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

D5.2 Report of hindering and supporting factors in the process of "useITsmartly" and impact of project activities in terms of changing attitudes, knowledge and behavioural aspects of green IT use of youths

Contract N°: IEE/12/997/SI2.644765

Start date of the project: 03/04/2013

End of the project: 02/04/2016

Lead contractor for this deliverable: IFZ (WP5 lead): Thomas Berger, Anita Thaler and Magdalena Wicher

Coordinator name/ organisation/ e-mail/ telephone number:

Jennifer Dahmen, University of Wuppertal - Germany

jdahmen@uni-wuppertal.de

+49 202 439 3181

Date of delivery: March 30th 2016

Co-funded by the Intelligent Energy Europe Programme of the European Union

Document History and Contributions

Version	Date	Author(s)	Description
1	26.02.2016	Anita Thaler &Thomas Berger (IFZ)	1st Draft D5.2
2	29.02.2016	Review of 1st Draft by Harald Rohracher (LiU) & Toke Haunstrup Christensen (SBI)	
3	16.03.2016	Anita Thaler, Magdalena Wicher &Thomas Berger (IFZ)	2nd Draft D5.2
4	30.03.2016	Review of 2nd draft by Harald Rohracher (LiU), Toke Haunstrup Christensen (SBI) & Jennifer Dahmen (BUW)	
5	31.03.2016	Anita Thaler, Magdalena Wicher &Thomas Berger (IFZ)	Final Draft

Part. N°	Participant name	Short name	Country code
CO1	University of Wuppertal	UW	DE
CB2	Inter-University Research Centre for Technology, Work and Culture	IFZ	AT
CB3	Danish Building Research Institute	SBI	DK
CB4	Radboud Universiteit Nijmegen	RU	NL
CB5	Dune Works 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	AURA energi	AE	DK

Institute for Gender Studies

Content

Introduction

This report provides an elaborate insight and evaluation of three years of useITsmartly activities. The project's overall aim is to engage the current energy consumption behaviours of European youths in five countries and to generate impact (saving of energy and greenhouse gas emissions) through an educational peer-to-peer approach. The first part analysis supporting and hindering factors of the implementation phase of the project. The evaluation team developed a tool called "country reports" to provide all participating partners with a standardized way to report and reflect on their pedagogical activities that engaged with adolescents. The five country reports for Austria, Germany, the Netherlands, Denmark and Norway will be compared and discussed.

The first part of this report compares hindering and supporting factors of the impact phase of useITsmartly by analysing the country specific data and comparing the experiences made in the five countries. Furthermore, the national approaches to get in contact with the target group are discussed. The task to engage youths with topics like "sustainability" or "climate change" is difficult in general and the lessons learned by the consortium throughout the process of the project may be interesting for professionals working in similar projects or fields.

The second part then describes the estimated impact of useITsmartly and provides a quantitative assessment of the achieved energy and CO_2 emission savings. Two quantitative surveys (one on user behaviour and one on the willingness to change ICT usage) and their outcomes will be combined and allow an estimated impact of the useITsmartly process.

The concluding final part closes with a reflection on what activities worked well during the impact phase, how many young Europeans were reached through all the various activities and how the estimated impact of the project can be interpreted.

Part 1 - Evaluation of pedagogical activities in useITsmartly

The pedagogical useITsmartly approach of educating young people in energy saving ICT behaviour (and to multiply this knowledge and share smart practices) comprised peer education[1], a vehicle-theory-based approach[2] and informal learning via social media. In the following this report will present evaluation results from country reports about the various useITsmartly trainings in Austria, Denmark, Germany, Netherlands and Norway[3].

Table 1 shows the various levels of reach that were accomplished throughout three years of useITsmartly. Most importantly, 331 IT-peers were trained and 39.716 persons were reached directly or indirectly by IT-peer activities. The project partnered up with 240 schools and thereby worked with and informed 408 teachers.

Social media wise, useITsmartly created a following of over 500 people (i.e. accounts) on Facebook, 376 followers on Instagram and 210 followers on Twitter. But various additional media and social activities created even more reach that can also be seen in table 2.

	Austria	**Germany**	**Norway**	**Netherlands**	**Denmark**
People reached (estimates)					
Peers	30	27	117	79	78
Persons reached	16.840	5.475	5.479	5.762	6.160
Schools	14	200	2	14	10
Teachers (and other multipliers)	200	28	12	154	14

Table 1: Overview of peers, persons and schools reached by useITsmartly training

[1] "Peer education" is the general pedagogical concept of useITsmartly and tries to enable and educate young people to inform their peers on an eye-to-eye level.

[2] The "vehicle approach" tries to find interests of adolescents and utilizes them to bring topics into play that are traditionally taught through front teaching. See: Thaler, Anita and Zorn, Isabel (2010): Issues of doing gender and doing technology - Music as an innovative theme for technology education, European Journal of Engineering Education 35 (4): 445-454.

[3] The full Report "D4.4. Report on the trainings of the first and second group of IT-peers" can be found in the download section at http://www.useitsmartly.com

Persons reached per country through various channels/activities additionally to the general dissemination and social media activities (estimates)					
	Austria	**Germany**	**Norway**	**Netherlands**	**Denmark**
Email newsletter				100	
Facebook			1.886	623	3.000
Instagram				193	
YouTube			377	1.459	
Other social media			1.640		
Events (conventions, exhibitions etc.)		865	35.240	3.550	30
Newspaper	105.882	2.000	268.000	100	
Tumblr	50			623	
websites			250	193	
Radio		133.000			
Magazine					2.000

Table 2: Overview of additional multiplication activities per country

1.1 Setting up the useITsmartly training

In Austria the useITsmartly training has been mainly organised in the days immediately before holidays, when Austrian schools have already finished teaching their curricula and fill the last days with additional project work. The Austrian partner used existing high school networks with highly motivated teachers. The students could be motivated with useITsmartly certificates, the crediting of peer work for school, and because the training was offered during times, when they did not miss school work. For this training, all students from several Austrian vocational high schools took part voluntarily. Special emphasis has been put on composing a gender-balanced group of students. The vehicle-based useITsmartly training has been organised separately as a course integrated in the existing school curriculum for one class. The students all took part and were motivated as the training was part of their school work (with grades).

