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CUMULATIVE ENERGY DEMAND OF ADOLESCENTS' DIGITAL MEDIA BEHAVIOUR

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1. INTRODUCTION

The use of digital media has become an integral part of our everyday life. At first glance, energy is only required for charging devices. However, energy input is also needed for manufacturing devices and for data transfer. In the interdisciplinary project "Digital Sufficiency", the cumulative energy demand (CED) of digital media use by Swiss adolescents was modelled with a life cycle assessment. The project was funded by the Mercator Foundation Switzerland.

2. MODELLING APPROACH

Modelling was based on digital media behaviour data. A survey was carried out to gather detailed answers from more than 800 Swiss adolescents aged between 12 and 25. These data were adapted to represent the average Swiss young person [1], [2]. The results were supplemented with data on device ownership from the JAMES-study [3]. Since most adolescents have multiple devices, the survey focused on the use of devices that have multiple uses and are widespread: mobile phones, tablets, laptops, desktops and televisions.
For each type of digital media use (i.e. sending text messages), the following aspects were included: the electricity demand for charging the devices, the electricity and equipment needed for data provision (data centre) and transfer (WLAN, mobile antenna, international network). In addition, the pro-rata energy requirement for manufacturing the devices was included. To calculate the energy demand associated with data transfer, an average data volume per behaviour was compiled. Modelling of the internet and the devices was based on the Green Media Calculator [4], [5], [6]. The CED was calculated with the method proposed by Frischknecht et al. [7]. As background data, the Swiss database ecoinvent, version 3.2 [9] was used (system model: "Recycled Content" corresp. "cut-off").

3. RESULTS

The average 12 to 25 year old Swiss individual's digital media use has a cumulative energy demand of roughly 11 megajoules per day. Of this energy, almost 90% is non-renewable. The analysis showed that the production and disposal of the devices accounts for more than half of the energy (see Figure 1). Devices owned by the adolescents themselves as well as those that are shared within the family (pro-rata) were accounted for. More than 40% of the CED results from televisions, since almost every family (96%) and nearly one in three adolescents owns a television. Another reason is that televisions need more energy than smaller devices both for the production (higher material demand) and use phase (direct energy use; larger data transfer due to high image resolution.)

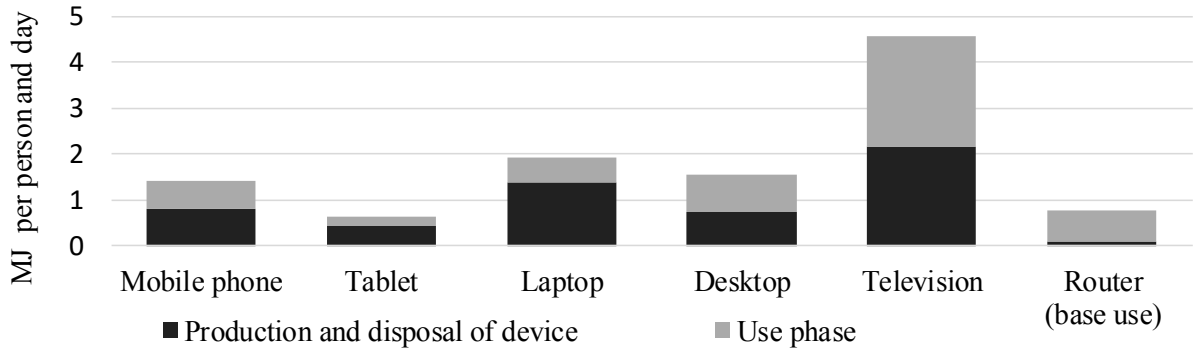

Figure 1: Cumulative Energy Demand of digital media use of adolescents per person and day.

The devices direct electricity consumption contributes approx. 16% to the total CED: desktops and televisions each contribute 6%, laptops 3% and the remaining devices less than 1%. The transfer of data from the device to the data centre and within the internet is of little relevance. The base use of the router (stand-by) accounts for 6% of the energy demand. Processing and provision of data in data centres is negligible for all activities, except for televisions (16%) and video viewing (3%).

5. CONCLUSIONS

When assessing the cumulative energy demand of digital media use, it is important not only to consider the direct energy use of devices, but also include the indirect energy needed for production of the devices. Data provision in data centres is only relevant for data intense uses.
To reduce the energy demand, the following recommendations can be given: (1) Sharing devices and avoiding buying new ones by increasing their lifetime. (2) Switching from energy intensive devices like desktops and televisions to more efficient devices like mobile phones. (3) Reducing the number of new devices purchased has the biggest reduction potential.

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