, including two energy balance models and six global climate models, were used to simulate these changes. These models successfully reproduced the warming from the 12th to the 14th century and the cooling from the 15th to the 19th century using just natural forcings such as insolation and volcanic eruptions.

Solar Activity Impacts

Scientists began to pay attention to the connection between solar activity and climate in the late 19th and early 20th centuries. A hypothesis on the impact of solar activity on the global climate was put up, however it still faces difficulties, notably in two areas: Long-term climate indices do not show any lasting 11-year cycles linked to the sunspot cycle, and solar variability has an impact on climate on Earth. Total solar irradiance (TSI) was once thought to be a constant, but further research revealed that it is actually a variable. It follows that the change in solar irradiance is insufficient to fully explain the historical climatic variability because the amplitude of the TSI only varies by roughly 0.1% during an 11-year cycle.

Medieval Warm Period

Two significant epochs in terms of the global climate are the MWP and LIA. Most experts believe that the MWP and LIA, which occurred before the industrial revolution, were caused by natural forces like solar activity rather than by the influence of human activities. over the past millennium, the link between surface temperature and solar fluctuations. Galactic cosmic rays are weaker in the MWP than temperature changes, whereas the situation is flipped in the LIA. The GCRs fluctuation also fits the advance and retreat of the tropical Andean glacier quite well. These data point to a close connection between GCRs and Earth's climate.

Causes of Solar and Climate Fluctuation

The parallel programming solar activity can affect the climate of Earth is by drastically changing UV radiation over an 11-year solar cycle. In an 11-year cycle, the variation in UV radiation is thought to be roughly 7% from the highest year to the minimum year, while different experts' estimations vary. When the sun's activity increases, ultraviolet radiation gets greater, O3 concentration rises and absorbs more UV light, which causes the stratosphere to warm. After that, the stratosphere significantly affects the troposphere via radiation and dynamic processes. But additional research is needed to fully understand the method and process by which solar activity influences Earth's climate.

Results

Using the limited sustainable supply of firewood to replace coal in power plants thus reduces CO2 emissions from coal by 7.35 million tonnes, CH4 from wood heaters by 2.2 million tonnes CO2-eq, offset by up to 0.88 million tones of CO2 from replacement heating, and results in a net reduction of 8.7 million tonnes. In order to put this into perspective, in 2007 there were 41.9 million tonnes of CO2-equivalent produced by passenger cars, thus a reduction of 8.7 million tonnes would be the same as removing nearly 21% of the passenger cars on the road in Australia. Even more significant reductions in greenhouse gas emissions might be achieved by using smaller-scale technologies such regional combined heat and power plants. Households might have heating, hot water, and a sizable percentage of their power for similar fuel consumption as that needed for remotely generated energy as long as the equipment burn effectively and emit no methane. The use of wood gasification, a promising technique, might guarantee that installations are effective and emit very little particle pollution that poses a health risk.

Discussion

The fact that heating is utilised for longer hours of the day, lowering the amount of energy lost by a device that, once lit, produces enormous amounts of heat on its lowest setting for 6–8 hours, is a probable explanation for why wood consumption in colder places is closer to heating needs. The average heat output from NZ wood-burners is 4.6 kW on low burn and more than 15 kW on high burn, compared to average heating needs in much colder locations like Oregon and New York. The majority of wood heaters are standalone devices that just

heat the living space, while some can be utilised as a component of a ducted central heating system. 10 m x 6 m, or somewhat less than 40% of a 160 m2 house's floor space, might be considered a generously sized living area. The remaining 60% of a home that is not centrally heated won't always be heated. It is reasonable to assume that only 20% of the energy needed to heat a 160 m2 home's remaining 60% will be used for electric radiant heating when it is necessary to heat the living area, which will take 40% of the energy needed to heat a 160 m2 home.

In Brisbane, Perth, and Sydney, methane emissions from wood heating in the living space are comparable to or greater than those from heating a 160 m2 house with gas in its entirety. Methane from heating a living space with wood in Melbourne and Canberra produces less CO2-eq than does central heating, but when the additional heating in other rooms is taken into account, the overall global warming impact is more than that of gas central heating. The availability of cheap firewood from non-renewable sources, such as tree dieback and land clearing, led to the widespread usage of domestic wood stoves in Australia. Firewood cutters must now travel farther and farther to acquire wood as these supplies run out. One study found that the way we now use firewood is not ecologically viable, while another found that 80–90% of Canberra's firewood supply comes from dead standing paddock trees that are up to 400 km away. This non-renewable resource's depletion could be compared to the depletion of fossil fuel reserves. The weighted average emissions for gas are approximately six times higher when the CO2 from burning the wood is taken into account, coming up at 7.7 tonnes CO2-eq.