In Denmark the useITsmartly training was designed as integrated part of existing school curricula. The Danish partners mainly used existing networks with schools (one school participated in useITsmartly creativity workshops), and contacted teachers and headmasters directly (with the exception of a new contact to an environmental youth network). Some students were part of whole classes attending useITsmartly courses, others participated voluntarily. Voluntarily participating students from a technical vocational school could be motivated with the useITsmartly certificate as they thought that this could help them applying for internships etc. Gender balance was also an issue by selecting schools and classes for the useITsmartly training in Denmark.

The German partners worked on the one hand with an existing climate working group within a school (all males group) and with a high school class. The contacts were made through previous cooperation with the university and personal contacts to teachers. The first group of students were already environmentally aware through their working group and were motivated by gaining additional IT knowledge from the useITsmartly training. The second group, a school class, was motivated by its teacher to take part at an energy school contest by the city. In Germany more males have been trained, but gender balance was especially considered with the trainers.

In Netherlands, prior to the useITsmartly trainings, a meeting with students helped finding out about interests and motivation for such a training. The useITsmartly training was then once organised as a voluntary, additional course programme for a University of Applied Sciences and promoted by a friend of the Dutch partners who teaches there. The students there were motivated by the voluntariness and study-points for the useITsmartly training. The second useITsmartly training took place at a high school in an extra-curricular-week, where one part of the class were obliged to participate the useITsmartly training, while the others went abroad.

In Norway, on the one hand previously established high school contacts have been used (from useITsmartly creativity workshops) and on the other hand communication departments in high schools have been systematically approached. The useITsmartly trainings have then been set up as obligatory parts for two high schools, where the vehicle approach has been included to motivate the students. The first useITsmartly training was integrated for all electronics classes in one high school. The gender balance in this students' group was unbalanced as electronics classes usually are (about 12 % females). The Norwegian team therefore included especially female technical experts. The second training was set up for two high school classes, with a slight majority of female students.

1.2 Hindering factors in conducting the useITsmartly training

In Austria the two parts of peer and vehicle training were only very loosely integrated as the vehicle approach (which intends to motivate young people to take part in a useITsmartly peer training, who are not voluntarily taking part already) needed too much time and effort (and would have had to be organised over weeks throughout Austria in order to produce a sufficient number of nationwide useITsmartly peers). So the compromise was a rather separated approach to test the vehicle based useITsmartly training with a whole school class. The opportunity to include those highly motivated students in the peer training group has not been used as the peer training then only comprised one or two students per school and not a whole class.

In Denmark, the experience was that a gender-sensitive training in the realm of technology starts with a focus on gender balance (in the student group and among trainers) but would profit additionally from a gender (and technology) expert. When students are enthusiastic about their ideas, it is frustrating for them to get their ideas discarded when they are worked out as posters or other products because they are regarded as sexist. It would be better to include gender sensitive design strategies in the training process beforehand.

Another hindering factor in training whole classes or groups of students (who are obliged to take part) are single unwilling students who disturb the training, this was reported in Denmark. Especially when working with pre-existing groups like school classes, past group conflicts can influence the training massively.

In Germany the knowledge of the students from an environmental group has been overestimated. Additionally the roles of the very present teacher and the useITsmartly trainers have not been clear to the students and especially the teacher (and associations to the usual course work) opposed the participatory approach of the useITsmartly training.

In the Netherlands pre-existing groups (friends) have been seen as possibly hindering, when they de-motivate each other, by proposing that enthusiasm can endanger ones position in the group.

In Norway too large groups with disturbing students and some not very interested/helpful teachers were mentioned as main hindering factors. The Norwegian partners reported a rather huge gender imbalance in one useITsmartly training group, all the more emphasis has been put on gender and diversity as discussion topics during the useITsmartly training (e.g. about discrimination, sexual harassment).

1.3 Supporting factors in conducting the useITsmartly training

The Austrian partners emphasized the importance of stressing the benefits for young people taking part in the useITsmartly trainings, as it is essential for their motivation (like voluntariness); furthermore the surroundings and timing of the training, and clear rules for receiving the certificate have been identified as support factors. The vehicle based training could increase the motivation and interest in green IT for students who were not previously interested in the topic, because the useITsmartly training used successfully fashion as an entry point for physics and technology education. When smaller groups are established around friends, sometimes all-male- or all-female-groups can arise. This can be an advantage in terms of breaking up gender and technology stereotypes when all groups undergo the same processes (for instance in the case of solar-fashion, all groups have to sew, connect wires etc.).

Another success factor in Austria was, beside the supportive teacher, the involvement of external trainers from companies, who were perceived as competent and credible. Students perceived useITsmartly knowledge helpful in finding a job later on.

The Danish partners emphasised that small things like cake or fruit brought to the training can have a very positive effect in training activities. Also smaller groups work better together, even better if their competences fit well together.

In Germany previous interest in climate change helped during the useITsmartly training. Interested supportive teachers who let useITsmartly trainers take over for a certain time. A diversity in trainers/experts helps creating a gender-sensitive diverse atmosphere. More time can be used for students in working groups to create own ideas and concepts etc., and the relationship between students and trainers gets better.

When the peer and vehicle training approaches are successfully combined, like in the Netherlands, the IT peers can use the vehicle for the multiplication process. Also an integration in school curricula can help, especially if all the work is valued with school grades. Enthusiastic teachers who contribute to a good atmosphere and act like the always present useITsmartly trainer as a constant in the training are seen as supportive. Overall a transparently communicated arrangement (between schools/teachers and useITsmartly trainers) as well as a clear (maybe narrowed down) focus helped communicating a good useITsmartly training to students.

