Peer-to-peer education for youths on smart use of Information and Communication Technologies

D2.2 Public, analytical report with conclusions and recommendations for policy makers based on the outcomes of a mapping exercise and focus groups

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CB5	DuneWorks B.V.	DW	NL
CB6	Smart Homes	SMH	NL
CB7	Norwegian University of Science and Technology	NTNU	NO
CB8	Umwelt-Bildungs-Zentrum	UBZ	AT
CB9	Lokalernergi	LE	DK

Content

1. Introduction

The energy consumption related to the use of Information and Communication Technology (ICT) is increasing rapidly. Computers, mobile phones, routers, TV sets, game consoles etc. today represent about one quarter of the European residential electricity consumption. In addition, the "hidden" consumption of energy and material resources for production and disposal of ICT and the provision of internet services is also increasing. This makes it important to address the consumption of ICT in order to mitigate climate change and environmental problems.

» Young people have in particular integrated ICT into most of their everyday activities

The use of ICT has become widespread among almost all groups of citizens, but young people in particular have integrated ICT into most of their everyday activities. Young people are therefore the target group for this EU Intelligent Energy Europe (IEE) project *Peer-to-peer education for youths on smart use of Information and Communication Technologies* (in short: useITsmartly). More specifically, we focus on young people aged 16-20 years in Germany, the Netherlands, Austria, Norway and Denmark. The aim of useITsmartly is to reduce the energy consumption related to ICT by developing innovative solutions to reach young people and facilitate their capacity to use ICT "smartly" in terms of energy consumption.

This report presents the main findings of the introductory mapping of energy consumption and user patterns related to young people's use of ICT (Work Package 2). It also presents the main policy recommendations. The study had two overall goals:

- Identifying the ICT user practices that are particularly important to address in order to save energy and map current technological and social trends, enablers and barriers for reducing energy consumption resulting from the use of ICT
- Mapping young people's knowledge, attitudes and practices of ICT use in order to customise and target later activities and campaigns aimed at capacity building

For a detailed presentation of the organisation, methods and empirical results and analysis, see deliverable *D2.1 Technical Report on the Organisation and Outcomes of Focus Groups and the Mapping Exercise* from February 2014 (download from the project website www.useitsmartly.com).

How we did the study

A mix of methods was used to produce the results and recommendations presented in this report. In the first part of the study, we did *literature reviews* and *national literature surveys* in order to summarise existing knowledge of the energy implications of ICT usage (including descriptions of current technological trends), the size of residential energy consumption for ICT and research on young people's use of ICT.

In the second part, we carried out *focus groups*. Unlike individual and group interviewing, the focus group method is about the discussion between the participants. The focus groups were moderated by a moderator on the basis of a general focus group guideline with questions to be discussed. The three overall research questions were: 1) How do the participants use ICT? 2) What do they think about the relationship between their use of ICT and energy and climate change? 3) What is their opinion about changing user practices in order to reduce energy consumption? Main focus was on the second question. Moreover, the participants completed a questionnaire on their personal use of ICT.

In addition to two pilot focus groups, three focus groups were carried out in each country (17 focus groups in total, 117 participants in total). We aimed for an equal representation of the genders male/female and a high diversity with regard to education, ethnicity, personal interests and age within the 16-20 years age group. The highest diversity was achieved with regard to education.

2. How much does the energy consumption of ICT matter?

There are a number of different kinds of energy consumption related to the use of ICT. The most "visible" is the electricity consumed during the use phase of ICT devices (e.g. when recharging the batteries of mobile phones). In addition to this *direct electricity consumption*, energy is also consumed in relation to the other life-cycle phases of ICTs, i.e. the production and disposal phases. This is termed the *embodied energy consumption*.

Standby energy consumption

Much focus has been on the standby power consumption of ICTs. The EU Ecodesign Directive sets limits to the level of power consumption of a number of household and office devices, which helps to reduce the standby power consumption. However, an increasing number of devices partly outbalance the achievements of the EU directive. On the basis of the national literature survey, we estimate that standby power consumption accounts for about 10% of the residential electricity consumption in the countries participating in this study.

