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Drivers and barriers to return and recycling of mobile phones. Case studies of communication and collection campaigns

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This article analyses drivers and barriers to returning and recycling mobile phones and their consideration in existing communication and collection campaigns.

This is an important issue based on the fact that the mobile phone market is growing rapidly. In 2015 there are nearly 7 billion global mobile cellular subscriptions. This means that, at least theoretically, everyone in the world has access to mobile communication services (ITU, 2015). However, the production of mobile phones is linked to an increasing use of natural resources: the “ecological rucksack” of a mobile phone is equal to about 75 kg of resources (Nordmann et al. 2015); while the global recycling rate of mobile phones is under 10 per cent (Nokia, 2008; Tanskanen, 2012).

In order to address this issue, the main factors that influence return and recycling behaviour (focussing on mobile phones) will be discussed in chapter 2 of this article. The theoretical analysis is based on the norm activation model by Ellen Matthies (2005). This analysis will be complemented by empirical data and findings generated in the research project “Return and use of old mobile phones”, funded by the German Ministry of Education and Research (Wuppertal Institute for Climate, Environment, Energy/Institute for Advanced Sustainability Studies, 2012–2014). To conclude, we will identify and operationalise essential components of mobile phone communication and collection campaigns, based on the theoretical approach of Matthies, literature and empirical studies, in order to develop a set of criteria for analysing and rating such communication and collection campaigns.

The results show that economic incentives as well as education and communication play a very important role in initiating more sustainable behavioural patterns in the ICT sector. The role of emotional factors is often underestimated in the development of communication activities. In summary, successful mobile phone communication and collection campaigns require a combination of several institutional, economic, social and emotional factors.

1. Introduction

By the end of 2015, the number of mobile phone subscriptions worldwide is expected to reach almost 7 billion subscriptions, compared to 962 milion in 2001 (see Fig. 1). This means, there will be more mobile phones subscriptions than there are people on the planet right now. The mobile phone penetration rate (number of active mobile phone users within a global population) amounts to 97% globally (ITU, 2015).

In terms of production and sales figures, more than one billion mobile phones were manufactured worldwide in 2010; even larger numbers were produced in the ensuing years. In 2010, around 1.6 billion phones were sold, 19 per cent of which were smartphones (Gartner Inc, 2011). In Germany, the industry sold around 28 million mobile phones in 2013 (Bitkom, 2013b). Again, smartphones are gaining in importance in mobile phone sales; approximately 96 per cent of the mobile phone market is dominated by smartphones; in Germany, only 4 per cent of today's sales are conventional mobile phones (Bitkom, 2013a). This increasing amount of smartphones foster a faster exchange rate of

Abbreviations: AMTA, Australian Mobile Telecommunications Association; BAFU, Bundesamt für Umwelt; BMBF, Bundesministerium für Bildung und Forschung; EMSU, Environmental Management for Sustainable Universities; EPA, Environmental Protection Agency; ERSCP, European Roundtable on Sustainable Consumption and Production; ICT, Information and communications technology; IASS, Institute for Advanced Sustainability Studies; ICT4S, International Conference on Information and Communication Technologies; ITU, International Telecommunication Union; LCI, Life cycle inventory; MIPS, Material Input per Service Unit; MRP, Material Requirement Planning; NGOs, Non-governmental organisations; SCP, Sustainable consumption and production; SCR, Sustainable Consumption Roundtable; SERI, Sustainable Europe Research Institute.

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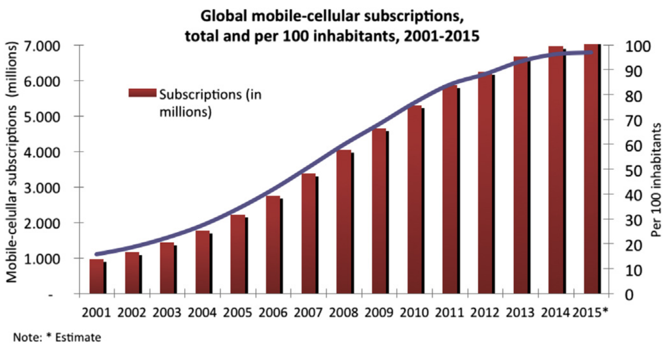

Fig. 1. Global mobile cellular subscriptions.

conventional mobile phones, even though the old mobile phone might still be useable. This is a common behaviour with mobile phones, which is only accelerated by the smartphone market.