The Norwegian partners argue that it is important in sometimes frustrating discussions about energy consuming behaviour to offer some small and practical solutions in the end, to feel self-efficacious. A diversity of teaching methods as well as interesting external experts can help keeping students motivated. Students were very motivated by the participatory vehicle approach of useITsmartly ('green IT-ambassador projects'), working on one's own ideas freely was the most enjoyed part of the training. For the end of the whole training celebrating with some food and drinks are recommended.

1.4 Hindering factors in conducting the useITsmartly multiplication process

There are two major lessons learned from Austria: When getting the useITsmartly certificate is not motivating students enough, they will not finish the multiplication process. When social media are not integrated in the training, it will not be used in the multiplication process.

The Danish partners also reported a lack of motivation especially regarding multiplying useITsmartly knowledge (the "peer education"), the students felt not comfortable in training others personally, especially because they feared the strong opposition of the current practices of heavy ICT use. Also having not sufficient time can hinder the motivation and the outcomes of the peer education activities.

In Germany also the lack of motivation for the multiplication process was connected to lack of time during the regular school work; students are only motivated if the peer work is part of their useITsmartly training in school (not regarded as a voluntary part in their leisure time).

The Dutch partners found out that the motivation drops after an intense useITsmartly training week and when neither students nor teachers feel responsible for the multiplication process after, it does not work out. Also the multiplication process was negatively influenced by timing (the performance/presentation took place during a time where few other students where at school) and technology (the quality of sound was not good). And finally also the Dutch students did not feel comfortable to be expected to train so many other peers after their training and take over the normative position of useITsmartly.

In Norway some students rather wanted to work on energy saving technologies and did not want to engage in the multiplication process, so other students for instance filmed their technology ideas and made “vehicle-inspired IT-ambassador projects”. One major problem was that being interested in the environment is not considered as very cool among young people and hence they do not want to educate others or even post these issues on their social media channels.

1.5 Supporting factors in conducting the useITsmartly multiplication process

Again in Austria the clear rules (a certificate can only be earned through a complete useITsmartly training) helped multiplying knowledge to other peers. It was also helpful that the Austrian partners had experience in peer education, so they focussed in the useITsmartly training not only on green IT contents but also on didactical skills and they could tell the students about various possibilities how to reach their peers.

In Denmark one lesson learned was that an effective peer training (multiplying knowledge to peers) needs time and didactical support, if these are provided, young people are full of ideas.

The German partners reported about the success factor ‘sustainability’, meaning that the useITsmartly training content has been integrated in an ongoing working group in a school and thus the knowledge will be automatically multiplied in the next years too.

In the Netherlands it helped that a teacher was keen on letting students present useITsmartly to others as this was seen as additional skills training.

In Norway “vehicle-inspired IT-ambassador projects” have been used to inform other peers about environmental effects of ICT.

1.6 Integrating social media in useITsmartly training

In Austria, social media have only been integrated in the vehicle (‘solar-fashion’) training and have not been in the focus of useITsmartly peer activities, therefore the involved peers did not use social media heavily for useITsmartly.

The integration of social media in Denmark worked very well, because the involved students preferred social media channels like YouTube videos for their multiplication process. As the young people created these videos (and posters, stickers, etc.) themselves they shared their products also on their private profiles (e.g. Facebook), which is otherwise not very often the case.

The German partners reported that students worked with own social media accounts and did not respond to useITsmartly social media channels.

Also in the Netherlands social media have been used very intensely, including the private ones to share self-made useITsmartly products (like a stop motion video, a game, etc.).

As it is not considered as cool among young people to be concerned about the environment, Norwegian youths did not want to post useITsmartly contents on their social media channels, therefore the school's or the project's channels have been used (one very successful example was the TurnIToff-hour).

Part 2 – ICT use and behavioural change

2.1 ICT use behaviour of adolescents

At the beginning of the useITsmartly project, there was little comprehensive knowledge on the actual ICT use of young Europeans from 16 to 20 years. Therefore, the first part of the project focused explicitly on the ICT devices predominantly used by the target group and tried to identify their everyday practices. This means that not only the different devices (e.g. hand-helds like smart phones or tablets) were scrutinized in terms of energy usage, but also their usage in the everyday life of young adolescents. A series of focus groups was launched in all five partner countries (Austria, Denmark, Germany, Norway and the Netherlands) to gain qualitative insight. The understanding of young people on ICT and energy consumption was analysed in detail during the first year of useITsmartly[4].

In conjunction with this effort, a questionnaire was developed to gather quantitative information on the devices and times of use during a typical day and also the main purposes for each ICT device (e.g. school, communication, entertainment etc.). This survey continued throughout the whole project period. It gives us insights into the most important ICT use behaviours that are also relevant concerning their energy consumption and CO_2 footprint.

602 persons in five countries that participated in various useITsmartly activities filled out the survey on ICT use in everyday life of young people. As the following graph shows, most participants were between 16 and 18 years (77,7 %) old.

[4] Toke Haunstrup Christensen with contributions from Ruth Mourik, Sylvia Breukers and Tomas Mathijsen and Herjan van den Heuvel (2014): Identify relevant areas of energy-efficient IT use, user practices and possibilities and barriers for change. Technical Report, http://useitsmartly.com/uploads/media/UseITsmartly_WP2_report_D2.1_FINAL_01.pdf

