



## Printed and tablet e-paper newspaper from an environmental perspective – A screening life cycle assessment

Åsa Moberg<sup>a,b,d,\*</sup>, Martin Johansson<sup>b,1</sup>, Göran Finnveden<sup>a,d</sup>, Alex Jonsson<sup>c,d</sup>

<sup>a</sup> KTH, Royal Institute of Technology, Division of Environmental Strategies Research, Department of Urban Planning and Environment, School of Architecture and the Built Environment, SE 100 44 Stockholm, Sweden

<sup>b</sup> STFI-Packforsk, PO Box 5604, SE 114 86 Stockholm, Sweden

<sup>c</sup> KTH, Royal Institute of Technology, Department of Media Technology and Graphic Arts, School of Computer Science and Communication, SE 100 44 Stockholm, Sweden

<sup>d</sup> KTH, Royal Institute of Technology, Centre for Sustainable Communications, SE 100 44 Stockholm, Sweden

### ARTICLE INFO

#### Article history:

Received 18 December 2008

Received in revised form 2 July 2009

Accepted 2 July 2009

Available online 26 August 2009

#### Keywords:

Life cycle assessment

Newspaper

E-paper

Multichannel

Reading tablet

Electronic media

### ABSTRACT

Viable alternatives to conventional newspapers, such as electronic papers, e-papers or e-readers, are intended to have many of the qualities of paper, such as reading using reflective light, high resolution, 180° viewing angle. It has been suggested that the environmental impact of e-paper can be lower than for printed and internet-based newspapers. However, in order to find the facts of the matter, a thorough life cycle perspective covering raw material acquisition, production, use and disposal should preferably be used to study the environmental performance of the different products. A screening life cycle assessment was performed to describe the potential environmental impacts of two product systems; printed on paper and tablet e-paper newspapers. Results show that the most significant phase of the life cycle for both product systems was the production of substrate or platform. Accordingly, key aspects that may affect the resulting environmental performance of newspaper product systems were for the printed newspaper number of readers per copy and number of pages per issue and for the tablet e-paper newspaper lifetime and multi-use of the device. The printed newspaper in general had a higher energy use, higher emissions of gases contributing to climate change and several other impact categories than the tablet e-paper newspaper. It was concluded that tablet e-paper has the potential to decrease the environmental impact of newspaper consumption. However, further studies regarding the environmental impact of production and waste management of electronic devices and internet use, as well as more comprehensive assessment of toxicological impacts are needed. As the data on the electronic devices becomes more comprehensive this may prove to be a major limitation of electronic newspaper systems. Developers are suggested to strive towards minimisation of toxic and rare substances in production.

© 2009 Elsevier Inc. All rights reserved.

### 1. Introduction

New products and services are constantly developed. In the media sector, new channels for better providing content are tried, both with current readers but also with new target groups in mind. Sometimes there is a genuine need, sometimes it is part of the on-going competition for users, consumers and advertisers. Content can today

be accessed via television, computer, printed media, mobile phone and in some cases via electronic paper devices. Financial issues are at the front of the competition – who will get the most out of the market? The consumers and their preferences and choices are investigated and acted on. The pros and cons of the different media are considered. During the last decade or so, device manufacturers have sought to provide a reading experience more similar to that of reading printed material, a development leading to a number of electronically distributed electronic paper devices or e-papers. For the end-user, viable alternatives to conventional newspapers have been available for roughly three years. Flemish daily De Tijd was the first occurrence of an e-newspaper, using the iRex iLiad device in February 2006 (<http://www.tijd.be>) and the first consumer product was the Sony PRS-500, launched in September 2006. The devices are often referred to as electronic papers, e-papers or e-readers. These products are intended to share many of the qualities of paper, such as reading using reflective light, high resolution, 180° viewing angle and high contrast. These properties, along with notably low-power consumption, distinguish

\* Corresponding author. KTH, Royal Institute of Technology, Division of Environmental Strategies Research, Department of Urban Planning and Environment, School of Architecture and the Built Environment, SE 100 44 Stockholm, Sweden. Tel.: +46 8 7907395.

E-mail addresses: [asa.moberg@infra.kth.se](mailto:asa.moberg@infra.kth.se) (Å. Moberg), [martin.x.johansson@lantmannen.com](mailto:martin.x.johansson@lantmannen.com) (M. Johansson), [goran.finnveden@infra.kth.se](mailto:goran.finnveden@infra.kth.se) (G. Finnveden), [alexj@csc.kth.se](mailto:alexj@csc.kth.se) (A. Jonsson).

<sup>1</sup> Present address: Lantmännen, Sustainable Development, PO Box 30192, SE 104 25 Stockholm, Sweden.

the e-paper displays from other devices which rely on traditional display technologies, carrying LCD, OLED, CRT or plasma screen components (see e.g. Senarclens de Grancy, 2008). Apart from the display itself, the e-paper device consists mostly of standard components, such as plastic housing, low-power one-chip micro-processor, rechargeable battery, controller boards and implements for navigation; e.g. buttons, jog wheels, and joysticks.

The tablet e-paper newspaper seems favourable also from an environmental point of view. If it is used instead of a printed newspaper, the paper material (substrate), offset printing, mail room operations, physical distribution of the printed newspaper, etc. can be avoided altogether. The e-paper device has substantially lower energy use during down-loading and reading compared with using a computer for reading newspapers on the internet. Thus, it has been suggested that the environmental impact can be lower than for printed and internet-based newspapers. However, Berkhout and Hertin (2004) discussing environmental impacts of information and communication technologies (ICTs) come to the conclusion that generally the use of these technologies lead to both positive and negative environmental impacts. A life cycle perspective should be used to study the environmental performance of the products. In this way, shifts of environmental impacts from one part of the life cycle to another can be identified, as well as possible trade-offs between different environmental impacts.

