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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 adress 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.

Highlights

- in 2015 we have more mobile phone subscriptions worldwide than people on the planet
- the ICT industry is closely linked to high energy and resource use
- the ecological rucksack of a mobile phone weights around 75 kg (material use along the whole life cycle)
- the main internal influencing factors for return and recycling behaviour are personal norms, emotional attachment, habits, knowledge
- the main external influencing factors for return and recycling behaviour are economic

incentives, infrastructures, education / communication

- successful communication and collection campaigns need to address a combination of these factors

Keywords

ICT, recycling, mobile phones, sustainability, resource use, communication and collection campaigns, return

Abbreviations

Australian Mobile Telecommunications Association (AMTA)

Bundesamt für Umwelt (BAFU)

Bundesministerium für Bildung und Forschung (BMBF)

Environmental Management for Sustainable Universities (EMSU)

Environmental Protection Agency (EPA)

European Roundtable on Sustainable Consumption and Production (ERSCP)

Information and communications technology (ICT)

Institute for Advanced Sustainability Studies (IASS)

International Conference on Information and Communication Technologies (ICT4S)

International Telecommunication Union (ITU)

Life cycle inventory (LCI)

Material Input per Service Unit (MIPS)

Material Requirement Planning (MRP)

Non-governmental organisations (NGOs)

Sustainable consumption and production (SCP)

Sustainable Consumption Roundtable (SCR)

Sustainable Europe Research Institute (SERI)

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 figure 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).

Figure 1: Global mobile cellular subscriptions

Note: * Estimate
Source: ITU World Telecommunication /ICT Indicators
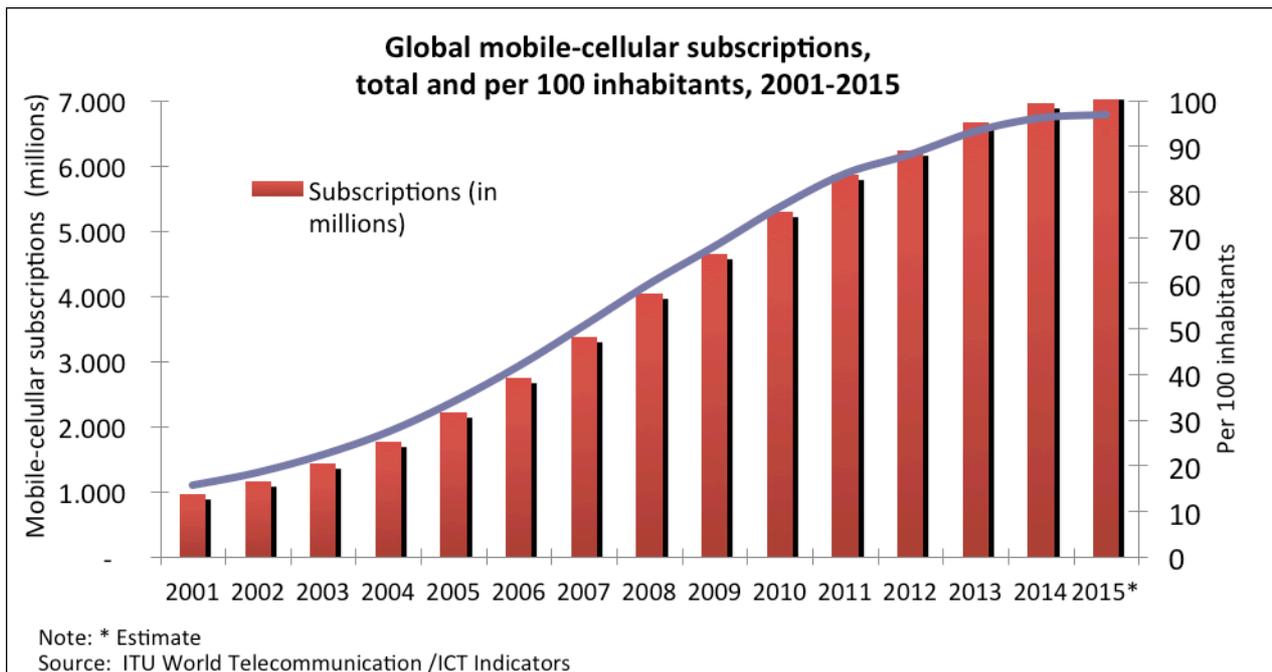
In terms of production and sales figures, more than one billion mobile phones were manufactured worldwide in 2010; even larger numbers were produced in the ensuing years. In 2010, around 1.6 billion phones were sold, 19 per cent of which were smartphones (Gartner Inc. 2011). In Germany, the industry sold around 28 million mobile phones in 2013 (Bitkom 2013). 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 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 to 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 figure 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).

Figure 2: Lifecycle of a mobile phone
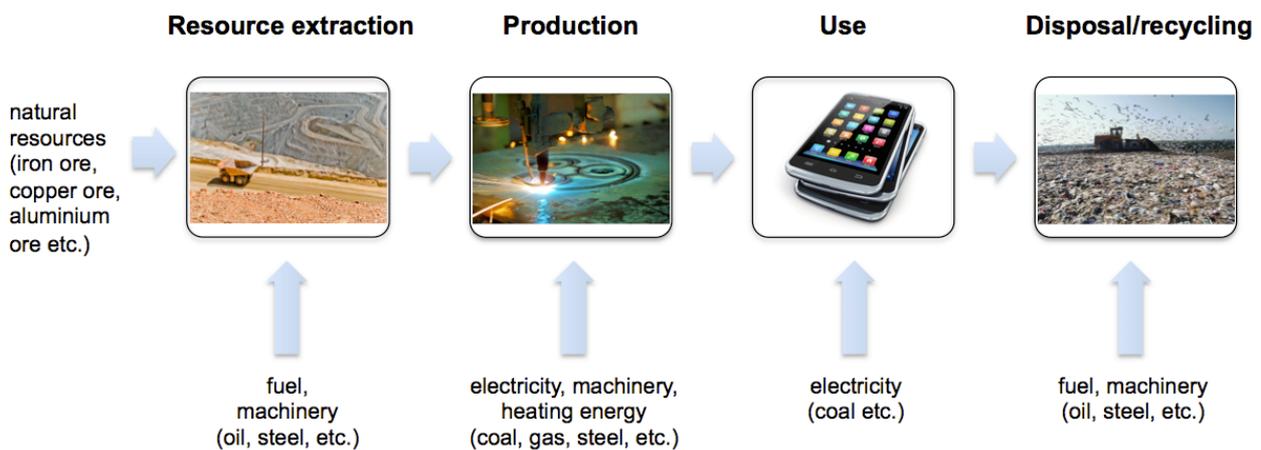
Source: Welfens et al. 2013

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 1992, 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, Bienge 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. Figure 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 figure 3).