Conclusion

Wood heating is not greenhouse neutral, despite what some people claim. Similar to the CO2 emissions from heating a 160 m2 house with gas, the methane emissions from a wood heater in the living room contribute to global warming. Even if all of the wood is sourced from sustainably managed forests, wood heating seems to be the worst option when emissions from supplemental heating are taken into account. Indeed, it is possible to conclude that wood heating contributes more than ten times as much to global warming than gas or reverse cycle air conditioning, depending on the time horizon, the sustainability of the firewood supply, the use of the GWP from AR4 and the inclusion of warmth from CO. Therefore, household wood log heaters should not be marketed as greenhouse neutral, with the exception of models with low methane and particle emissions and efficient methods of storing any excess heat. The development and promotion of more efficient uses of sustainably produced wood, such as local wood-fired CHP installations, wood pellet heaters, or the substitution of sustainably produced biomass for coal in power plants, along with cleaner, more environmentally friendly methods, such as solar heating, are preferable. Methodologically, the geographical and seasonal patterns of global temperature changes support the theory that the atmosphere has been getting warmer since the middle of the 20th century as a result of an increase in CO2. Climate models that have been compelled by rising GHG concentrations in the atmosphere can also mimic the warming of the past 30 years. But throughout the past century, climate models that are driven primarily by rising GHG concentrations are unable to replicate the warmth in the 1940s and the cooling in the decade between 1950 and 1970. This mismatch between model predictions and data suggests that natural forcings, such as solar activity, volcanic activity, and thermohaline circulation in the world's deep oceans, also play significant roles in climate variability over decadal timescales. Significant data show that the MWP and the LIA are tightly tied to solar activity, and that the Northern Atlantic cold periods in the Holocene were closely related to the declining solar activity shown in the 14C and 10Be records. The current climatic changes cannot be fully explained by the variations in TSI. The majority of scientists are currently aware of how important the effects of GCRs on climate variability are. When solar irradiance declines, higher GCR causes more low clouds, which causes a cooling of the climate. The specifics of the method, however, require more research because they are not well understood. Further research is required to determine how much solar activity and other natural forces amplify or counteract the greenhouse effect. Despite NIPCC's insistence that the current warming is of natural rather than anthropogenic origin, mounting data shows that the cause of the global warming is a combination of natural and anthropogenic forcing, with the largest contribution coming from man-made GHGs, particularly since the mid-20th century. The primary mechanism for GCR's effects on Earth's radiation exposure is thought to be its modulation of low cloud cover. Therefore, it is imperative to continue investigating how solar activity influences Earth's climate.

Acknowledgement

The author would like to acknowledge his Department of Earth Science, National Centre for Rural Greenhouse Gas Research, Greece for their support during this work.

Conflicts of Interest

The author has no known conflicts of interested associated with this paper.

References

1. Gillanders BM (2011) Potential effects of climate change on Australian estuaries and fish utilising estuaries: a review. Mar Fresh Res 62: 1115-1131.
2. Hallett CS (2018) Observed and predicted impacts of climate change on the estuaries of south-western Australia, a Mediterranean climate region. Reg Environ I Change 18: 1357-1373.
3. Roy P (2001) Structure and function of south-east Australian estuaries. Estuar Coas Shelf Sci 53: 351-384.
4. https://link.springer.com/chapter/10.1007/978-94-024-0990-1_2
5. Whitfield A, Elliott M, Basset A, Blaber S, West R (2012) Paradigms in estuarine ecology-a review of the Remane diagram with a suggested revised model for estuaries. Estuar Coas Shelf Sci 297: 78-90.
6. Ashizawa D, Cole JJ (1994) Long-term temperature trends of the Hudson River: a study of the historical data. Estuaries 17: 166-171.
7. Seekell DA, Pace ML (2011) Climate change drives warming in the Hudson River estuary, New York (USA). J Environ Monit 13: 2321-2327.
8. Najjar RG (2010) Potential climate-change impacts on the Chesapeake Bay. Estuar Coas Shelf Sci 86: 1-20.
9. Nixon SW, Granger S, Buckley BA, Lamont M, Rowell B (2004) A one hundred and seventeen year coastal water temperature record from Woods Hole, Massachusetts. Estuaries 27: 397-404.
10. Oczkowski A (2015) Preliminary evidence for the amplification of global warming in shallow, intertidal estuarine waters. PLoS ONE 10:e0141529.
11. Wiltshire KH, Manly BF (2004) The warming trend at Helgoland Roads, North Sea: phytoplankton response. Helgol Mar Res 58: 269.
12. Marba N, Duarte CM (2010) Mediterranean warming triggers seagrass (Posidonia oceanica) shoot mortality. Glob Change Biol 16: 2366-2375.
13. Rönnbäck P (1999) The ecological basis for economic value of seafood production supported by mangrove ecosystems. Ecol Econ 29: 235-252.
14. Harrison TD, Whitfield AK (2006) Estuarine typology and the structuring of fish communities in South Africa. Environ Biol Fishes 75: 269-293.
15. Franco A, Franzoi P, Torricelli P (2008) Structure and functioning of Mediterranean lagoon fish assemblages: a key for the identification of water body types. Estuar Coas Shelf Sci 79: 549-558.