Several studies have been made of the environmental impact of printed media and paper (e.g. Axel Springer Verlag AG, Stora & Canfor, 1998; Axelsson and Dalhielm, 1997; Johansson, 2002; Larsen et al., 2006). Internet-based newspaper reading or reading from PDAs (personal digital assistants) have been compared to reading of printed newspapers in previous studies (Hischier and Reichart, 2001; Toffel and Horvath, 2004; Yagita et al., 2003). In addition, other kinds of information in printed or electronic form have been compared from an environmental perspective. Gard and Keoleian (2003) studied digital and printed journal articles and Kozak (2003) printed scholarly books and e-book reading. Many of the studies comparing electronic reading with reading printed matter have focused on energy or climate change (e.g. Gard and Keoleian, 2003; Kamburow, 2004; Yagita et al., 2003). The results indicate that the reading time for internet-based newspapers is crucial (Hischier and Reichart, 2001; Yagita et al., 2003). The number of unique readers has been shown to influence the environmental performance (Gard and Keoleian, 2003). Studies on e-paper include a German study focusing on the cumulative energy use for the three product systems printed, online and e-paper newspaper using a life cycle perspective (Kamburow, 2004). A Canadian life cycle assessment (LCA) study covering printed newspaper and e-paper newspaper was presented by Trudel at a life cycle management conference in 2007, but the study has not been published so far (Trudel, 2007). The field of study is thus still rather new, especially concerning the use of e-paper devices, and more research is needed to describe the environmental consequences of new ways of distributing and obtaining news or other information.

## 2. Method

### 2.1. Aim and scope

The aim of the current paper is to describe the potential environmental impacts of the two product systems printed newspaper and tablet e-paper newspaper and analyse the environmental aspects of e-paper compared to printed newspapers. The paper is a further elaboration of a technical report (Moberg et al., 2007a) which was also presented at the 34th Iarigai conference on Advances in Printing and Media Technology (Moberg et al., 2007b).

A screening life cycle assessment was performed. A full LCA can be time consuming and resource extensive. Instead of starting with a full LCA, an alternative approach can be to perform a so called screening LCA to identify the most important aspects of the studied system. If

requested, more detailed studies can then be directed to these important aspects (Lindfors et al., 1995). A screening LCA is usually performed using readily accessible data. Since the aim is to identify the most important processes, data quality is of less importance than in a full LCA. However, it is important to include all processes and materials that can be of major importance, if some processes or materials are known to be of minor importance, they can be excluded.

Information from Sundsvalls Tidning (ST) was used partly as inspiration, as this Swedish newspaper has been produced and distributed as a printed newspaper, a tablet e-paper newspaper as well as an internet-based newspaper. ST has performed a full-scale test with an iReX iLiad e-paper device, and was thus able to provide important input. Part of the newspaper data defining the two product systems studied was obtained from ST, for example edition and number of readers, whereas other data were from other sources, for example distribution of printed newspapers and number of pages. Data from ST were obtained through personal communication with Svenåke Boström at ST (2006).

The study performed was comparative and attributional rather than consequential, studying the environmental impacts of the respective system as they are rather than the consequences of a choice between them (Rebitzer et al., 2004). In line with the methodology for attributional studies average data, and not marginal, were used.

The scope of the study was firstly to study a newspaper from a European perspective, with European electricity mix and waste flows, etc. In addition, a Swedish scenario was tested where the electricity mix, waste management and distribution of printed newspaper were altered.

The functional unit of the study was 'the consumption of a newspaper during one year by one unique reader'. The two product systems were studied separately and no combinations were made within the scope of this study (e.g. reading of a tablet e-paper newspaper combined with a printed version).

Several different environmental impact categories were assessed; resources used (non-renewable, renewable and total), acidification, climate change, eutrophication, photochemical oxidant (photo-oxidant) formation, ozone depletion and toxicity based on Guinée (2002) and Finnveden and Östlund (1997). The greenhouse gas emissions of the climate change impact category were assessed without including biogenic carbon dioxide uptake or emissions, assuming this to be adding up to zero with a life cycle perspective.

In addition to the results for each impact category, two different kinds of weighting methods were used; Ecotax 02 (Finnveden et al., 2006) and Eco-indicator 99 (Goedkoop and Spriensma, 2000). Ecotax 02 is a monetary method where the weighting is based on environmental taxes and fees in Sweden. The unit is SEK, the Swedish currency. The Ecotax method has two alternative weighting factors, minimum (min) and maximum (max), representing the span of taxes and fees on various substances within the same impact category. Eco-indicator 99 is a method where three damage categories are weighted: ecosystem quality, human health and resources. To deal with the fact that damage modelling and weighting implies value choices and that there will always be different points of view influencing these, the Eco-indicator 99 have developed three different perspectives of the methodology, using the archetypes hierarchist, individualist and egalitarian as described in Cultural Theory. In our study we used the default recommended version with a hierarchist perspective.

### 2.2. Studied systems

In the screening LCA performed, the studied systems included activities from the cradle to the grave. For the printed newspaper this meant that forestry, pulp and paper production, editorial work, prepress, printing and distribution of the newspaper were covered, including the production of supply material (Fig. 1). The waste management of the waste newspaper was also covered. For the tablet e-paper newspaper the production of the tablet e-paper device, editorial work, distribution

Download English Version:

<https://daneshyari.com/en/article/1053093>

Download Persian Version:

<https://daneshyari.com/article/1053093>

[Daneshyari.com](https://daneshyari.com)