Figure 3: Ecological rucksack of a mobile phone, divided into all four lifecycle phases

Ecological Rucksack 75.3 kg
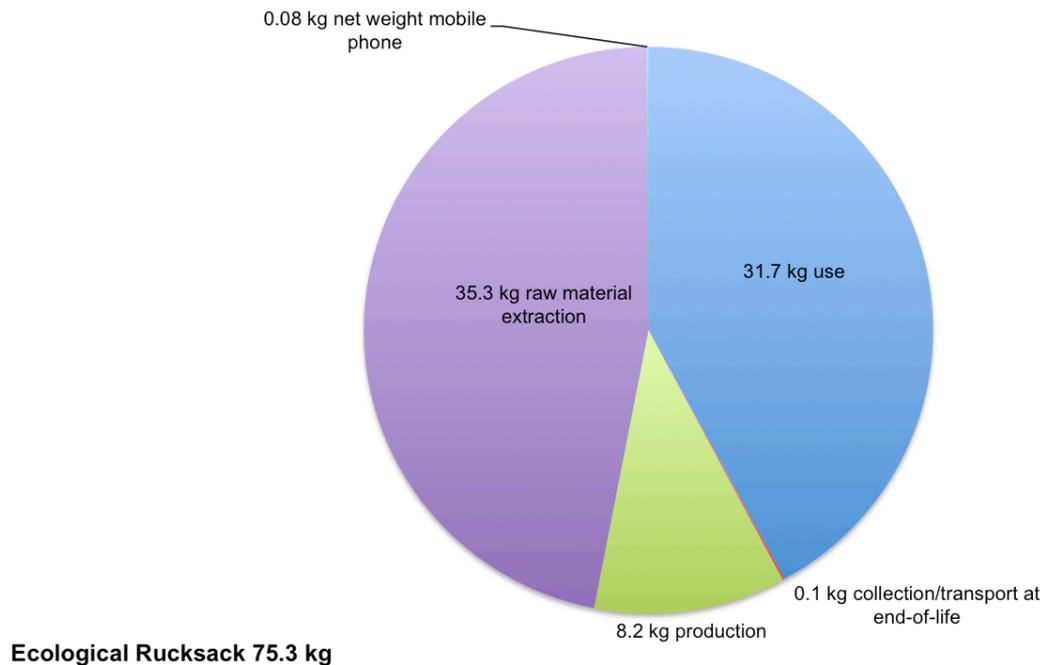
Source: Nordmann et al. 2015

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).

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[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

1.2 Research questions

Based on the challenge of reducing the use of resources in the ICT sector described above, the aim of this article is to further investigate problems and facilitate factors for the sustainable use of mobile phones, applying them to existing communication and collection campaigns[3]. It therefore focuses on the following two research questions:

- What are the main drivers and challenges to motivate returning and recycling of mobile phones?
- How have these drivers and barriers been addressed by existing communication and collection campaigns?

Most communication and collection campaigns are related to recycling mobile phones. However, recycling is only one part of the solution. Prolonging the use phase, thus reducing the demand for new products, is the best solution to address global resource problems. Our analysis focuses on communication and collection campaigns, and hence mainly on the end-of-life phase without, however, losing sight of the overarching issue of sustainable consumption, including the use phase.

In order to answer our two research questions, we will use the comprehensive norm activation model by Matthies (2005) to analyse the problem of a lack of awareness as a barrier to recycling mobile phones (Section 3). Based on this, a number of indicators can be derived, guiding the analysis of mobile phone return programmes and what they accomplished in various countries (Section 5). This case study research employs various data collection methods, such as document and literature analysis, interviews, observations and questionnaires (chapter 4). The paper starts with a desk research on major driving forces behind the demand for mobile phones (chapter 2).

Most of the data used in this article – especially in chapter 4 – was generated in the research project "Return and use of old mobile phones", funded by the German Ministry of Education and Research (BMBF), conducted at the Wuppertal Institute for Climate, Environment and Energy in collaboration with the Institute for Advanced Sustainability Studies (IASS), Potsdam.[4]

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[3] The focus of our study are campaigns that inform about sustainable use and recycling of mobile phones and/or have the aim to collect mobile phones. In most cases both aims are linked very close to each other. Therefore in the following we are referring to „communication and collection campaigns".

[4] The aim of the research project was to increase understanding of consumer behaviour in the context of sustainability, focusing on individual recycling behaviour. Furthermore, economic potentials that could result from a regulated return of mobile phones were investigated. Based on this, recommendations were developed for different stakeholders in the value chain. Additionally, a comprehensive communication and collection campaign "Die Rohstoff-Expedition. Entdecke, was in (d)einem Handy steckt!" (The Resource Expedition—exploring the content of your mobile phone!" for mobile phone recycling was prepared and supervised, extending the scope of previous approaches. In this context, a number of educational and communication materials were developed based on the concept of the ecological rucksack. The campaign, including its teaching material, aims at informing individuals about the resource intensity of mobile phones and preventing them from discarding their old phones in household waste. The target group of the project and campaign are children and (young) adolescents aged 9 to 18. (Client/sponsor: German Federal Ministry for Education and Research (BMBF)).

2. Factors that influence the recycling of mobile phones

As explained in chapter 1, there is a great need to reduce the consumption of resources in the ICT sector. The number of mobile phones is growing rapidly, increasing quantities of resources are used, and recycling rates are low. In 2008, the global recycling rate of mobile phones was below 10 per cent, according to a customer survey conducted by Nokia (Nokia 2008, Tanskanen 2012).

Mobile phone communication and collection campaigns mainly addressed the aforementioned problem, seeking to encourage consumers to participate in return programmes for recycling mobile phones. In addition, however, the high prevalence of mobile phones and use of resources need to be reconsidered. Most previous communication and collection campaigns failed to address this issue. For this reason, this study focuses on return and recycling behaviour, seeking to counteract the lack of more holistic campaigns emphasising sustainable behaviour (buying and using mobile phones). Previous campaigns will be analysed to determine the extent to which they establish a successful infrastructure to spread knowledge about returning and recycling mobile phones, and encouraging consumers to do so.

Nevertheless, since mobile phones have led to a revolution in communications and everyday behaviour, it is important to first identify the main factors that influence the use of mobile phones. Based on these factors, drivers and barriers to desired behaviours (focusing on recycling behaviour) will then be deduced from a broad literature review. This literature review will be supplemented by empirical results generated in surveys, interviews and discussion rounds, conducted in the research project "Return and use of old mobile phones". Furthermore, the drivers and barriers will be analysed using a behavioural model for explaining the terms of environmental-friendly action – linked to the barriers and drivers for recycling mobile phones.

2.1 Factors influencing return and recycling behaviour

Meta studies, in which a large number of studies on environmental and recycling behaviour were evaluated (Hornik et al. 1995, Visscher et al. 2009) identified a number of drivers and barriers to desired behaviours. These studies unanimously showed that objective variables such as age, gender and income are not reliable and effective factors for recycling (Saphores et al. 2012). Darby and Obara (2005), however, found that low-income households recycle fewer electrical appliances, but exhibit a longer use phase. Relevant factors are e.g. knowledge, habits, economic factors, subjective attitude towards the subject as well as existing personal and social norms (Darby & Obara 2005).

Factors influencing recycling behaviour can act as both a driver for and a barrier against returning old mobile phones, depending on the social context. The modern societies are characterized by complexity and dynamic interaction, when possible drivers and barriers of certain behaviour are related to many others that have an impact on them. This is a multi-directional process with dynamic interactions between individuals, society, politics and economy.

We can distinguish between internal and external factors influencing recycling behaviour (see figure 4). All these factors influence each other and vary in their degrees of effectiveness; these interactions, however, are not analysed in this paper.

