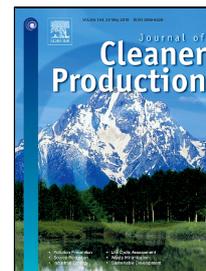


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Life-cycle greenhouse gas emissions of e-books vs. paper books: a Japanese case study

Kiyotaka Tahara, Hirokazu Shimizu, Katsuhito Nakazawa, Hiroyuki Nakamura, Ken Yamagishi



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3 *Kiyotaka Tahara¹, Hirokazu Shimizu², Katsuhito Nakazawa³, Hiroyuki Nakamura⁴ and Ken
4 Yamagishi⁵

5
6 ¹ National Institute of Advanced Industrial Science and Technology (AIST), 16-1 Onogawa
7 Tsukuba Ibaraki 305-8569 Japan

8 ² Shimizu Printing Inc., 2-1-20 Otowa Bunkyo-ku Tokyo 112-0013 Japan

9 ³ Fujitsu Laboratories Ltd., 10-1 Morinosato-Wakamiya Atsugi Kanagawa 243-0197 Japan

10 ⁴ Dai Nippon Printing Co., Ltd., 1-1-1, Ichigaya Kagacho Shinjuku-ku Tokyo 162-8001 Japan

11 ⁵ The Japan Environmental Management Association for Industry (JEMAI), 2-1 Kaji-cho 2
12 chome Chiyoda-ku Tokyo 101-044 Japan

13 *Corresponding author (k.tahara@aist.go.jp, P: +81-29-861-8789 F: +81-29-861-8118)

15 Abstract

16 The increasing presence of e-books (electronic books) has become a major focus in countries
17 around the world. In the United States, e-books represented 28% of the total book sales for 2012.
18 In Japan, the conversion from paper books to e-books is expected to accelerate by the prevalent
19 use of smartphones and tablet PCs. It is therefore important to quantitatively evaluate the
20 environmental load of paper books and e-books for a sustainable society. In this study, paper
21 books are compared to e-books read on different electronic devices (e-ink tablets, tablets, cell
22 phones, smartphones, laptop computers, desktop computers and portable music players) through
23 a case study on a 224-page book. The study is based on key primary data such as use time and
24 reading speed for each device and aims to minimize assumptions made in other studies. GHG
25 emissions for paper books are 1.24 kg-CO₂e/book, and are reduced to 1.11 kg-CO₂e/book when
26 the effect of paper recycling is taken into consideration. The results for e-books under average
27 use-time conditions range from 0.25 to 0.91 kg-CO₂e/book with the e-ink tablet having the
28 lowest emissions. When the average use time of each e-book device is applied, the paper book
29 has a higher impact than all the e-books. However, sensitivity analysis shows that the impact of
30 paper books can be lower than that of e-books for larger screen devices such as tablets, laptops
31 and desktops when the reuse of books is considered or the e-book reading device is hardly used
32 during its life cycle.

33
34 **Keywords** paper book, e-book, questionnaire survey, GHG emission, consumer behavior

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