Direct electricity consumption and embodied energy consumption together represent what has been termed the *1st order effects* of ICTs (Hilty 2008). These are the kinds of energy consumption at product level. However, the use of ICT also has more "hidden" and secondary effects. Thus, *2nd order effects* are the "indirect environmental effects of ICT due to its power to change processes (such as production, transport or consumption processes), resulting in a decrease or increase of the environmental impacts of these processes" (ibid.: 16). Examples are movie streaming replacing physical DVDs or eBooks and online news reading replacing traditional paper media. The 2nd order effects can be both negative and positive in terms of energy. In relation to this, *internet-related energy consumption*, i.e. the energy consumption related to transmitting data via the internet and data storage and processing at data centres, plays a significant role for the total 2nd order effects.

Finally, *3rd order effects* are the energy impacts of economy-wide changes, i.e. changes in social structures, consumption or production patterns etc. These are medium and long-term systemic effects of the use of ICT. As 3rd order effects are highly complex and difficult to estimate, we have not included them in this study.

"Small" versus "large" devices

When it comes to 1st order effects, a general "rule of thumb" has it that for small portable devices (like smart phones, tablets and laptops), the major part of the energy consumption relates to manufacturing and disposal, whereas the use (operation) phase represents the main contribution to the energy consumption for large devices (e.g. desktops and television sets).

On the basis of a review of current literature on ICT-related energy consumption, we have identified the following practices or habits as particularly energy intensive and important to focus on if the goal is to reduce energy consumption through changed ICT user practices. Our focus has been on 1st order effects (direct electricity consumption and embodied energy consumption) and 2nd order effects (in particular internet-related energy consumption).

- Desktops involve high power consumption for the use (operation) phase.
- The habit of *not* turning off computers (desktops/laptops) and leaving them in standby/sleep mode contributes to significant standby energy consumption.

- Use of internet services involving high volumes of data traffic results in high internet-related energy consumption. This is mainly streaming/download of movies and video clips or similar data-intensive activities like online game playing.
- Using mobile broadband access connections instead of Wi-Fi on mobile devices results in relatively high power consumption for data transmission (especially if used for data-intensive activities like movie streaming).
- Watching television is a particularly energy-intensive ICT activity because typical television sets have a high power consumption compared with smaller ICT devices.
- Frequent replacement of ICT devices results in high energy (and material) consumption for manufacturing and problems with electronic waste.
- Purchasing more devices results in increased energy (and resource/material) consumption for manufacturing as well as for handling electronic waste.

The energy intensity of streaming

Coroama et al. (2013) estimate the direct energy demand of internet data transmission to about 0.2 kWh/GB (this includes only the transmission infrastructure, including electricity consumption for router on sender and receiver side). On the basis of this, the estimated energy intensities of different types of video and music streaming are:

Video streaming in high quality: 449 W
Video streaming in medium quality: 269 W
Video streaming on YouTube: 54 W
Music streaming: 9 W

For comparison, a 42 inches LED television set has a power consumption of about 55-65 W.

While the list identifies energy-intensive practices, it is also important to emphasise that ICT in principle possesses a potential for dematerialisation, e.g. replacing "paper reading" by e-reading. Thus, ICT also can play a role as *enabling* energy saving *within other consumption areas* (positive 2nd order effects).

» ICT in principle holds a number of dematerialization potentials...

Final residential electricity consumption for ICT

Across the five countries, ICT (IT and electronics) represents about 25-30% of the final electricity consumption in households. Thus, ICT is in general a larger energy consumer than e.g. lighting.

	Austria	Germany	Netherlands	Norway	Denmark
Lighting	**15%**	**10%**	**17%**	**21%**	**12%**
Cooking & white goods	**54%**	**46%**	**48%**	**50%**	**44%**
IT & Electronics	**13%**	**29%**	**23%**	**23%**	**42%**
TV	} 8%	-	8%	9%	-
Video & Audio		-	6%	5%	-
IT (PCs, laptops etc.)	4%	-	8%	9%	-
Miscellaneous	**19%**	**16%**	**12%**	**6%**	**2%**

See useITsmartly deliverable (report) D2.1 for sources and details. Based on data for 2007-2011 (Germany), 2011 (Netherlands & Norway) and 2012 (Austria & Denmark). Note that the low Austrian figure for ICT might be due to data uncertainties. Electricity consumption for heating not included. The difference between the bold figures (IT & Electronics) and the sum of TV, Video & Audio and IT for Austria and the Netherlands is due to rounding off.