Figure 4: Internal and external factors influencing return and recycling behaviour
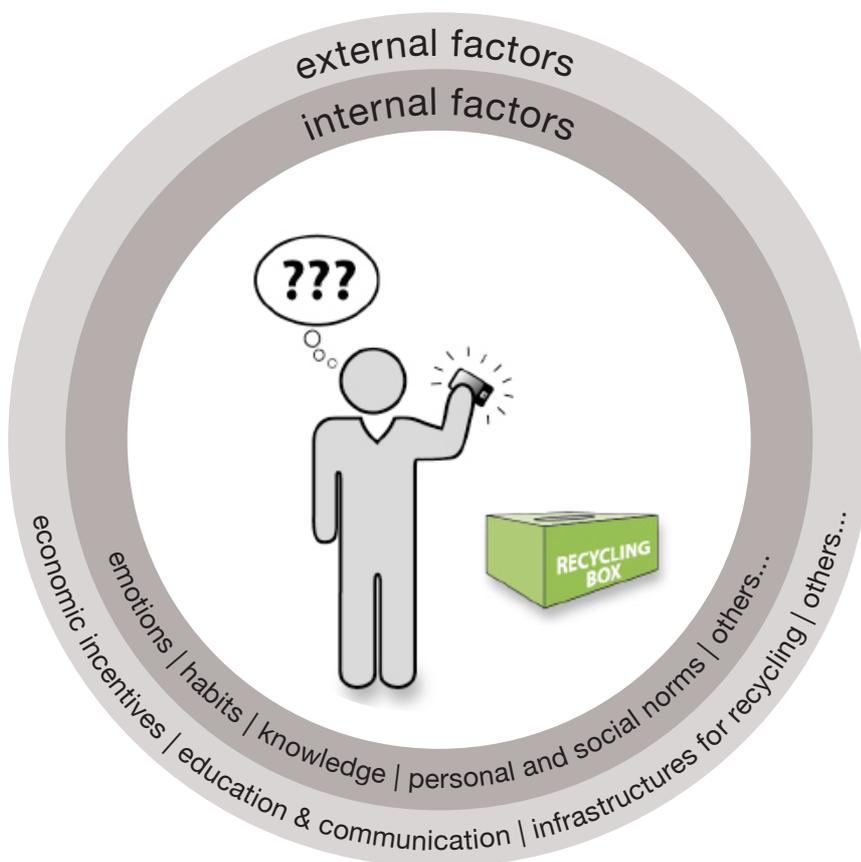
Source: Wuppertal Institute 2015

Internal factors are drivers and barriers developing within and from socio-cultural environments, i.e., they are influenced more at an individual and less at a political or a corporate level.

External factors are classified bundles of drivers and barriers that exert influence on decision making in the area of consumption and recycling and have a systemic, institutional and structural nature (e.g. Tukker et al. 2008), i.e., they are not imminently determined by individual action of consumers, but rather at a political and corporate level.

The selection of internal and external factors of return and recycling behaviour of individuals is based on analyses of different studies (see Hornik et al. 1995, Røpke 2003, Visschers et al. 2009, Tanskanen 2012, Mäkelä 2011, Suckling & Lee 2015, Bookhagen et al. 2013, Welfens et al. 2013).

Internal factors that influence consumer behaviour regarding mobile phones are:

- **"Personal and social norms" -** act as a driver if recycling is considered a desirable behaviour within a social group or society. If recycling is socially desirable, there is social pressure to recycle. Personal norms are influenced by social networks (family, friends) that can reinforce or inhibit certain behaviours. It facilitates recycling behaviour if other persons in this social group have also recycled their old mobile phones and recycling is not a marginal phenomenon, but common practice or standard. Conversely, if recycling has a negative image and is treated with disregard, this factor works as a barrier. There are two sides of the coin in case of the factor of **"personal attitude to the subject":** a low sense of responsibility and a negative attitude towards the environment can act as a recycling barrier. On the other hand, a person's high degree of responsibility and positive attitude towards the environment stimulate recycling behaviour.

- Strong **emotional identification** with the product: a mobile phone is not only used for communication, but also for navigation, information, organisation and entertainment. More and more areas of our life are coordinated (and controlled) by mobile phones. The users get fond of their mobiles, which they have often customized by decorationg it and, equipping it with individual choice of apps and photos. Thus, it is becoming increasingly emotionally charged, despite its rational communication and information function, and is perceived as a personal accessory. Quotes such as "The mobile phone feels like a part of me" from household surveys conducted in the "Resource expedition" project illustrate that the mobile phone is much more an expression of personal style than just an everyday commodity. This represents an additional barrier to returning it, even if the device is outdated. It is also the case that smartphones and ordinary mobile phones contain sensitive personal data that is difficult to fully erase, meaning that mobile phone users decide to keep their old phones rather than sell them as used phones or return them for recycling upon purchasing a new mobile phone.

- **Habits** are identified as being another significant factor. To understand habits, the "theory of practice" offers explanatory power (Shove 2006, Warde 2005, Spaargaaren 2004).[5] It basically assumes that such actions are the outcome of shared conventions, competences,

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[5] Habits are only one aspect focused on by the theory of practice. Others are the cultural and institutional framework, codes of conducts, infrastructure and social milieus

images and material resources and due to the impacts of social systems. According to this theory, practices (habits) are a set of established objectives, procedures and understandings. The factor "habit" is a driver if the recycling of resources, such as paper or glass, is already part of a person's everyday routines. If this is not the case, an entirely new habit must be established. This requires a change in routines, and then this factor acts as a barrier. In this context the habit "to keep and collect things" is also relevant in regard to old mobile phones: they will be stored in households "just in case". People keep their old mobile phones as a second one in case their currently used mobile phone gets lost, stolen, broken, etc. This habit works as a barrier for return and recycling.

- The factor of **"knowledge"** acts as a driver for recycling behaviour if the respective person is sufficiently aware of the problem; in reverse, it acts as a barrier if his or her awareness of the need to recycle (mobile phones) is unsatisfactory. It is also important for people to know exactly how and where they can return their mobile phones. If there is sufficient knowledge, such as clear instructions provided in a communication and collection campaign, the probability of recycling behaviour increases. If instructions are unclear, the probability of recycling decreases.

The analysis of **external driving forces** is important when the consumer activity (in this case return and recycling of mobile phones) should be eventually shaped by policies.

- An important motivating factor for the return of mobile phones is the idea of **economic incentives**. An incentive system that relies on the immediate material compensation of users motivates more people to recycle their old phone (money or other benefits like free minutes, discounted new phone) to return the phone.

- **Infrastructures** for recycling of mobile phones – easy access to recycling bins, boxes and other collection points of mobile phones are also an important factor influencing recycling culture. Kollmuss and Agyeman (2002) identified the desire for comfort and convenience as one main driver that influences consumption patterns. An example from glass collection shows that the collection amount would triple if the collection point is place very close to the household (Tanskanen, p, 137). In this context the factor **"perceived effort"** (e.g. the cost/benefit ratio of an action), acts as a driver as long as the personal costs of recycling only have to be taken into account to a minor extent or not at all (for example, loss of time, discomfort) or users are rewarded for their recycling behaviour. The higher the perceived cost of the desired behaviour (returning the mobile phone), the less likely it is that the mobile phone will in fact be returned. Another barrier of mobile phone recycling connected

to recycling infrastructures is a certain **mistrust due to non-transparent recycling processes.** People are afraid that others could enrich themselves through one's own mobile phone or misuse personal data. Therefore, they prefer to keep their old mobile phone. Mistrust due to non-transparent recycling pathways is another factor that influences the return and recycling of mobile phones. Many of the young people interviewed in the research project "The Resource Expedition" connect the issue of recycling mobile phones, and electronic waste in general to images of illegal "backyard recycling" in developing countries. The conclusion drawn is often, it is better to keep the old mobile phones in the drawer – that way, they will do no harm. Finally, mobile phones are very small, unlike bulky refrigerators, for instance. Hence, owners of old devices do not mind keeping several generations of mobile phones at home.