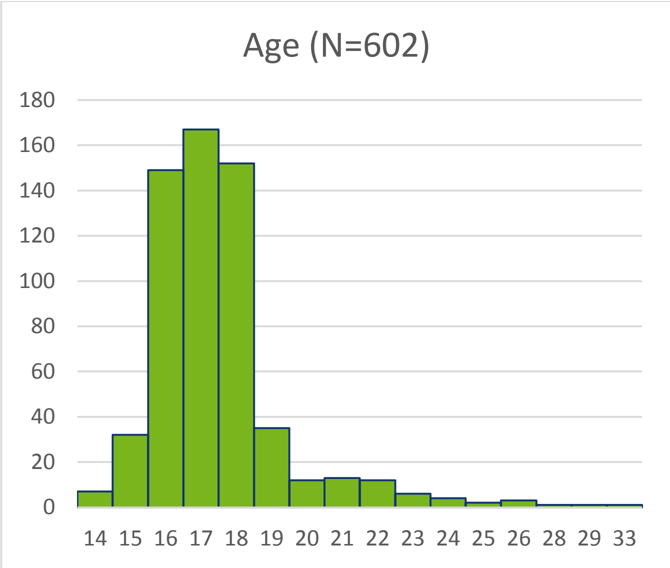


Fig. 1: Age distribution of the first survey

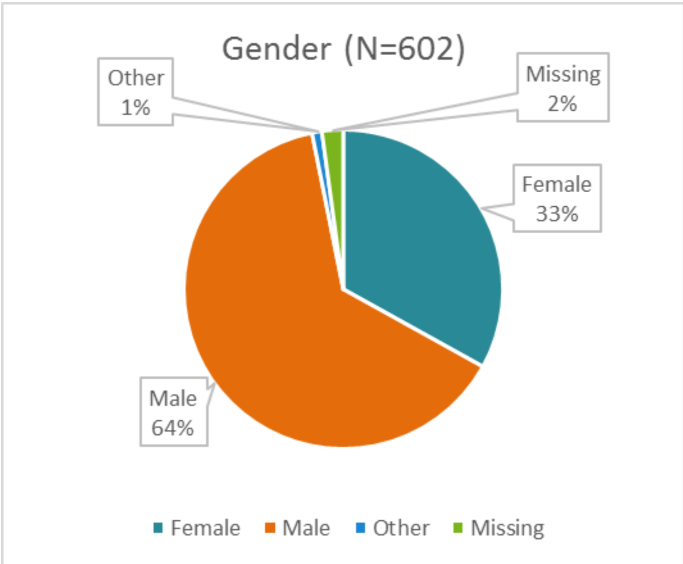


Fig. 2: Gender distribution of first survey

64 % of the participants declared themselves male and 33 % female. 1 % chose the category "other" when asked about their gender. Most of the adolescents (over 80 %) still live in their parents' home, which is not surprising since the biggest age groups represented in this survey are still in school age. Only a small portion lives alone (under 10 %) or in other accommodation settings.

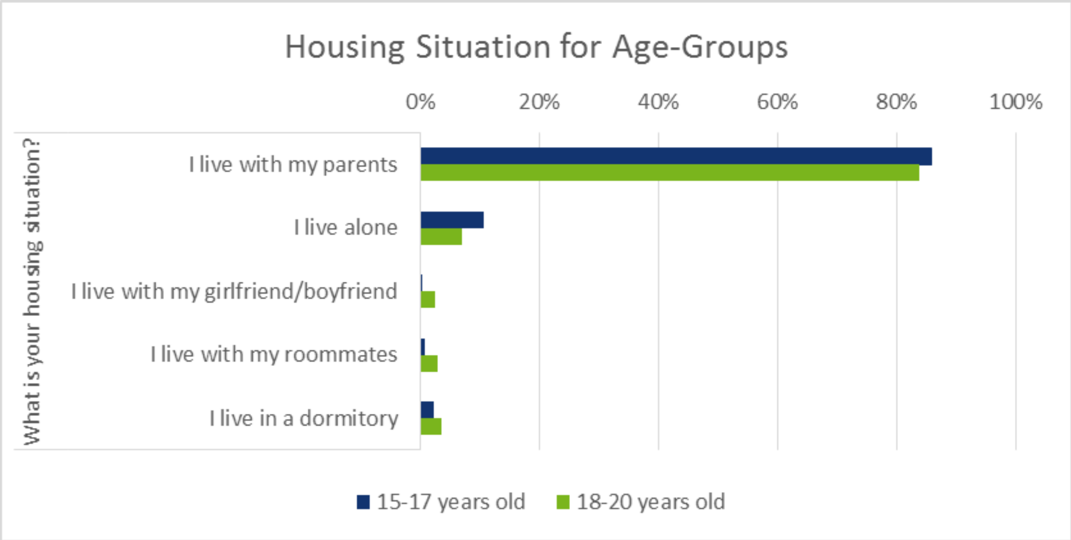


Fig. 3: Housing Situation for age-groups

The main purpose of the survey was to gather information on the use of certain ICT devices by young people. The following graph shows the general device use in the five participating countries. At first glance, it is obvious that adolescents use a wide range of electronic devices. Variations between countries in the use of specific devices cannot be explained through this descriptive analysis, but may be due to the different national access strategies to the target groups. Some partners focused on vocational training schools and some more on first and second semester university or college students. Therefore, desktop computers may be used more in one country than in the other. The graph also shows the three most used devices: smart phones (most reported device for over 85 % of the youths in all countries), television sets, and laptops. Desktop computers and gaming consoles are in the middle range. Classic mobile phones (without smart internet applications), tablets and MP3-players seem to have a minor utilization.