3. How do young people use ICT?

Devices

On average, the participants in the focus groups reported that they used about five ICT devices on a regular basis. The far most frequently used devices are smart phones and laptops (in both cases used regularly by about 80-90% of the participants), then follows shared television set at home (about 60%), desktop at school (about 50%) and desktop at home (about 40%). Other devices used regularly by 30-40% of the participants are: Television in own room, game console, tablet and MP3 player. Overall, three types of ICT devices stand out as the most widely used: Mobile/smart phones, laptops and television sets (in own room or shared with others).

Participants attending general secondary (grammar) school or in higher technical education use laptops most frequently due to the close integration of this device in both teaching and homework, whereas laptops are in general used less extensively by participants attending vocational schools or similar. It indicates that the type of education has an important influence on the use of devices. This was also confirmed with respect to how the participants typically access internet services like Facebook etc.; participants who typically use laptops for education-related purposes more often use computers to access the internet, whereas students attending vocational schools or similar to a higher extent access the internet via their smart phone.

» ... it is widespread among young people to keep old phones as "spare phones" instead of handing them in for recycling ...

The focus groups indicate that it is a widespread practice among young people to keep old phones as "spare phones" instead of handing them in for recycling – and thus, old phones are not made available for the use of others. The focus groups also include several examples of ICT devices that the participants had acquired but only used rarely (e.g. 3DTV, game consoles and – in particular – tablets). Embodied resource consumption would be reduced, if these kinds of purchases could be avoided.

User practices

The great majority of the focus group participants explain that they use ICT intensively in their everyday life. In the focus group survey, we asked the participants how frequent they used ICT for a number of energy-intensive activities like, e.g. video streaming or playing games. Their responses show that uploading/watching photos or video on social media was widespread on both laptops/desktops and mobile/smart phones, while streaming video/television/music was widespread on laptops/desktops (in all cases reported by about 50% of the participants to take place daily). Other common energy-intensive practices were gaming (offline or online) on laptop/desktop or mobile/smart phone, which about one third do at least weekly, while about a fifth report to play games on game consoles at least weekly.

While type of education seems to play a role for the choice of device and use of ICT, the focus group survey only showed

Diversity in uses

Behind the description of the most widespread ICT user practices, there is a high degree of diversity. An example is a Danish focus group with pupils from a general secondary (grammar) school: While music and video streaming and social media are very widespread, the participants differ on a number of uses. Thus, some are very interested in game playing and spend a lot of time gaming, while others do not play computer games at all. Some like to search for information about topics they are interested in as a kind of spare time activity, while others do not share this interest. Some use their computer as an integrated part of creative interests like playing music or drawing, others do not. Some like to watch television for relaxation or have the television running "in the background", others prefer to stream specific movies and serials.

few gendered differences – and mostly in relation to the use of computers (laptops/desktops) and game consoles. Thus, the male participants stream music/video and play games on their computer much more frequently than the female participants. The gender difference is particularly strong for playing games on computers. Similarly, only very few female participants report playing games on game consoles. With regard to other ICT devices, the survey indicates that male participants more often watch television on their own television set than on a shared television. Even though the differences in this study are in general limited, they suggest that young men tend to have more energy-intensive ICT habits (more devices used more often and for more energy-intensive activities) compared with young women.

Facebook and WhatsApp are the most widespread social networking media, although the focus groups show important differences between the countries. Thus, WhatsApp seems particular widespread in Austria, the Netherlands and to some degree Germany, while Facebook is still the primary social media used in Norway and Denmark. Other social media like Instagram, Twitter and Snapchat seem to have a relatively limited use across all countries.

Many participants describe the flow of messages via social media (in particular WhatsApp and Facebook) as a "source of distraction" in their daily life. Often, messages divert their attention from other things that they feel they should focus on instead (like studying). Not all are able to cope with this in a relaxed way and some have developed strategies to avoid distractions.