- Education and communication also plays an important role – they target the knowledge aspect of human behaviours and people's value orientations. The knowledge about resource scarcity, recycling and sustainable use of ICT devices (e.g. mobile phones) should be part of the school curricula. (see e.g. Nordmann et.al 2015). Often people do not have basic knowledge (see internal factors) about the environmental impact of production and usage of mobile phones. The role of education and communication is to inform society about the (partly intransparent) recycling processes. That might contribute to reducing mistrust.

This description is strongly simplified. In reality, these factors never occur in isolation, but influence each other. For this reason, the integrative norm activation model by Matthies is used here because it takes into account the complexity of social reality. The model is called integrative because it brings together both empirical elements of the theory of planned behaviour (Ajzen 1991) and behavioural issues regarding norm activation (Schwartz & Howard 1982). It also takes into account the factor of behavioural habits, the significant influence of which has also been proven for environmental behaviour (Harms et al. 2005, Klöckner 2005).

Using the norm-activation model in an environmental context has been supported by empirical analyses of many studies in the last decades, see e.g. in the area of energy conservation (Black, Stern & Elworth, 1985), regarding recycling (Park & Ha 2014, Bratt 1999, Hopper & Nielsen 1991) and general pro-environmental behaviour (Nordlund & Garvill 2002).

Personal standards (the current feeling of one's commitment to environmentally responsible action) and social norms (the anticipated pressure of expectations by significant others, such as friends, family and colleagues) take centre stage in Matthies' model. By integrating social norms, the norm activation model can be linked to the Theories of Practice, which perceives decisions on

action and consumption as a result of interaction between infrastructures and collective conventions, traditions, principles, institutions and norms (Shove 2006, Warde 2005, Southerton et al. 2004). By extending the micro level (anticipated expectations by friends, family and colleagues) to the macro level of society (anticipated expectation of the joint practice in society)this explains how consumption patterns are controlled by socio-cultural institutions and technical infrastructures.

The theory of planned behaviour assumes that, in general, people are motivated to satisfy other people's expectations in order to be appreciated. This, however, cannot explain selective motivation patterns: a person may not be willing to perform a specific behaviour because his or her own moral ideas are not compatible with another person's moral ideas. A person's internal restrictions can therefore be stronger than their motivation to conform (Miniard & Cohen 1981).

Finally, the person weighs up the possible moral and social consequences of his or her decision and considers further costs and benefits before taking action. At the beginning of the decision-making process, the person must be aware of the existence of a problem and its connection to his or her personal behaviour. Furthermore, he or she must be aware of possible alternatives to that behaviour. Figure 5 illustrates the norm activation model:

Figure 5: The comprehensive norm activation model of environmentally friendly everyday behaviour
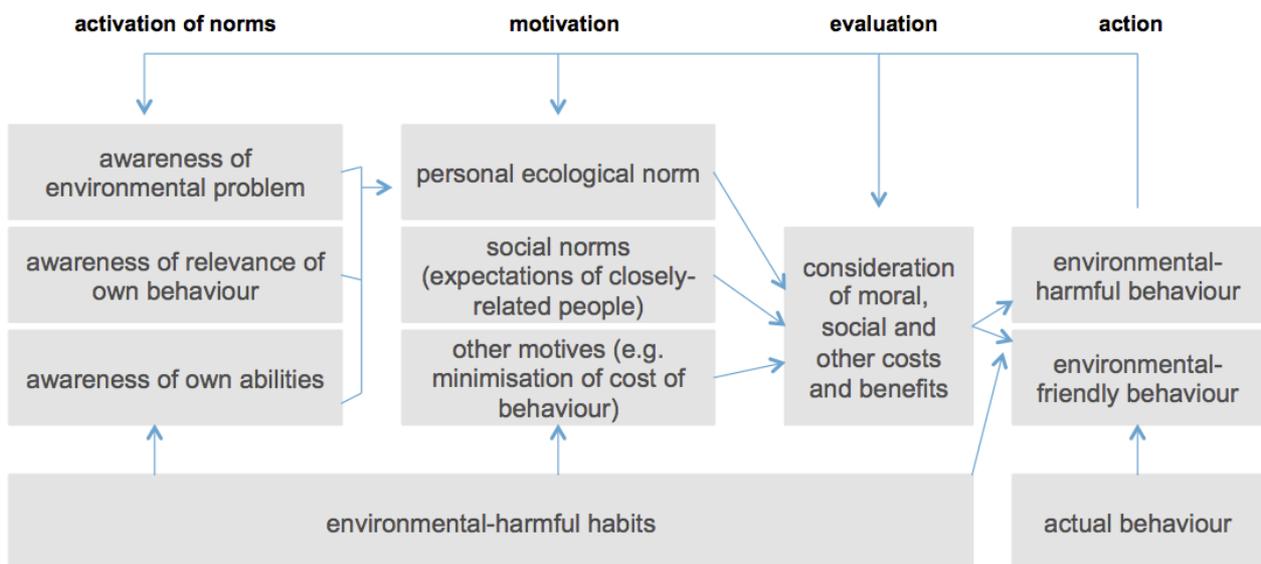
Source: Matthies 2005

The model explains the gap between ignorance and knowledge, and between knowledge and action: if an individual accumulates sufficient knowledge and gains access to this knowledge in specific situations, the first gap is bridged. After this has happened, personal and social norms can be activated, evaluated and implemented in the action. In the motivational and evaluation phase, it will be decided whether environmental or sustainability knowledge from the norm activation phase

will be implemented in the action phase. Hence, there are two phases – motivation and evaluation– between knowledge and action.

Thus, a person must first

(a) become aware of a specific problem (increasing mobile phone production in the context of resource scarcity, environmental degradation, etc.);

(b) know that his or her own behaviour is relevant (e.g. recycling practice for sustainable resource management); and

(c) know how he or she can change his or her behaviour (e.g. knowledge of how and where mobile phones can be returned).

2.2 Barriers for return and recycling behaviour

There are four main barriers to changing a person's behaviour towards more sustainable patterns in general. All these four barriers are influenced by some of the internal and external factors presented in figure 4 (page 10):

- *Barrier 1: insufficient awareness of the problem (norm activation phase)* due to insufficient knowledge, low level of education and low influence of social milieus with high level of social norms

- *Barrier 2: inadequately trained personal ecological norm (motivation phase)* due to lack of knowledge and low education level

- *Barrier 3: social norms and conventions (motivation phase)* due to weak social norms, lack of habits supporting pro-environmental behaviour

- *Barrier 4: unfavourable cost/benefit ratio (motivation phase)* due to weak (or even a complete lack of) economic incentives and lack of infrastructures supporting sustainable behavioural patterns.

These barriers can be divided into internal and external factors with the first two described as internal and the last two as external variables. All four can affect a person's return and recycling behaviour. The four barriers are described in more detail below:

Barrier 1: Insufficient awareness of the problem (norm activation phase)

Knowledge about environmental issues is necessary but not sufficient for initiating the desired behaviour of returning old mobile phones. That makes it easy for consumers to return their mobile phones (condition c) but does not take into account conditions (a) and (b) and therefore is likely to fail in its purpose to initiate recycling behaviour in the long term. A comparison between persons

who recycle and those who do not showed that "awareness of the importance of recycling and knowledge about recycling programs" was an important factor. Those with a low level of awareness of (sustainability) problems did not recycle (Hornik et al. 1995, p. 109).

