



Factsheet: Media Use

Which is better for the environment: print or electronic media? The answer, it turns out, is not always obvious. What is more important is how the printed materials or IT equipment are used. The best option is to share printed materials with other people, and not to print out electronic documents.

Every year, approximately 30 million sheets (or 92 tons) of paper are used for printing at UZH.¹ In the same period, around 65 tons of electronic waste is generated.² There are many ways to reduce this day-to-day consumption of materials by students and staff.

Background

Many different factors determine the environmental impact of materials, as shown in the table below for a 200-page lecture transcript. The document can be downloaded, read on an IT device or printed out – which requires the production of paper. The bottom line in the table is particularly important: It shows the document’s share of the greenhouse gas emissions generated by the manufacture and disposal of the equipment (computer, monitor and, if relevant, printer). For laptops, tablets and monitors, the

document’s share of the environmental impact of the manufacture and disposal of the device is actually greater than the impact caused by the energy use while reading the document. The ranges in the bottom line are due to different sizes and usage times of the devices in question. If a device is used twice as long before being disposed of, the values per page are halved. The most effective way to reduce IT-related greenhouse gas emissions is thus to use the equipment for as long as possible before disposing of it.

This becomes even clearer if we take other forms of environmental and social impact also into account, such as the mining of scarce raw materials and the toxicity for humans and the environment. Numerous critical and toxic raw materials are required for the manufacture of IT equipment [7]. In addition, there is a risk of a negative social impact, particularly with regard to «conflict minerals» and working conditions in the electronics industry [8,9].

If documents are printed out, using recycled paper has clear advantages. Double-sided printing halves the impact of paper production and should be set as the default setting in printer drivers, as far as possible.

Using central printers has much less impact on the environment than buying and later disposing of a personal workplace printer.

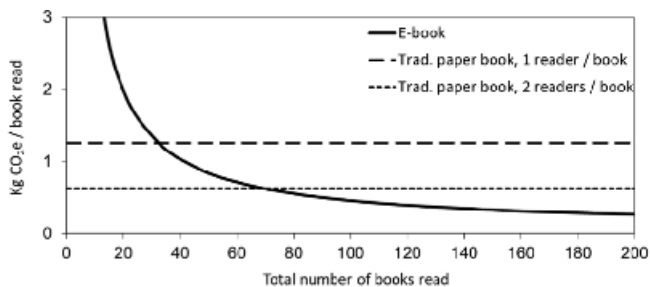
Greenhouse gas emissions (g CO₂ equivalents) for a 200-page document

| Activity | Device | Desktop | Laptop | Tablet | Separate monitor | Personal printer | Central printer |
|---|--------|---------|---------|--------|------------------|------------------|-----------------|
| Download from Internet | | 0.3-1.0 | | | | | |
| Read on screen (10h) | | 200-300 | 25-40 | 8-11 | 10-40 | - | - |
| Print out | | - | - | - | - | 100-400 | 30-90 |
| Production of fresh fiber paper, A4, 80g/m ² | | - | - | - | - | 1600-1900 | |
| Production of recycled paper, A4, 80g/m ² | | - | - | - | - | 600-1100 | |
| Share of manufacture and disposal of device | | 120-250 | 100-200 | 25-100 | 100-550 | 400-7000 | 150-750 |

Example: Downloading 200 pages from the Internet and reading them on a laptop using an external monitor generates at least (0.3+25+100+10+100=235.3) g CO₂eq. Printing them out on fresh fiber paper (single-sided) on a personal workplace printer generates at least (100+1600+400=2100) g CO₂eq. In general, the environmental impact of the equipment in question can be reduced by extending the service life of the device; this explains a part of the ranges in the bottom line. Double-sided printing halves the values for paper production. Sources: own calculations based on the ecoinvent database and [1-5].