» The theme of "always being online and accessible" cuts across most of the focus groups

The theme of "always being online and accessible" cuts across most of the focus groups. Messages are frequently "popping up" on the computer while they are doing other things or via applications on the ubiquitous and "always-at-hand" smart phone. At the same time, many focus groups talk about the "need" to be online and connected all the time as a kind of "social pressure". "You need Facebook if you want to be part of society", as one Norwegian participant explained.

» You need Facebook if you want to be part of society

ICT devices – and in particular smart phones – are also often used for entertainment and to "fill in" time between other activities (e.g. while waiting for the bus). As mentioned before, music and video streaming are very widespread (often due to the convenience of being able to watch a movie or serial when you like it). Also here, many focus groups voice a more critical concern about possible negative effects of always being online. The frequent use of computers and smart phones for entertainment can easily divert attention from other activities.

The term "being addicted" to ICT comes up in several focus groups, and some participants also point at the possible "anti-social" consequences of ICT. Computers, and particularly smart phones, represent an always-available temptation for diversion, entertainment and connectedness with friends.

A feeling of ambivalence with regard to the use of ICT seems widespread among young people. On one hand, they think ICT offers many positive options for social interaction, entertainment and convenience, but at the same time they also associate their own use of ICT with aspects of time waste, distraction and alienation of social relations.

4. How do young people understand the link to energy and climate?

Awareness of energy and climate change issues related to ICT

Overall, the focus groups show limited awareness and interest in energy and climate change issues related to ICT. The participants often find it difficult to elaborate on the links between their personal use of ICT and energy/climate change, and many have never thought about this link before.

Most of the participants have heard about climate change, but this does not concern them, and they seem sceptical of the idea of changing their daily habits in order to save energy. Some have also heard about general environmental problems related to ICT through school teaching or the media (e.g. the extraction of noble metals, conflict minerals and problems with electronic waste export to developing countries).

ICT and the environment

The idea of a link between ICT and climate change even appeared somewhat absurd to some participants:

Well, so, if I now use IT, I have to say, honestly, that I am not worried about [it], or my thoughts don't even go to climate change. I don't see a connection… (…) Well, I think this [ecology] is the last topic we would speak about. That is simply no topic for us. Just not an interesting topic for me. (German focus group)

An important reason for the limited awareness of the link between ICT and energy and climate change problems is the "invisible" nature of the link between purchase and use of ICT and energy and anthropogenic climate change. This applies in particular to the production and disposal of ICT devices as well as derived energy implications related to the use of the internet.

This said, the participants found it easier to see the link between the use of ICT and the direct electricity consumption – especially in relation to their use of portable phones and the experience of having to recharge these often. In some focus groups, the participants even developed rather elaborate understandings of how the direct electricity consumption depends on what the devices are used for. The experience of battery life-time and devices becoming warm seems to provide often reliable and valid insights. This could be an entry point for raising young people's awareness of ICT and energy consumption and a point of departure for discussions about ICT and energy. However, the practical experience of ICT and energy consumption are also misleading as these do not include the "hidden" energy consumption and are mainly related to portable devices.

Understandings of direct consumption

A few examples illustrate how many focus groups were able to develop a rather comprehensive understanding of the link between use of ICT and direct electricity consumption:

With mobile internet on your phone, you need to charge it much more often (…). I had this mobile without internet [before] and then I could use it for a week. Now I can use it only for one day [before recharging], you use a lot more power. (Dutch focus group)

Also, if you are streaming Netflix, for instance, on your iPad, when you can indeed feel that – if you are running HD – that it gets hot on the back, because it works. And heat is also energy, so it must also use some energy. (Danish focus group)

Other sources of knowledge about ICT and the environment mentioned in the focus groups were school teaching and – to a lesser extent – popular TV science shows, websites or parents.

Motivation for changing practices in order to save energy

The question of "who's responsible" for solving the climate change problems related to ICT came up in most focus groups. In general, the focus groups seem to allocate the responsibility to other actors than themselves. Several pointed out that the responsibility of the industry for making more efficient and environment-friendly products, the responsibility of the energy

providers to make "green energy", or the politicians to make "green regulation".

The understanding that ICT has a limited impact on climate change or is being overshadowed by other consumption areas with much higher energy consumption (e.g. transport) also seems to influence the participants' motivation to change own habits and save energy in relation to ICT. Many do not feel personally responsible for the environmental problems related to ICT.