Barrier 2: Inadequately trained personal ecological norm (motivation phase)

Anyone with a positive attitude and a strong sense of environmental responsibility usually has sufficient awareness of the problems involved and accepts higher personal costs for a desired behaviour. If, however, the person does not have a sufficient sense of responsibility, there will also be a lack of intrinsic motivation for environmentally responsible behaviour. This creates a barrier, which can be addressed by large-scale education programmes.

Barrier 3: Social norms and conventions (motivation phase)

This barrier describes the influence of social or peer pressure, such as close friends, parents, peer groups or the social majority. If such social pressure is lacking, this potential driver for returning old mobile phones will become a barrier. As recycling of mobile phones is normally not seen by others, in other words it is somewhat invisible, there is no real shame factor pushing this desired behaviour. Members of the peer group do not see how many old, unused mobile phones are stored in the desk drawer or whether they are being recycled; thus, this social pressure does not occur here in comparison to e.g. driving the car even for short distances, which can be closely observed by others

A study undertaken in the UK concluded that individuals were willing to behave in an environmentally friendly manner if they felt they had to change their behaviour together with others (SCR 2006).. The majority of consumers are willing to change their own way of life "but on one reassurance: that others, whether your neighbour at home or your competitor in business act likewise – the simple idea of 'I will if you will'" (SCR 2006, p. 6). In their meta study on drivers and barriers to recycling behaviour, Hornik et al. (1995) noted that another important incentive besides environmental knowledge is social influence, "defined as the presence or absence of social support for recycling" (Hornik et al. 1995, p. 108). It follows that one's commitment to recycling depends on other people's commitment to recycling.

Such standards, social norms and conventions may therefore be both drivers and barriers. A good example of successful standards is glass, paper and plastic recycling in Germany: in recent years, a routine has developed for collecting such material and managing the circulation process. No such convention has been established yet for electrical and mobile phones. We can see "spill-over" effects where recycling standards, such as in paper or plastic, have been established in society (Darby & Obara 2005).

Barrier 4: Unfavourable cost/benefit ratio (motivation phase)

Consumers will change their environmental behaviour if their personal benefit increases or the associated costs remain low. The costs involved are not only monetary costs, but also time, freedom, comfort, pleasure, status or habit loss. Beukering and Bergh (2006) showed that willingness to recycle decreases if recycling is time-consuming. Wang et al. (2011) discovered that recycling habits and inconvenient accessibility to recycling centres in Beijing were the key factors that negatively affected residents' recycling behaviour.

Excessive recycling costs can therefore be incurred if recycling works against behavioural habits or if returning infrastructures are too unwieldy. The higher the expected cost of return, the more likely there will be a "diffusion of responsibility", for example, the desired behaviour will be transferred to others.

Thus, if a particular environmental behaviour is required, it has to overcome two gaps: the gap between ignorance and knowledge (barrier 1) and the gap between knowledge and behaviour (barriers 2-4). The following combinations then arise:

- If the first gap has been overcome, meaning that conditions (a) – (c) are met, then the first barrier for returning mobile phones has been bridged.
- However, if the necessary knowledge is available, but there is a lack of intrinsic motivation to act accordingly to this knowledge (barrier 2), the desired behaviour will not be exercised. Those who, conversely, have high ecological norms must also have an awareness of the problem (relation between using mobile phones and increasingly overconsuming resources and energy).
- If a person possesses neither environmental knowledge nor personal ecological norms (like barriers 1 and 2) but social pressure is high, then the probability that this person will exercise the desired behaviour increases with the level of social pressure. Barrier 3 can therefore be a driver for environmentally friendly behaviour if social norms are proactive, id est the social expectation of recycling is high. In this case, the personal cost of ignoring the desired behaviour –here: returning mobile phones – is in fact high.
- Furthermore, in the absence of environmental knowledge and personal ecological norms, financial incentives can facilitate the desired behaviour. Saphores et al. (2012) suggest a deposit system for electrical equipment.
- Even a person with a high level of environmental awareness and ecological motivation to return old mobile phones will still refrain from returning a mobile phone if the associated expenses or costs are too high. If the personal ecological norm is very high, however, the cost of returning the mobile phone will be accepted.

- Overall, the following situation may be typical for the combination of the aforementioned barriers: if there is sufficient awareness of the problem, the ecological norm and social pressure are low and the cost of returning the device is rather high, the probability that a mobile phone will be returned is rather low.

3. Methodological approach

In order to answer our second research question "How have these motivating drivers and barriers been addressed by existing communication and collection campaigns?", in the first phase we used results from the research project "Return and use of old mobile phones". In the research project empirical data was collected from quantitative surveys conducted at ten German high schools in North Rhine-Westphalia (focusing on young people between the ages of 14 and 19), qualitative World Cafés took place through schools and qualitative interviews were held in households of different social milieus (Welfens et al. 2013).[6] The project results confirmed the adaptations of the norm activation model:

- Based on findings from the surveys and interviews, mobile phone recycling is not a relevant issue for young people and their families. They do not care about communication and collection campaigns and most do not connect their behavioural patterns (regarding mobile phone use) to sustainability issues. However, if provided with knowledge about the relevance of mobile phone recycling, it was quite easy to raise their interest in such issues.
- Clear instructions on return procedures and information on recycling infrastructures are supporting factors for participating in communication and collection campaigns. A lack of knowledge of recycling infrastructure, e.g. places where old mobile phones can be returned, may be an important barrier to recycling behaviour.
- Important motivational factors for the return of mobile phones are economic incentives. Most people will not return their mobile phone in the absence of financial incentives.
- (Target group-oriented) education and communication material is a very promising approach to increase individual motivation to recycle. The educational material developed in the German research project was evaluated in more than 300 schools, with very positive results.

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[6] For an extensive overview over the applied methods see (Welfens et al. 2013).

Based on the empirical findings generated in this project as well as theoretical knowledge (theoretical model of Matthies), we derived a set of criteria for a successful communication and collection campaigns (see table 1). In addition, experience with campaign work influenced the choice of variables to measure the effort involved in communication and collection campaigns.[7] These criteria can be applied to any communication and collection campaign that addresses sustainable resource use, such as sustainable mobility patterns or nutrition.

Table 1: Criteria for successful communication and collection campaigns derived from the norm activation model and empirical research

	Criterion	Description	Theory: Norm activation model	Empirical research project: "Return and use of old mobile phones"
1	Clear message	A clear message that enables addressees to understand the (sustainability) problem communicated by the campaign as well as the relationship between individual behaviour and the respective problem	Raising awareness of the problem; providing knowledge and understanding of the connection between one's individual behaviour and the sustainability problem; providing knowledge on what to do (clear instructions), part of the **"activation of norms" phase**.	Providing knowledge about the relevance of recycling mobile phones can be a motivational factor for recycling practices. Clear instructions support broad participation in communication and collection campaigns
2	Educational elements	Supporting educational measures to raise addressees' awareness of the campaign (id est customers) Accompanying educational measures to raise the awareness of members of staff who are in direct contact with customers	Intervention at the **"activation of norms" phase**.	(Target group-oriented) education and communication material is important for developing an individual "resource-saving habit"
3	Access to infrastructures	Easy access to return infrastructures	This section focuses on the **motivation phase**: the cost of behaviour should be kept low.	
4	Information about participation via communication channels	Broad dissemination of information about the opportunity to participate in the campaign	**"Activation of norms" phase.**	

[7] Based on the theoretical framework of the norm activation model and the empirical results generated by the surveys and interviews, a comprehensive communication and collection campaign entitled "The Resource Expedition - exploring the content of your mobile phone!" to encourage mobile phone recycling was developed as part of the project. This campaign addressed mobile phone recycling in connection with resource efficiency and sustainability issues. The use of resources by mobile phones was visualised by the ecological rucksack. Applying this concept, a number of educational and communication materials were developed.