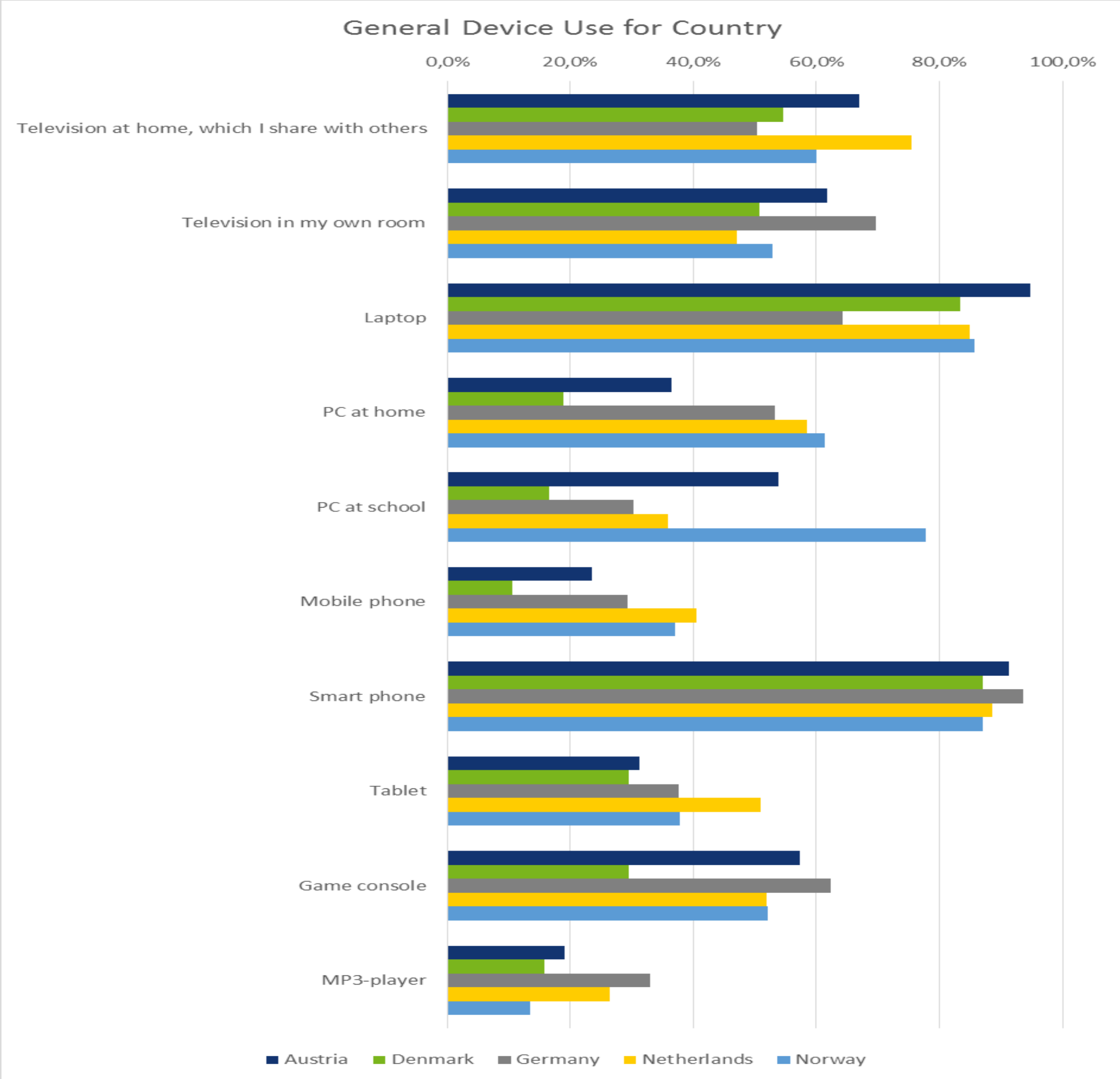


Fig. 4: Device use in five countries

The next graph combines all usage times of all devices and shows the average ICT device use time per day of each country. The participants in the five European countries use ICT technologies between 2 and 2,5 hours during a typical weekday.

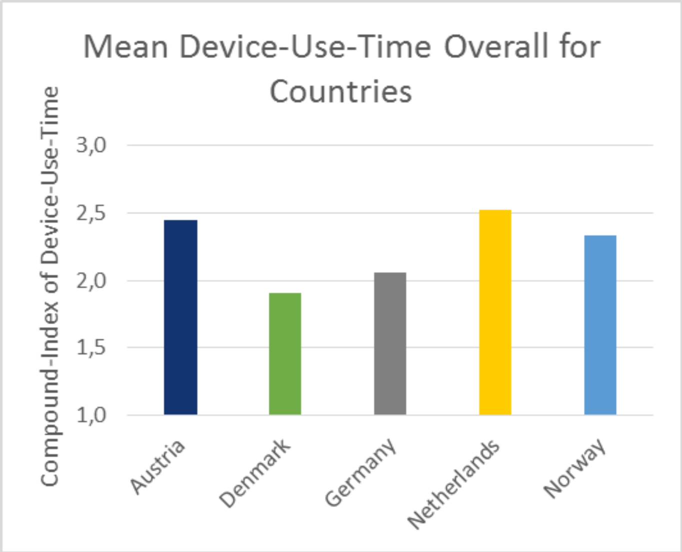


Fig. 5: Average ICT device use per day

Teenagers use ICT for many different things. UseITsmartly was especially concerned with ICT practices that consume a lot of energy or cause CO_2 emissions. The graph below shows that more than 50 % use laptops or PCs and about 35 % use phones to stream videos or television online on a daily basis. Online streaming is a very energy intensive practice and thus has also been included in the survey on the potential to change user behaviour.

