Journal of Physics Special Topics
An undergraduate physics journal

P2 5 [W][O][R][D][L][E] vs the World

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December 4, 2025

Abstract

In this paper, we discuss the environmental impact of a large number of people playing the *Wordle* minigame every day, assessing if it is a significant factor in global environmental decline. We calculate that the total daily CO_2 emission from global *Wordle* players is 3.04 kg by projecting data of usage to 2025. Overall, we conclude that daily actions like playing the *Wordle* are minimal in the overall discussion about the environment, and that the biggest factors in environmental decline are not due to the actions of an average citizen playing a simple puzzle every day.

Introduction

The '*Wordle*' is a small online mini-game currently owned by the American newspaper, the New York Times [1]. The goal of the game is to guess the five-letter word of the day in six attempts, with hints about what letters to use coming from the previous guesses. The game soared in popularity after its creation in October of 2021, where many people would take five minutes out of their days to play the *Wordle*. In this paper, we discuss the environmental impact of all the users of *Wordle* in the modern day.

Method

To investigate the global impact of the *Wordle* game in the modern day, we must find useful information for the user count over time. Utilising the publicly available information about *Wordle* usage in 2022 and 2023 [2], we can plot the usage over time as in Figure 1. To fully utilise this data for the modern day, it must be modelled accurately. Modelling the data as a decaying exponential:

$$N = Ae^{-Bt} + C \tag{1}$$

where N is the number of users per day on a given month, t is an integer value relating to the month, where February 2022 is $t = 1$, and A, B, and C are the parameters of the model.

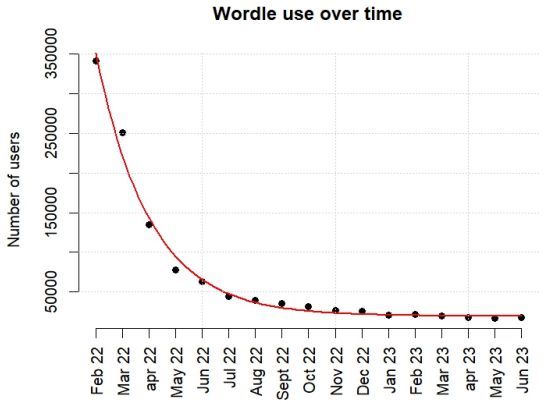

Figure 1: *Wordle* user count over time according to the '*wordlestats* bot' [2]. Time period between February 1 2022, and June 1 2023. All data points taken on the first of the month. The data begins on the 266th day of *Wordles* and terminates on the 711th day of *Wordles*. The red line is the regression model overlaid on the dataset.

Non-linear Regression Modelling

Using non-linear regression modelling with least square fitting in R [3], it can be found that the best fit model is as follows:

$$N = 544100 \times e^{-0.4935t} + 19540 \qquad (2)$$

This modelling function does not have an error value, and as the data are arbitrary stated values, a high variance would be likely. The '*Wordlestats* bot' had common issues with data recording and is based on an unreliable dataset.

The model is coherent with the data recorded, as it can reproduce values for known dates. The model suggests that after $t \approx 20$ (September 2023), the usage of *Wordle* should plateau and remain at approximately 19540 users from then on, as the exponential term decays. We can use this to project total usage to 2025. The likelihood that the popularity of *Wordle* will vary further after the end date of the data is high, but as a first-order approximation of usage over time after the original popularity after release, the model is sufficient.

Other sources that may have impacted the bias of the data trend are that the '*Wordlestats* bot' operated on the website *X.com*, which was purchased in April of 2022. After this point, a decline in users could be attributed to the decline in popularity of *X.com*.

The *Wordle* data used from the '*Wordlestats* bot' could be better represented in the model by taking the full data set instead of a monthly data point.

Results

Now that we have a model for the number of users on a given day, we must consider the percentage of users that would post their *Wordle* data to *X.com*. We base this on the overall percentage of people who have *X.com* [4], but this introduces a possible bias where *Wordle* players may not follow the same trends as *X.com* users. If after 2023 the *Wordle* usage stays approximately to the model and conservatively 7% of *Wordle* users would post their daily game to *X.com*- it can be postulated that daily *Wordle* user count is $\approx 2.79 \times 10^5$.

The Environment

Modern cellphones are energy-efficient devices that can conservatively use power and are able to access the internet and allow people to play the *Wordle* on the go.

To calculate the carbon dioxide offset produced by people using their phones to play *Wordle*, we start by defining the mass of CO_2 produced by phone usage:

$$M = \frac{CABVN}{10^6} \qquad (3)$$

Where M is the mass of CO_2 released, C is the CO_2 released in kg/kWh for a specific power source, A is the charge of the battery in mAh, B is the fraction of battery used in 5 minutes, V is the voltage of the battery, and N is the number of people.

As an estimate for a typical modern cellphone, we use my own phone, a Google Pixel 9 [5] with a battery of 4700 mAh operating at 3.7 V with a battery life of 24 hours. Based on the fuel offset for natural gas (assuming in a non-ideal situation where natural gas accounts for all the energy used by the cellphones, $C \approx 0.18$ kg/kWh [6][7]) we can calculate the mass offset for one person playing *Wordle* every day for a year (Equivalent to $N = 365$ in Equation 3) to be 3.96 g of CO_2. For our $N = 2.79 \times 10^5$ daily users, the impact is 3.04 kg per day, or 1.11 Tonnes per year.

Discussion & Conclusion

Compared to the approximate annual CO_2 emissions in the UK of 5.63 Tonnes of CO_2 equivalent per capita [8], we can see that the yearly *Wordle* usage of a person is not a significant margin of the emissions, approximately 0.00007%. In comparison instead to the carbon emissions of billionaire Elon Musk, where his private jets produce 5497 Tonnes of CO_2 per year [9], we can see that the carbon emissions of *Wordle* do not have a significant impact on the environment compared to the impact of large companies and the decisions of billionaires.

References

[1] The NYT *Wordle*. Available at: https://www.nytimes.com/games/wordle/index.html [Accessed 28 October 2025]

[2] *wordlestats X.com bot*. Available at: https://x.com/wordlestats [Accessed 28 October 2025]

[3] R *coding language, used for modelling*. Available at: https://www.r-project.org/ [Accessed 28 October 2025]

[4] *Percentage of people that use X.com, formally known as twitter*. Available at: https://gs.statcounter.com/social-media-stats [Accessed 28 October 2025]

[5] *Google Pixel 9, statistics and information*. Available at: https://store.google.com/product/pixel_9_specs?hl=en-GB [Accessed 28 October 2025]

[6] Available at: https://www.neso.energy/news/britains-electricity-explained-2024-review

[7] Available at: https://www.itpenergised.com/new-2024-uk-grid-emissions-factors/ [Accessed 28 October 2025]

[8] EDGAR - Emissions Database for Global Atmospheric Research. Available at: https://edgar.jrc.ec.europa.eu/report_2025?vis=ghgpop#emissions_table [Accessed 28 October 2025]

[9] *Elon Musk's carbon emissions*. Available at: https://uk.pcmag.com/travel-how-to/155097/elon-Musk-jeff-bezos-emit-your-lifetime-carbon-footprint-in-90-minutes [Accessed 28 October 2025]