Overall, the trust in technological development as the main road to reduce the climate change impact of ICT seems widespread among the participants. They feel confidence in technological solutions as a way to save energy and reduce greenhouse gas emissions from ICT. This is also part of the reason why only very few participants feel a direct, personal responsibility for saving energy in relation to their own use of ICT.

Like a slimming diet

One participant compared the challenges of changing personal ICT practices with her own experience of being on a slimming diet as the only person in her family:

Everybody has to be willing to pay attention [to save energy], you cannot pay attention alone. It is like with a diet. (...) I wanted to start a diet once, but if you live in a house with other people, who do not go on a diet, then you can't make it. I think. You have to be ready to do it all together, alone it does not work. (German focus group)

» The willingness and motivation to change their use of ICT in order to save energy is little

Thus, the willingness and motivation of the focus group participants to change their use of ICT in order to save energy is limited. There is consensus across the focus groups that only if energy-saving habits do not involve too much effort and do not compromise the convenience of using ICT, they might consider changing habits.

Even though most participants were sceptical of the idea of changing practices, several also came up with specific ideas on how one could save energy (see box below). A few also expressed a positive attitude towards changing their own practices. The financial aspect (saving money) is mentioned by many participants as a possible motivation, but seems irrelevant in their present situation as most still live at home with their parents (who pay the electricity bill).

Many also point out problems of "lock-in" and that changing one's use of ICT to save energy would be like swimming against the tide. The use of ICT has been become an integral part of almost all everyday practices and social relations, which makes it difficult to change one's own habits if everybody else continue their habits. One participant compared it with being on a slimming diet alone (see box above). This suggests a need to think about changing practices as a collective exercise rather than (only) targeting the individual person.

Ideas on how to save energy

Despite the general reluctance to changing personal practices, the focus groups came up with a number of ideas on how to save energy in relation to ICT. These were:

- Promote repair instead of replacing – e.g. by making repairs less expensive
- Think about whether new ICT devices are really are necessary – e.g. by not replacing old phones just because it would be "nice" to have the newest model
- Promote correct disposal of ICT
- Avoid standby power consumption – e.g. power down computers between uses
- Use less ICT (e.g. Facebook, video streaming etc.) – promote a more "reflexive" use of ICT
- Use fewer devices by doing things together (e.g. watching a movie together with friends or family) and avoid multi-tasking (e.g. not having the television running while using the laptop)
- More information about the link between ICT and climate change – and how to save energy
- Technical improvements – e.g. make products last longer
- Using ICT to save energy in other consumption areas – e.g. use ICT to inform about energy consumption related to, for instance, transport.

5. Conclusions and policy recommendations

Here follows the main observations and recommendations for policy-makers and designers of initiatives to promote energy-saving in relation to young people's use of ICT.

Include the "hidden" energy consumption

Traditionally, initiatives to promote energy saving in relation to ICT have mainly focused on the direct electricity consumption from the use of devices. However, the literature review of this study shows that the "hidden" energy consumption is significant too, and might be even more important in the future. For small devices like laptops, smart phones and tablets, the embodied energy consumption related to production and disposal is comparable to or even higher than the direct electricity consumption from the use phase. In addition, the internet-related energy consumption from data transmission and data storage and processing at data centres is also growing rapidly and has become an important contribution to the overall energy consumption of ICT. Internet services that involve high data traffic such as video streaming and video sharing result in high energy consumption in the internet infrastructure.

From a climate change perspective, it is therefore important to also address these "hidden" energy implications of the use of ICT. This might in particular apply to young people, who are among the users that use ICT devices and internet services most extensively.

Focus on energy-intensive practices

ICT is used for a great variety of practices with widely different energy implications. Some uses involve very little direct or "hidden" energy consumption such as text messaging, whereas some uses are very energy-intensive such as video streaming in high definition. Initiatives to promote energy saving in relation to ICT should recognise this complexity and should primarily address ICT user practices that are energy-intensive.