This dynamic development of the mobile phone industry is linked to a rapidly increasing use of natural resources and energy. Thus, such highly developed and disseminated mobile phone communication systems cause substantial environmental and social problems along the entire value chain, from resource extraction to production, use and disposal. Like any other electronic device, mobile phones consist of a variety of substances such as plastics and ceramics, as well as a number of precious and rare metals. Approximately 28 per cent of a mobile phone is made out of metal, with copper making up the largest part (15 per cent), followed by cobalt and lithium (4 per cent), ferrous metals (3 per cent), nickel (2 per cent), and many others. Some of these metals are "technology metals", which are essential for new technologies and industries such as electric cars and the solar industry. These technology metals include platinum group metals, palladium, tantalum, indium, lithium, silver and gold (Hagelüken, 2013). Overall, the mobile phone and computer industry consumes 4 per cent of the global annual extraction of gold and silver; and even 20 per cent of palladium and cobalt (Hagelüken, 2013).

Most of these metals have only very limited natural deposits or cause significant environmental and social impacts when extracted from nature. Therefore they need to be used more responsibly, including professional recycling techniques to minimise the need for primary resources. This would not only save primary resources, but also provide economic and political advantages, reducing a nation's dependency on imported resources. Furthermore, the extraction of metal ores has a high energy intensity, while it takes less energy to recycle these metals; e.g. for palladium approximately 92–98 per cent energy savings can be made, for silver approximately 96 per cent and for nickel approximately 90 per cent (ecoinvent, 2010). This reduced energy input also means that fewer greenhouse gases are emitted compared to primary production. Today, many of these metals can be recycled using highly sophisticated technologies. Others are not recycled yet because it is economically infeasible or no adequate technologies are available. Mainly copper, silver, gold, and platinum are currently recycled (Hagelüken, 2013). In addition to the issue of potential technical and economic barriers to recycling mobile phones, there is also the problem of the relatively low return rate of old mobile phones (and other ICT products). In 2008, Nokia conducted a worldwide consumer survey, which revealed that less than 10 per cent of all mobile phone users return their old mobile phones that are no longer in use to a recycling point. Almost 50 per cent of the customers interviewed said that this was the case because they did not know where to return their old mobile phones (Nokia, 2008; Tanskanen, 2012). This lack of knowledge may be partly due to the fact that there seems to be no public debate about sustainability issues underlying the mobile phone industry. Such public debate is slowly starting to emerge, and a growing number of campaigns and activities concerning this topic are being undertaken. Nonetheless, large parts of society in most countries are unaware of this issue. Awareness needs to be raised about this problem. After all, if these issues are not discussed openly, they will be unable to become part of a general understanding of the connection between sustainability and mobile phones, leading to more sustainable practices and behavioural patterns in this area, including recycling practices.

1.1. The ecological rucksack of a mobile phone – a life cycle perspective

In order to increase the general understanding of the need for the sustainable use and disposal of mobile phones and to raise awareness accordingly, we need to adopt a lifecycle-wide perspective, assessing all environmental impacts of a product and the quantity of (natural) resources used to produce it (see Fig. 2). Most of these impacts are invisible to consumers. Hence for raising public awareness and changing consumption patterns, the public needs to be informed and educated about the "invisible resources" required to manufacture a product. This, however, is only one aspect; the relationship between knowledge and behaviour is very complex and influenced by various factors (see chapter 2 for a more detailed description of these factors influencing each other).

The total amount of resoucres used by a product along all its lifecycle phases – from resource extraction up to disposal – can be presented as its "ecological rucksack" (Schmidt-Bleek et al., 1998). These resources are measured using the MIPS (Material Input per Service Unit) concept in five natural resource categories: abiotic materials (metallic and non-metallic minerals such as ores, rocks, sand, etc. in addition to fossil energy carriers such as coal, mineral oil, natural gas); biotic materials; soil (including erosion and earth movement); water; and air (see Schmidt-Bleek, 1998; Liedtke et al., 2014). This ecological rucksack is invisible to consumers, but is purchased along with every mobile phone (and any other product). Compared to the actual product, the mobile phone's rucksack is very heavy, outweighing the device itself by far. Fig. 4 shows the ecological rucksack of a mobile phone, showing only abiotic and biotic materials, based on existing data for a standard mobile phone (not a smartphone).[1] In this figure, the weight of the actual product (80 g) is contrasted to the weight of its ecological rucksack (75.3 kg, excluding the weight of the actual mobile phone)[2]; the latter weighs almost one thousand times more than the actual product (see Fig. 3).

This figure clearly shows that the first phase of the lifecycle (resource/raw materials extraction) involves the largest amount of resources. The second heaviest phase is the use phase caused mainly by electricity consumption, which accounts for almost one quarter of the total ecological rucksack. In third place is the production phase with a total of 8.2 kg, followed by the end-of-life phase, involving the use of only 0.1 kg of resources. Calculations for the last phase, however, only include the resources required for transportation (no robust data was available for recycling processes).

[1] The ecological rucksack has been calculated for a conventional mobile phone, not a smartphone, due to lack of reliable data for smartphones. The calculations for the energy use is based on the German energy mix 2011.

[2] The weight of the ecological rucksack accounts for the turnover of primary resources extracted from nature and does not refer to a static quantity of materials.