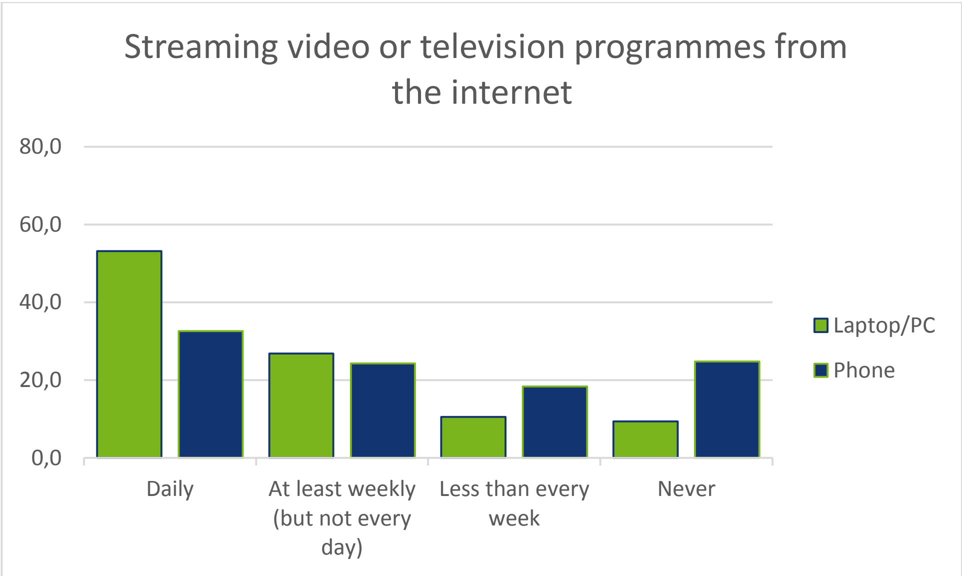


Fig. 6: Device use for internet streaming

The next graph is an indicator that most of the youths surveyed by useITsmartly are continuously connected and use the internet through laptops/PCs and/or smart phones. Close to 80 % use laptops/PCs and nearly 60 % use their phones to connect with search engines like Google on a daily basis.

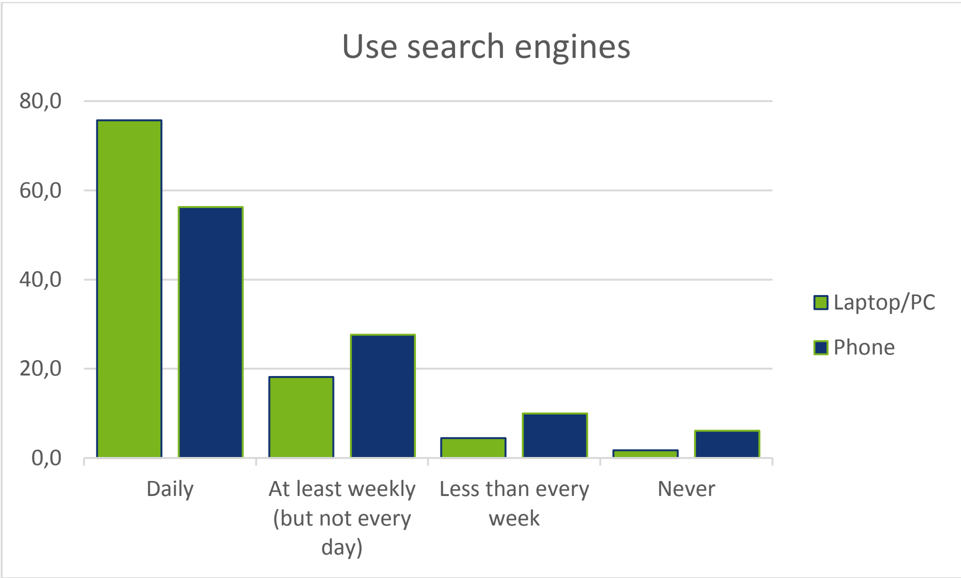


Fig. 7: Device use and search engine access

The findings of the first useITsmartly survey illustrated above are also in line with recent surveys conducted by Eurostat, the official statistics organisation of the EU. One survey on the online communication of European citizens shows that the life style of the age group most relevant for our project (16-24 years) is heavily embedded in internet practices. Over 90 % of 16-24 year olds use email services and almost 90 % participate in online social networks.

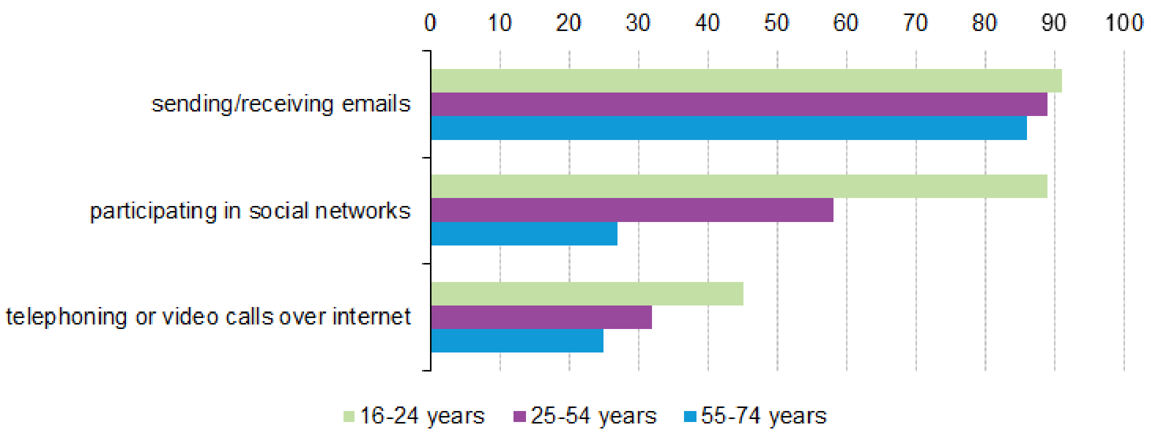


Fig. 8: Use of internet for communication, by age group, EU-28, 2013 (% of internet users)[5]

[5] Eurostat (2015): Internet use statistics - individuals, http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Use_of_internet_for_communication,_by_age_group,_EU-28,_2013_%28%25_of_internet_users%294.png, 15.03.2016

Another EU-survey “Being young in Europe today - digital world” [6] shows that youths (16-29 years of age) are predominantly using the internet in their own home (close to 90 % of the participants of this age group). The age group16-19 years, according to the same survey, has the highest daily internet use when all age groups are compared and over 75 % of 16-29 year olds access the web via hand held devices outside of their home.