5	**Economic incentives**	Economic incentives in order to motivate people to participate	Economic incentives influence the **motivation phase**	Economic incentives are a strong factor that influence people's willingness to participate in campaigns

In the second phase we tested this set of criteria. Comparing the campaigns using different variables enabled us to examine the set up and design of individual campaigns (for an evaluation of campaigns, see also Gibson and Römmele (2009, p. 286), Siedentopp (2009, p. 114ff.) and Tenscher (2007, p. 70). The results may lead to suggestions, in terms of our theoretical elaborations, of possible shortcomings of previous communication and collection campaigns. The aim of this work is to identify differences and similarities in the communications work based on the description and comparison of campaigns. Concluding statements and generalisations will be made with appropriate caution.

We used case study research to compare the different campaigns. Case study research is a widely known and accepted research methodology in social sciences (Dubé & Paré 2003, Levy 2008). It generates insights by examining a phenomenon in its usual setting (Benbasat, Goldstein & Mead 1987). Comparative case studies therefore have the advantage of discovering causal mechanisms, enabling generalised research results to be formulated even with smaller sample sizes (Muno 2009, p. 123). In a multiple case study, only a few cases and multiple variables are analysed ("small n" approach) (cf. Muno 2009, Yin 2009). This corresponds with the paper's objective to describe the efforts and success of mobile phone communication and collection campaigns.

The case study design involves 16 implemented or partially ongoing German and international campaigns for returning old mobile phones. The campaigns were conducted with no long-term success, considering that the number of old, unused mobile phones in German households is growing steadily (see Bitkom 2014). Most of the campaigns were carried out by one of the four German network operators (Deutsche Telekom, Vodafone, E-Plus, Telefonica/O2); others were initiated by radio stations, companies or non-governmental organisations (NGOs). The list in table 2 is not exhaustive, but contains only a selection of campaigns.

Table 2: Ongoing German and international communication and collection campaigns for returning old mobile phones and their efforts to collect mobile phones

Campaign	*Number of mobile phones returned*
1 *"Bringen & Gewinnen" (Return & Win)* *– return your old mobile phone and win a car* *August to October 2010* *Deutsche Telekom*	*Approximately 62,000 mobile phones* *Telekom in general: over the past three years, Deutsche Telekom AG (DTAG) has returned over one million mobile phones within various campaigns (Wuppertal Institute 2013).*
2 *"Ein Herz für Kinder" (A Heart for Children)* *Deutsche Telekom spendet € 2 pro Alt-Handy* *(Deutsche Telekom donates € 2 to charity for every mobile phone returned)*	Approximately *585.758 mobile phones collected for the campaign (total number in 2011: 762,000) (Deutsche Telekom AG 2012)*

	October to December 2011 *Deutsche Telekom*	
3	*Handys für die Umwelt* *(Mobile phones for the environment)* *Deutsche Umwelthilfe in cooperation with Deutsche Telekom* *(Ongoing campaign since 2003)*	*No information about number of collected mobile phones available.*
4	*"Mittlere Elbe"* *(Middle Elbe)* *2012* *Telefónica/O2*	*Telefónica collection activities in general:* *2012: 18,196 mobile phones recycled and 3.176 mobile phones re-sold (trade-in-programme);* *2013: 16,520 mobile phones recycled and 3.033 mobile phones re-sold.* *(Telefónica Germany GmbH & Co. OHG 2014).*
5	*"Alte Handys für die Havel"* *(Old mobile phones for the River Havel)* *Since January 2011;* *E-Plus*	*152,541 mobile phones returned since 2011 (NABU 2014)*
6	*"Handys clever entsorgen"* *(Recycling mobile phones cleverly)* *2012 to 2013* *Bavarian State Ministry of the Environment*	*90,000 mobile phones and approximately 1,000 laptops returned, mainly collected by school classes (EPlus Gruppe 2014).*
International campaigns		
7	*"Nokia loves earth"* *November 2008 to February 2009* *Nokia, Thailand*	*3,000 mobile phones and 150 kg mobile phone accessories returned (The Nation 2008)*
8	*"Green Box"* *Since 2005* *China mobile*	*Collection from 2005 until 2007: 2,6 Mio. mobile phones and phone accessoires (Yin et al. 2011)*
9	*Regenersis-FONEBAK, UK* *Since 2002* *UK government, in cooperation with manufacturers*	*Since 2002: collected over 25 Mio. mobile phones (no latest reference year found) (sellmymobile 2015)*
10	*Ö3 Wundertüte* *Extension:* *"Ö3-Wundertüte macht Schule!", school competition* *Austrian radio station & Caritas & "Mondi"*	*434,000 mobile phones were returned by 2014 (Hitradio Oe3 2014).*
11	*"Mobile Muster"* *since 1998,* *Australian Mobile Telecommunications Association (AMTA)*	*100 tonnes of mobile phone components have been collected and recycled since the programme was launched. This figure includes 8.8 million handsets and batteries and over 550,000 kg of accessories as at 30 June 2014 (MobileMuster 2014).*
12	*"Recycle your cell phone – it's an easy call" 2008* *Environmental Protection Agency* *(EPA), USA*	*11 million mobile phones returned (Wuppertal Institut 2013).*
13	*"They are calling you"* *since 2009,* *Jane Goodall Institute*	*/Since 2009: 18,000 mobile phones (Taronga 2015)*
14	*"Hope phones"*	*10,000 mobile phones returned in 2011 (EveryMotherCounts*

	USA, Canada	campaign) (Hope Phones 2011).
	Medic mobile	
15	Samsung recycle	Samsung in general: in 2013, Samsung Electronics collected
	India	and recycled about 355,000 tonnes of electronic waste
	Samsung	(Samsung 2014).

Campaigns were selected based on three main aspects: duration, scope and visibility. Campaigns that lasted less than three months and that were conducted more than five years ago (unless ongoing) were excluded from the analysis because they were out-of-date and/or too short to enable a change in behavioural patterns. Furthermore, we primarily looked for nation-wide campaigns not only in Germany, but also in any other country in the world. This was done in order to exclude small campaigns with a very narrow focus and target group, e.g. for a certain city or region of Germany. Instead, we selected broader campaigns aimed at the general public. In addition, we only chose campaigns that had a high level of visibility. This was done because such campaigns are more likely to have successful communication strategies, which is one of the previously identified success factors.

Campaigns were not selected on the basis of the initiating organisation (company, NGO, etc.), even though the campaigns would have had a different purpose and content depending on the organisation behind them. Interestingly, all but one of the German campaigns were initiated by the industry in cooperation with various NGOs. This was a different case in other countries, where we found broader, nation-wide campaigns led by other actors, too.

4. Analysis and results

The following table lists all 15 national and international campaigns, which were selected for analysis, comparing them with the set of criteria developed from theory end empirical findings.

