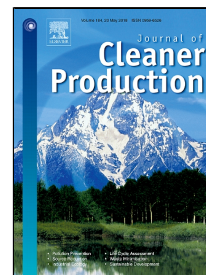


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Life-cycle greenhouse gas emissions of e-books vs. paper books: a Japanese case study



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## 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-CO<sub>2</sub>e/book, and are reduced to 1.11 kg-CO<sub>2</sub>e/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-CO<sub>2</sub>e/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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