Energy-intensive usage of ICT is typically characterised by being practices that include one or more of the following characteristics: 1) Involve a high level of data processing (direct electricity consumption for the device), 2) involve high amounts of internet data traffic (internet-related energy consumption), 3) involve the use of several devices at the same time through multi-tasking (direct electricity consumption). In addition – and taking the embodied energy consumption into account – also practices that increase the number of devices as well as the wrong disposal of ICT should be addressed.

On the basis of our focus groups and the reviewed literature, the following practices have been identified as particular important to address in campaigns aimed at reducing the energy consumption of young people's use of ICT.

Video streaming

Currently, increased streaming of audio-visual content via the internet seems to be one of the most important drivers for increasing energy consumption for ICT.

Sharing photo/video clips

Even though the energy consumption for sharing photos or short video clips is not in the same magnitude of order as video streaming, this might also involve significant energy consumption – particularly if it takes place via mobile broadband (3G/4G).

Standby

The electricity consumption related to computers and electronics that are not switched off between uses is still significant.

Having several devices turned on at the same time

Having more devices turned on at the same time (e.g. watching television while doing home-

work on laptop and communicating with friends via smart phone) contributes to high energy consumption. A particular focus should be on the use of television sets as a "backcloth" for other activities, as television sets are among the ICT devices with the highest direct electricity consumption.

Devices rarely used

Young people often acquire ICT devices that they rarely use (e.g. tablets and game consoles). The embodied energy consumption could be reduced if the acquisition of rarely used devices was avoided.

Keeping old phones as spare phones

Young people often keep their old phones as spare phones, but as these are not often technically obsolete, they could be reused by others and in this way reduce the overall replacement rate.

Frequent replacement of ICT devices

The frequent replacement of ICT devices contributes to a high energy (and material) consumption for manufacturing and problems with electronic waste. It is important to promote the use of devices for a longer time before replacement.

Limited awareness of correct disposal

In general, young people are not aware of the importance of correct disposal of ICT devices, which is problematic in a general environmental perspective.

ICT is an integral part of young people's everyday life

ICT has become an integral element in young people's everyday life. Thus, ICT is involved in most practices that young people are engaged in (entertainment, social interaction with friends and schoolmates, school-related work, etc.). The extensive integration of ICTs in the everyday practices and the habit of always being online and accessible result in an extensive use of ICTs (often through multi-tasking) and a generally resource-intensive everyday life of young people.

This also represents one of the most important "barriers" for turning young people's ICT usage in a less resource-intensive direction. The collective nature of ICT usage challenges the idea of targeting young people as individuals and the idea of young people's use of ICT as being a result of rational choices that might be changed by providing them with more information. Instead, interventions and campaigns should to a higher extent be designed to facilitate (also) collective action among young people as well as addressing also other elements that shape young people's use of ICT (see also later recommendations).

Young people find it difficult to see the link between ICT and energy

The study shows young people's limited awareness of the climate change problems related to the use of ICT. They find it difficult to establish the link between ICT and energy consumption and climate change. They also believe that the energy consequences of their use of ICT are limited.

Lacking awareness of the energy implications of ICT is one of the reasons why young people in general seem unwilling and sceptical toward the idea of changing their practices in order to save energy. They tend to believe that the potential energy savings are insignificant, like a "drop in the ocean".

This represents another major challenge in relation to developing interventions and campaigns addressing young people's use of ICT. It is therefore important to design approaches that take into account that young people in general find it difficult to see the rele-

vance of addressing their use of ICT as a subject for energy saving. Thus, interventions should convey the connection between ICT and climate change in an accessible and illustrative way.

However, despite young people's general ignorance of the energy and climate change implications of ICT, the study shows that they actually possess an often rather detailed (but implicit) knowledge about the *direct* electricity consumption of *portable devices*. This is mainly due to practical and sometimes very tangible experiences with how the life time of battery charges and the heat production of mobile devices depend on the specific use of these devices. This "practical knowledge" might be utilised in initiatives to promote energy saving as a way to make the topic of ICT and energy consumption meaningful to young people and spur reflections about this (see also later recommendation about "entry points").

