

The Italian publishing houses are traditionally based on printed books. However, in the last years, another tool for conveying content and information has been developed with the introduction of digital books (e-books). E-books have the advantage of offering a wide range of digital content and of avoiding carrying a weight, but the “digital cost” is not burden-free in terms of environmental impacts. As of now, the most widespread proposal of the Italian publishing houses to schools is a mixed package (called “type b ministerial book”), including a printed and an e-book.

This work has assessed the potential environmental impacts related to the type b ministerial book as commercialised by the Italian company Zanichelli. The average printed book weighs 860 grams and it is made of 400 pages, while the e-book is composed of the same pages of the printed book in digital format plus a variety of videos and interactive exercises. The analysis was performed through the Life Cycle Assessment (LCA) methodology with the main objective to identify the stages that give rise to the main environmental burdens along the supply chain. Results of the analysis have been used to recommend to the company some improvements to the environmental performance of its product. A particular focus has been dedicated to the e-book life cycle, whose environmental impacts are expected to be highly dependent on usage patterns. In fact, the user might transfer a variable amount of digital information from the datacentre (i.e. downloading a certain amount of Gigabyte) during a scholastic year and the time spent on the e-book reading device can range from a few minutes to many hours per year.

Primary data related to the Zanichelli company for the year 2019 were collected as far as possible, in order to model the system of the analysed product, otherwise for the background data the ecoinvent database, version 3.7.1 was used. Fifteen midpoint impact indicators of the Environmental Footprint method (version 3.0), recommended by the European Commission, were calculated.

In accordance with the adopted assumptions for the current situation, most of the impacts of the mixed book are associated to the life cycle of the printed book, with a contribution to the total burden higher than 80% in all the analysed impact categories. This result is mainly due to the production of the coated, wood-free, virgin paper in an amount of 1 kilogram per one printed book. On the other hand, the impacts associated to the life cycle of the e-book are minor (always lower than 15% of the total impact), since the current usage is very low. In fact, an average user of the e-book accesses only one eighth of the available digital material per year and the overall time spent reading the downloaded material is only 5% of the total time dedicated to learn the subject.

However, a sensitivity analysis on the usage patterns of the e-book has been performed and the outcome highlights an important influence of these parameters on the results. In case the e-book is used to a greater extent (i.e. downloading of the full digital content and learning of the subject entirely done on the e-book), the impacts of the mixed book would significantly increase, between + 17% and + 229% depending on the impact category. Most of the impacts of the e-book resulted associated to the electricity consumption used for both the transfer of the digital material from the datacentre to the final user and the use of an electronic reader. Moreover, in some impact categories, also the production of the electronic device resulted in a significant environmental burden, although less of 1% of its production impacts have been allocated to the analysed function of learning.

In the last part of the study, it was analysed how the impacts of school publishing would change if the market moved from the current mixed package (paper book plus the e-book with a minimal use) to the product only in the digital version (called ministerial book c in the Italian context). The use of the book type c would reduce the impacts in 12 out of 15 impact categories, while in two impact categories (freshwater eutrophication and depletion of minerals and metals) an evident increment of the environmental burden would be shown.