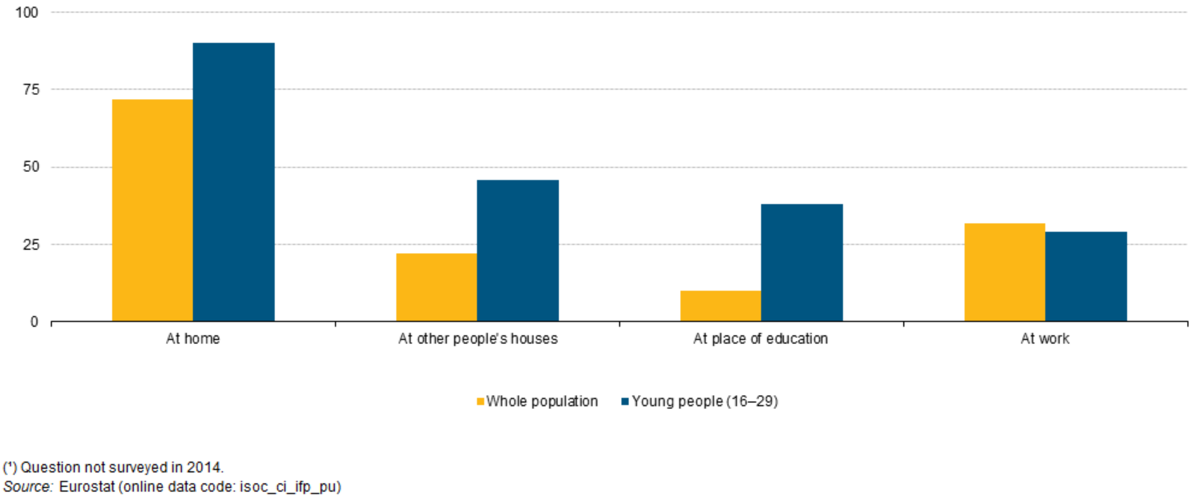


Fig.9: Proportion of people who used the internet in specified places, EU-28, % 2013

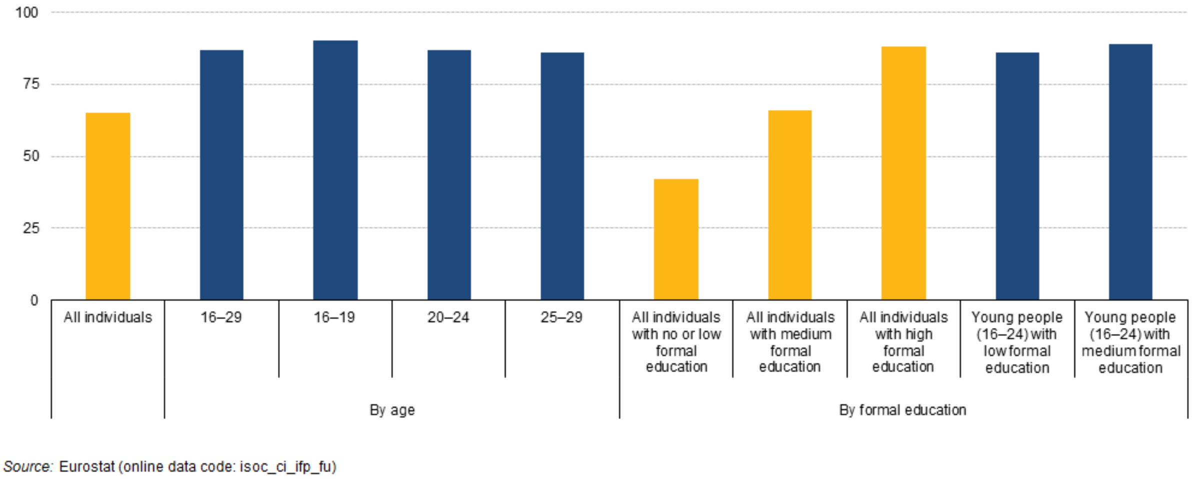
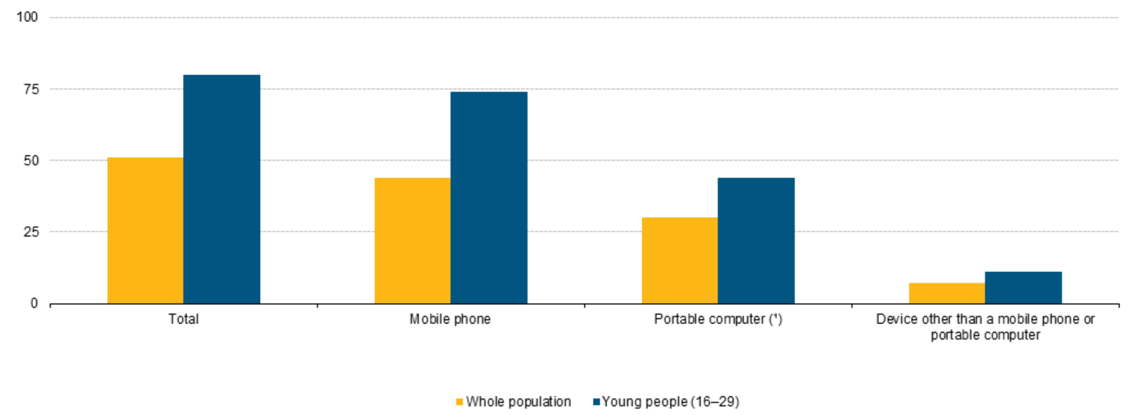


Fig. 10: Proportion of people who used the internet on a daily basis, by age and by formal education, EU-28, 2014 (%)

6 Eurostat (2015): Being young in Europe today - digital world, http://ec.europa.eu/eurostat/statistics-explained/index.php/Being_young_in_Europe_today_-_digital_world, 15.03.2016



(¹) Laptop, notebook, netbook or tablet computer.
Source: Eurostat (online data code: isoc_ci_ifp_pu)

Fig. 11: Proportion of people who used mobile devices to access the internet away from home or work, EU-28, 2014 (%)

2.1.1 From ICT use to behavioural change

Based on useITsmartly research conducted in the first project phase in 2013 energy intensive practices were identified and it came to light that a lot of "indirect" or "hidden" energy is used because of current ICT 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 (Toke Haunstrup Christensen 2014, p. 11)[7].