Young people is a heterogeneous group

When designing policies and campaigns for young people's use of ICT, it is important to have in mind that this is a heterogeneous group. Despite the general patterns with regard to the use of ICT found in this study (e.g. the extensive integration of ICT in everyday practices), the focus groups also show differences that can be related to gender, educational status, personal interests etc. Especially the type of education seems to play an important role for how young people use ICT (which devices used for which purposes), but also some energy-intensive ICT usages seem to be somewhat gendered (for instance game playing which seems to be particularly prevalent among young males).

Policies and campaigns targeting young people should consider the heterogeneity of young people either through a flexible and inclusive design that makes sense to a broad range of young people or through a set of incentives tailored to specific groups of young people.

Address energy saving as a collective task

Another important reason for young people's apparent lack of willingness to change their everyday practices in order to save energy is closely related to the integration of ICT across almost all everyday practices. The "normalisation" of use of ICT in everyday life implies that changing the use of ICT (e.g. to save energy) creates the experience of swimming against the tide– i.e. an experience of "fighting" against what is perceived as "normal" and what everybody does. If everyone else continues their usual practices, it is difficult to maintain new, energy-saving habits and routines.

This suggests that policies and campaigns aimed at promoting energy-saving ICT usage should address this as a collective task rather than a responsibility to be raised by the individual young person. Furthermore, this approach would be in line with studies showing that young people are strongly influenced by their peers in relation to topics like environment and energy saving. If young people within a community could be made interested in saving energy in relation to ICT, they could motivate and support each other to keep a focus on this and develop and maintain new energy-saving routines.

That policies and campaigns should address energy saving as a collective rather than an individual challenge is in line with the idea behind peer-to-peer education, which is a key method in this project.

Look for possible entry points

Young people's limited awareness of the connection between ICT and energy and their moderate willingness to consider changing their daily use of ICT seem to be major challenges for designing effective policies and campaigns. Therefore, it is important to identify possible "entry points" for interventions that can help shape a more sustainable ICT use among this group. By "entry points", we think of the potential or enablers for making young people interested in this topic and/or supporting them in attempts at adopting more energy-efficient uses of ICT.

On the basis of the reviewed literature and the focus groups, we have identified the following as possible entry points for promoting less energy-intensive use of ICT among young people.

Addressing young people's practical knowledge about ICT and energy use

As mentioned previously, young people often have a practical knowledge about how the direct electricity consumption of particularly portable ICT devices depends on how they use them. This existing knowledge could be utilised as a foundation for making the link between ICT and energy consumption comprehensible to young people.

Addressing young people's interest in extending the life time of battery charges

There seems to be a widespread interest among young people to learn methods for extending the life time of battery charges of portable devices such as tablets, laptops and (in particular) smart phones. Many have also learned different "tricks" on how to extend the life time of the battery charge (e.g. turn off mobile broadband). Addressing this interest could be a way of addressing energy-saving habits more generally.

Influence through parents and peers

The social network – in particular parents and peers – seems to have an important influence on motivating young people to adopt energy-saving habits. This makes it important to include the social network of young people in initiatives aimed at promoting energy–saving use of ICT. This is also in line with the previous recommendation of addressing energy saving as a collective task.

Addressing negative implications of always being online and accessible

Even though the majority of young people seem to enjoy always being online and accessible, many also describe downsides like distraction, waste of time, mediated interaction with others as being "unauthentic" and even concerns about negative health effects by intensive use of ICT. Addressing this kind of negative implications of ICT usage could be a way of opening a discussion about a more "reflexive" use of ICT, which could – among other things – address energy-intensive practices like the simultaneous use of several devices (multi-tasking) or promote a more deliberate use of online gaming and video streaming.

Addressing the problem of rarely used devices

It seems as if many young people have experience of owing devices that they only rarely use. Addressing this experience explicitly might help develop a more reflexive approach to the acquisition of new devices, which could be a way of reducing the total number of ICT devices.

It is not only about the individual consumer

Young people's use of ICT is a result of the interaction of many different, heterogeneous elements. Particularly the development and design of new ICT products and services seem to play an important role in shaping young people's use of ICT. Therefore, in order to lessen the inconvenience related to changing practices, interventions and campaigns should also address the actors involved in designing and developing products and services. Ideally, environmental concerns should be integrated in the design of new products and services right from the beginning and in this way support a more energy-efficient use of ICT. .

6. Literature

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