Table 3: Selected mobile phone communication and collection campaigns

| Campaign | Criterion 1: Messages | Criterion 2: Educational elements for | | Criterion 3: Access to infrastructure | Criterion 4: Information via communication channels | Criterion 5: Economic incentives |
		Customers	Staff			
German campaigns						
1 "Bringen & Gewinnen"	Metals / mobile phone as a supplier of raw materials / environmental protection	Customer awareness / mobile phone communication and collection campaigns at schools with enclosed learning booklet	Information and training for employees	Return envelope, households nationwide	Website Twitter, Facebook; newspapers and magazines, broadcasting	Prize draw for five BMW Minis
2 "Ein Herz für Kinder"	Mobile phone as a supplier of raw materials / environmental protection	/	/	Mobile phone collection boxes with return envelopes	Campaign launched at "Wetten, dass." (a popular television show at the time)	€ 2 for each mobile phone returned; donation to "Ein Herz für Kinder"
3 "Handys für die Umwelt" (DUH Umweltschutz-Service GmbH 2014)	Mobile phone as a supplier of metals / raw materials / environmental protection / pollutant relief	Information about what to do with old cell phones (sell, recycle)	/	Telekom shops, free delivery	Facebook, website	Money from recycling/reselling is invested in environmental projects organised by Deutsche Umwelthilfe e.V."
4 "Mittlere Elbe" " (Telefónica Germany GmbH & Co. OHG 2014).	Supplier of metals / raw materials ; "urban mining"; resource conservation	Raising consumer awareness ("Eco Index")	Raising staff awareness	O2 shops or return by mail (free of charge)	Website	€ 2 donation to WWF for every mobile phone returned
5 "Alte Handys für die Havel" (NABU 2014).	Conducive to sustainable development	/	/	E-Plus shops, return to NABU (by mail) or NABU collection points	Website	For each mobile phone returned, E-Plus donates up to € 3 to a NABU (Havel) renaturation

						project: the NABU groups involved can win non-cash prizes
6	"Handys clever entsorgen" (Bayerisches Staatsministerium für Umwelt und Verbraucherschutz 2014)	Supplier of metals / raw materials; strengthen sense of responsibility; strengthen and improve existing disposal infrastructures	Teaching material about mobile phones, laptops, etc.	/	Collection boxes in schools and public buildings	Website, Facebook; QR Code	School competition, non-cash prizes

Campaign	Criterion 1: Messages	Criterion 2: Educational elements for		Criterion 3: Access to infrastructure	Criterion 4: Information via communication channels	Criterion 5: Economic incentives
		Customers	*Staff*			
International campaigns						
7 "Nokia loves earth"	Environmental protection, non-specific	?	?	Collection boxes at 12 Nokia Care Points, 23 Nokia shops and partner companies	Website	Promotional contests / prize draw to win new mobile phones / cash donation to WWF for every mobile phone returned
8 "Green Box"	Environmental protection, non-specific	?	?	Collection boxes at 700 Nokia service points and shops	Website, Twitter	?
9 Regenersis, formerly FONEBAK	Environmental protection, non-specific	/	/	Free return	Website	Donation can be chosen independently; for example, the BBC's Children in Need
10 Ö3 Wundertüte (Hitradio Oe3 2014)	Environmentally and socially compatible (long-term unemployed are involved as employers)	/	/	Free return	Website	Donations to Austrian "Families in need"
11 "Mobile Muster" (MobileMuster 2014).	To avoid future greenhouse gas emissions, save energy, protect our	Raise awareness of recycling (website)	/	Encourage people to return their old mobile phones, either by dropping	Website, Facebook	Motivation to donate to several projects

#	Campaign						
		environment and conserve scarce natural resources.			*them off at a shop or sending them by mail / free of charge for consumers, schools, businesses, councils and government agencies.*		
12	*"Recycle your cell phone – it's an easy call" (EPA o.J.)*	*Environmental protection, non-specific*	*Environmental protection, non-specific*	/	*Collection points*	Website, public service announcements printed	*No specific data*
13	*"They are calling you" (Deforest Action o.J.)*	*Environmental protection, non-specific*	Great Apes, Coltan and mobile phones learning assessment Including a test for schools	/	Free return	*Website, poster for schools,*	Proceeds to be donated to a project in Congo to save primates
14	*"Hope phones" (Hope Phones 2011)*	*No specific data*	/	/	*Free return*	*Website, Facebook, Twitter*	*Donation to various projects supporting the development and improvement of mobile technologies for medical care in rural areas*
15	*Samsung recycle (Samsung 2014).*	*To save natural resources, energy, clean air and water*	/	Consumers must call to find out where collection points are	*Customers can return their old devices at various drop-off points*	*Website*	*?*

The table shows that most campaigns differ considerably with regard to fulfillment of the five criteria adressed in chapter 3. Based on this, the following recommendations for creating successful communication and collection campaigns for mobile phones can be formulated as follows:

- **Criterion 1: Formulating of a clear message** that enables addresses to understand the (sustainability) problem is an important element of any communication and collection campaign. As experience from various campaigns shows, it is difficult to integrate the sustainability issue in a campaign's message due to its complexity. In particular, campaigns run by a number of mobile phone operators who attempt to link the corporate image campaign to sustainability goals focus on one aspect of sustainability only, for example, environmental aspects (e.g. campaign number five) or social aspects (e.g. campaign number two). In the context of sustainability, it is important and desirable for a campaign's message to not only refer to (a few) selected aspects of sustainability. If a campaign addresses just one aspect of sustainability, such as recycling, it can easily create the impression that recycling alone will solve all social and environmental problems in the value chain. A clear and simple message of a communication and collection campaign requires a certain reduction in complexity of the issue. The increase in resource efficiency caused by recycling must be communicated as just one part of the solution to the sustainability problem; improvement options in production and consumption must also be addressed. Only a few campaigns focused on the use phase, stressing that mobile phones should be used for as long as possible or exchanged and passed on within the family to extend the use phase. For example, the mobile phone campaign run by the Deutsche Umwelthilfe (campaign number three) stated that old mobile phones can be sold (and bought) second-hand.

  Generally, campaigns addressing the issue of sustainability should be embedded in resource and energy issues in the ICT sector, and should demonstrate a holistic picture along the value chain of mobile phones. The aim is to communicate the relationship between personal consumption and the use of resources.

- **Criterion 2: Integration of training and educational measures** in the campaign – is important in order to trigger long-term behavioural change. In this context, training and educational measures have to address specific target groups. For example, young people should be addressed via relevant social networks. Campaign number one included a mobile phone communication and collection campaign at schools with a learning booklet; the campaign led by the Bavarian Ministry of the Environment (campaign number six) distributed teaching material on the topic of mobile phones, laptops and other ICT products. A successful sustainability campaign can be supported by comprehensively training and further educating staff in direct contact to customers about the campaign. Sustainability-related education and training programmes are suitable for stakeholders such as shop employees, call centre agents, technical service employees, and other employees. These employees need to be able to answer specific questions and close information gaps for

customers. This aspect is only taken into account in two of the selected campaigns (numbers one and four).

- **Criterion 3: access to infrastructures/a reduction in transaction costs** (can be used successfully as a motivating factor in combination with other factors. All campaigns implemented a simple method of return; for example, the widespread distribution of envelopes for small electrical appliances to households. Old mobile phones could also be returned in stores. However, this method can be perceived as requiring the customer to take greater effort. Envelopes minimise this barrier significantly, since extra transaction costs remain low. Nevertheless, this did not lead to significantly higher return rates in any of the campaigns. This, again, emphasises the need to address more motivating factors simultaneously.