Example: E-book reader vs. printed books

Manufacturing an e-book reader generates roughly as much greenhouse gases as producing 30-40 printed books (350 pages/book). By contrast, the energy consumption of using an e-book reader is negligible. So, you would need



Emissions per e-book, read on an e-book reader

Greenhouse gas emissions (kg) for e-books, plotted against the number of books read on the e-book reader over the course of its service life [5].

to use the e-book reader to read at least 30-40 books before it becomes «more sustainable» (see illustration). If we assume that a printed book is read by two people, you would need to use the e-book reader to read 60-80 books until it pays off in environmental terms. A library book that is lent out 100 times is far more sustainable than an e-book reader.

Further information

The Sustainability Team at UZH is happy to advise you on sustainability issues affecting your day-to-day work:

www.sustainability.uzh.ch/en/tips.html

Recommendations

- Encourage multiple use of printed materials, for example by using libraries, lending materials to other people, and passing on journals and lecture transcripts to others.
- Wherever possible, do not print out electronic documents – read them on the screen instead.
- If you need to print out electronic documents, do not buy a personal workplace printer. Instead, use a central printer, and make sure you print double-sided.
- Buy new electronic equipment as infrequently as possible.
- When you plan your teaching, keep in mind how your students will access the teaching materials and how this will affect the environment.
- Always buy 100% recycled paper.

Notes

1 Figures for 2014. In 2014, UZH bought 23 million sheets (70.5 tons) of photocopy and printer paper from Kantonale Drucksachen- und Materialzentrale Zürich. In addition, students printed around 8 million sheets of paper that they bought from the Zentralstelle der Studentenschaft at UZH. Paper purchased from other sources, materials printed by third parties, and private consumption by students are excluded. Extrapolating from the results of a study of Informatics students, [6] the amount of paper used by the whole of UZH, including lecture materials printed at home, could be even higher – around 60 million sheets.

2 Figures for 2014. Servers and IT-equipment of students not included.

References

- 1 HISCHIER, R.; WÄGER, P.A. (2015): The Transition from Desktop Computers to Tablets: A Model for Increasing Resource Efficiency? In: Hilty, L.M.; Aebischer, B. (eds.): ICT Innovations for Sustainability. Advances in Intelligent Systems and Computing, vol. 310, pp. 243–256. Springer, Switzerland
- 2 HISCHIER, R.; AHMADI ACHACHLOUEI, M.; HILTY, L. M. (2014): Evaluating the Sustainability of Electronic Media: Strategies for Life Cycle Inventory Data Collection and their Implications for LCA Results. Environmental Modelling and Software 56, 27-36
- 3 HISCHIER, R.; COROAMA, V.C.; SCHIEN, D.; AHMADI ACHACHLOUEI, M. (2015): Grey Energy and Environmental Impacts of ICT Hardware. In: Hilty, L.M.; Aebischer, B. (eds.): ICT Innovations for Sustainability, pp. 171–189
- 4 COROAMA, V.C.; HILTY, L.M. (2014): Assessing Internet Energy Intensity: A Review of Methods and Results. Environmental Impact Assessment Review 45 (2014), 63-68

- 5 COROAMA, V.C.; MOBERG, Å.; HILTY, L.M. (2015): Dematerialization Through Electronic Media? In: Hilty, L.M.; Aebischer, B. (eds.): ICT Innovations for Sustainability, pp. 405–421
- 6 KUCHIBHOTLA, S.A. (2014): Environmental Impact of Media Use in Teaching and Learning at the Department of Informatics. Bachelor Thesis, Department of Informatics, University of Zurich
- 7 WÄGER, P.A.; HISCHIER, R.; WIDMER, R. (2015): The Material Basis of ICT. In: Hilty, L.M.; Aebischer, B. (eds.): ICT Innovations for Sustainability, pp. 209–221
- 8 EPSTEIN, M.; YUTHAS, K. (2011): Conflict minerals: Managing an emerging supply-chain problem. Environmental Quality Management, 21 (2), 13-25
- 9 SMITH, T.; SONNENFELD, D.; PELLOW, D. (2006): Challenging the chip: Labor rights and environmental justice in the global electronics industry. Temple University Press, Philadelphia

Publishing details

Editor:
Sustainability Team, University of Zurich

Authors:
Lorenz M. Hilty, Linde Warland, Roland Hischier (Empa)

Contact:
info@sustainability.uzh.ch
www.sustainability.uzh.ch