  In addition, **the wide dissemination of information (criterion 4)** and support by celebrities or opinion leaders are further measures taken in successful campaigns. The campaigns analysed used a variety of communication channels: a microsite for the campaign, TV commercials, radio spots and radio commercials, social media, information for online access, print media (flyers and brochures) and mail-order promotions. Even communication via social networks (Facebook, etc.) was undertaken in various mobile phone communication and collection campaigns. However, education and training programmes that tackled the whole sustainability issue were not included. In addition, the campaigns only utilised a few channels. It may be more effective to disseminate information via many different channels simultaneously.

- **Criterion 5: economic incentives** in order to motivate people to participate (e.g. participation in a contest) can act as a strong motivating factor in campaigns. In terms of sustainability, it is important to choose a topic that is related to environmental protection and resource conservation; thus, a non-material price should preferably be chosen. Campaigns led by the German mobile phone operators often focused on charity (e.g. donations for people in need). Here, it would be desirable to additionally address a number of environmental problems to cover the sustainability issues in a holistic way. A charity campaign that tackles sustainability/resource problems would be more appropriate. The use of resources throughout the value chain (ecological rucksack) of a mobile phone was not addressed by any of the mobile phone communication and collection campaigns analysed.

In summary, a combination of these criteria is required to facilitate more sustainable behaviour in consumers (for example, mobile phone recycling). This combination should include economic incentives, simplified conditions to access recycling infrastructure, low transaction costs and target group-specific education to raise problem awareness. Depending on the topic and target group, such a coordinated interplay may succeed in initiating the desired behaviour. An increased social expectation that old mobile phones are generally recycled can reinforce sustainable behaviour.

5. Discussion

Various campaigns have been conducted to increase the return of mobile phones and accessories. Indeed, a large number of mobile phones were collected in some of these campaigns. However, the campaigns only tackled short-term effects; they failed to change the settings that encourage consumers to recycle mobile phones in the long term.

Summarising the results for drawing up recommendations for return programmes, we stress that no single factor ensures a successful programme but a combination of proposed conditions appears to be the key. Below is an overview of aspects that seem to have influenced the campaigns analysed:

- Based on the analysis of return barriers, successful campaigns raised awareness of the problem by considering conditions (a) - (b) (see sub-chapter 2.1). Furthermore, campaigns have to combine **clear instructions** with **little effort** of (new) return habits. A certain normative pressure is exercised through such an integrated dissemination of **environmental and problem knowledge**. It requires a holistic view on the life cycle of a mobile phone and its ecological backpack, not just a focus on recycling.

- The analysis of the third barrier (social norms and conventions) shows that a large part of the population acts in a socially desirable manner if there is knowledge of practical implementation in general. Consequently, communication strategies should integrate practical and normative elements in order to show that **recycling is common and important** and that many people return and recycle their mobile phones.

- None of the campaigns addressed **personal consumer norms**; it was not the focus of short-term campaigns. Campaigns must be of a long-term nature in order to support sustainable development by educational policies (Rieß 2010, Stengel et al. 2008). Furthermore, based on the fact that personal norms are hard to change, it is even more important to address other factors of the integrative norm activation model by Matthies (2005); namely awareness of environmental problems, awareness of relevance of one's own behaviour, and awareness of the own abilities (see figure 5 on page 14).

- **Minimum effort** also seems to be a key factor, ensuring that no personal costs are incurred. People need to be able to easily participate in the campaign by handing in their old mobile phones or sending them in free of charge (for example, free envelopes sent to households generated a reasonably positive impact). Nonetheless, two of the German campaigns (numbers one and two) clearly showed that this factor is indeed important, but is insufficient on its own to achieve a successful campaign. As long as no **practical system solution** is introduced, no long-term changes in consumer behaviour will be achieved. In light of our analysis, such a system would either promote permanent motivating factors to ensure mobile phones are recycled, use existing routines, or dismantle these routines and keep the barriers to returning old devices to a minimum.
- Programmes **offering cash** for returned mobile phones also have a noticeable impact. However, this only applies to new models of mobile phones that can still be used, and therefore tend to support the category of re-use, which is not the topic of our investigation.

The involvement of governmental or well-known non-governmental organisations also seemed to have a positive impact. In general, government-supported measures seemed to be more successful, implying that a legal and trustworthy factor may also be one of the key factors in these programmes. People seem to be influenced by the fact that reliable partners reduce the chance of their mobile phones being treated inappropriately; trustworthy partners seemed to communicate a certainty that mobile phones will be recycled properly (for example, in terms of data privacy and reliable recycling processes instead of being sold to shady businesses, as well as ensuring that no money is made from it). This ensures that the programme does not have the character of a business or selling programme, but rather a trustworthy idea with a clear motive.

6. Conclusions

This paper generates important findings about mobile phone return programmes and is a promising basis for further research in this area.

In this paper, we explored the problem that the recycling of electronic waste in general and mobile phones in particular has not reached the public debate yet. In contrast to the implementation of recycling systems for glass and paper, there is no widely perceived public opinion that advocates electronic waste recycling. Thus, a successful establishment of mobile phone recycling habits has so far failed in campaigns throughout the world.

This failure is due to a lack of collective awareness, which may arise from insufficient social expectations to encourage individuals to return and recycle their mobile phones. Without sufficient awareness of the problem, no personal norms can be activated.

A high sense of responsibility and a positive attitude towards the environment do not initiate recycling behaviour as long as the level of knowledge about its relevance is low. Furthermore, most municipalities have no infrastructure that connects the recycling of electrical equipment to existing routines. Previous campaigns did little to change this lack of infrastructure.

Depending on the specific context, some of the factors identified may play a more prominent role than others. Since this may change from campaign to campaign, there is no universal "check list" for devising a successful mobile phone return programme. Nevertheless, based on the results of this paper, we recommend taking these findings into account and applying them according to the characteristics of the defined target group.

It should also be noted that, although recycling mobile phones and other ICT products is not the most sustainable option, it is the best solution – in addition to prolonging the use phase – for tackling the resource problem at present. Repair systems, handing devices down to other family members or selling mobile phones over the internet should be supported in terms of sustainability and resource efficiency. Future campaigns should also address the whole value chain of mobile phones, especially the use phase, more closely and not focus on the end of the value chain only.

More research is required in order to refine our tentative recommendations. The model can be developed further and refined in order to explain and understand human behaviour in terms of responding to such campaigns and changing behaviour accordingly. Such campaigns in the context of mobile phone recycling are starting to evolve, hence more empirical data is required in addition to the theoretical background information collected for this paper.

In particular, issues related to a nationwide transferability of concepts such as e-waste containers, mobile phone deposits and a mobile phone discount should be explored further. Experiments and surveys could be used with selected test persons in certain regions in order to analyse the

complexity and effect of higher granularity. Furthermore, a dialogue with key stakeholders from the government, industry and consumer groups should be initiated to discuss the acceptability and feasibility of recycling options.

Given the rising prices of rare materials and the increasing awareness of environmental protection issues, the topic of mobile phone recycling is destined to gain in importance in the future towards an absolute reduction in material throughput. Hence, related concepts and measures are increasingly relevant to policy-makers, practitioners and researchers alike. Here, again, it is important to design, implement and evaluate campaigns successfully in order to achieve the expected outcomes and behavioural changes, and to avoid a waste of resources. This paper represents a first tentative step towards such a concept for designing a successful campaign and evaluating it for further improvements in this context.

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