Through the knowledge gained by the qualitative and quantitative research activities, a second survey was constructed to estimate the potential and willingness of youths to change their ICT practices to a more sustainable level. Five entry points for this second survey were chosen:

- the rapid replacement of smart/mobile phones (1),

[7] Toke Haunstrup Christensen with contributions from Ruth Mourik, Sylvia Breukers and Tomas Mathijsen and Herjan van den Heuvel (2014), Analytical report with conclusions and recommendations for policy makers, http://useitsmartly.com/uploads/media/UseITsmartly_WP2_report_D2.2_FINAL_01.pdf

- HD-online streaming (2),
- TV-set usage (3),
- TV standby (4)
- and IT disposal and recycling (5).

These five areas were chosen because of their relevance to energy consumption and CO_2 footprint (direct and indirect) and also because of their wide spread among young Europeans. Five questions about potential changes in ICT practices were designed through a participative process including all partners of the project consortium. This ensured that all experiences made during all project phases were fed into the survey outline.

2.2 Willingness to change ICT usage

2.2.1 Survey sample

In total 2.478 persons participated in the second useITsmartly survey. The aim was to reach several groups of people for this questionnaire: participants of the peer-trainings, other project activities and persons that were in contact with IT-peers, but also people that know useITsmartly through social media and have a general interest in the topics of ICT and sustainability. The survey was distributed in all project countries through specific national strategies. Some preferred a pen-and-paper-version to reach youths at events directly; other partners mostly advertised the online-version of the questionnaire.

The survey was also combined with a lottery in each country to increase the incentive to participate. At the end, a combined data set was generated for the following analysis. The distribution over the five project countries can be seen in the graph below. The largest share of participants came from Austria (24 %), 23 % from Germany, 21 % out of Denmark, 20 % from Norway and 12 % from the Netherlands. The general purpose of the questionnaire was to understand the potential of young people to change their ICT use towards more sustainable patterns and how the activities of useITsmartly play into these intentions. In the following sections five possible entry points to increase the energy efficiency of ICT behaviours will be presented.

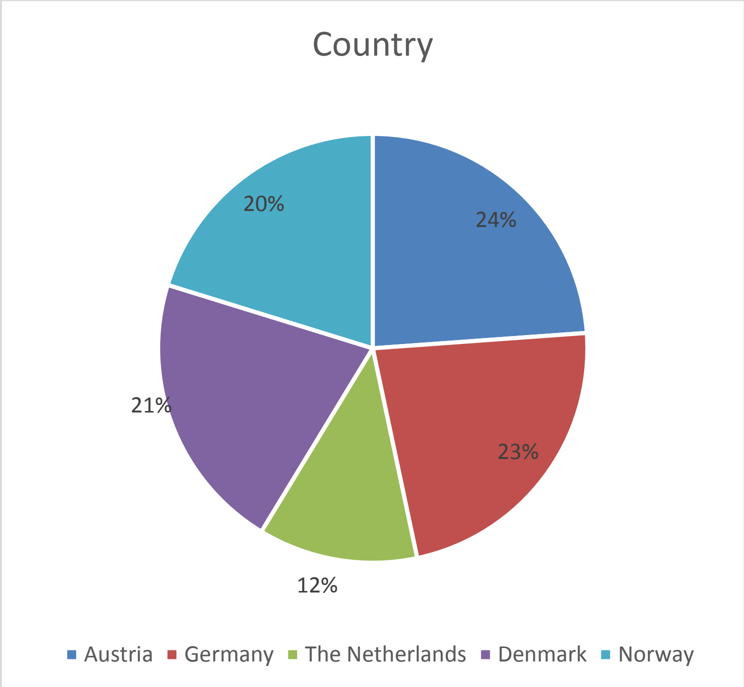


Fig. 12: Sample distribution country wise

52 % of the survey participants described themselves as male and 45 % as female. 1 % chose the gender-category “other” and 2 % did not know. The gender balance of this survey is therefore relatively even.

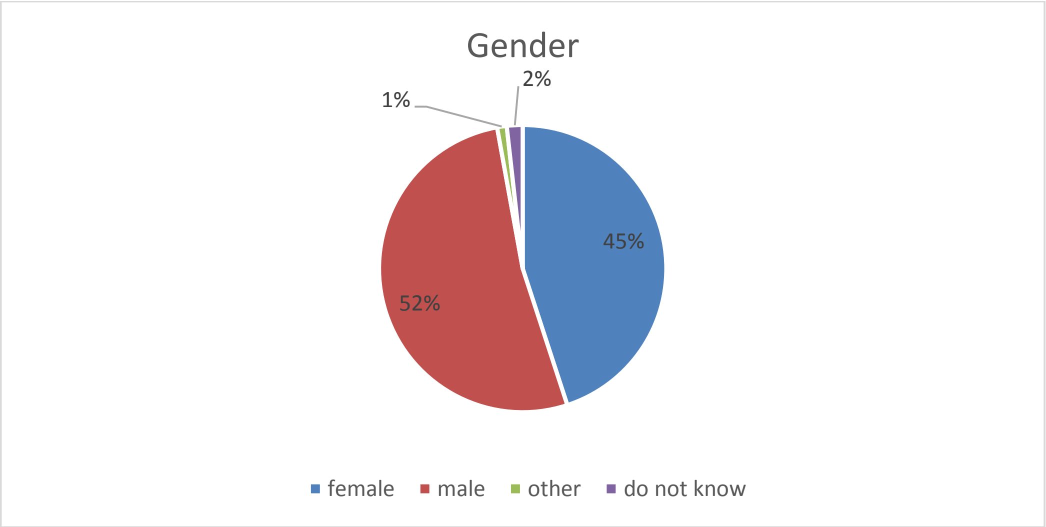


Fig.13: Gender distribution of second survey

Most of the persons that filled out the survey are going to school (48 %) or are enrolled at a university (32 %). 15 % have some kind of job and 2 % are in vocational training or an apprentice ship.

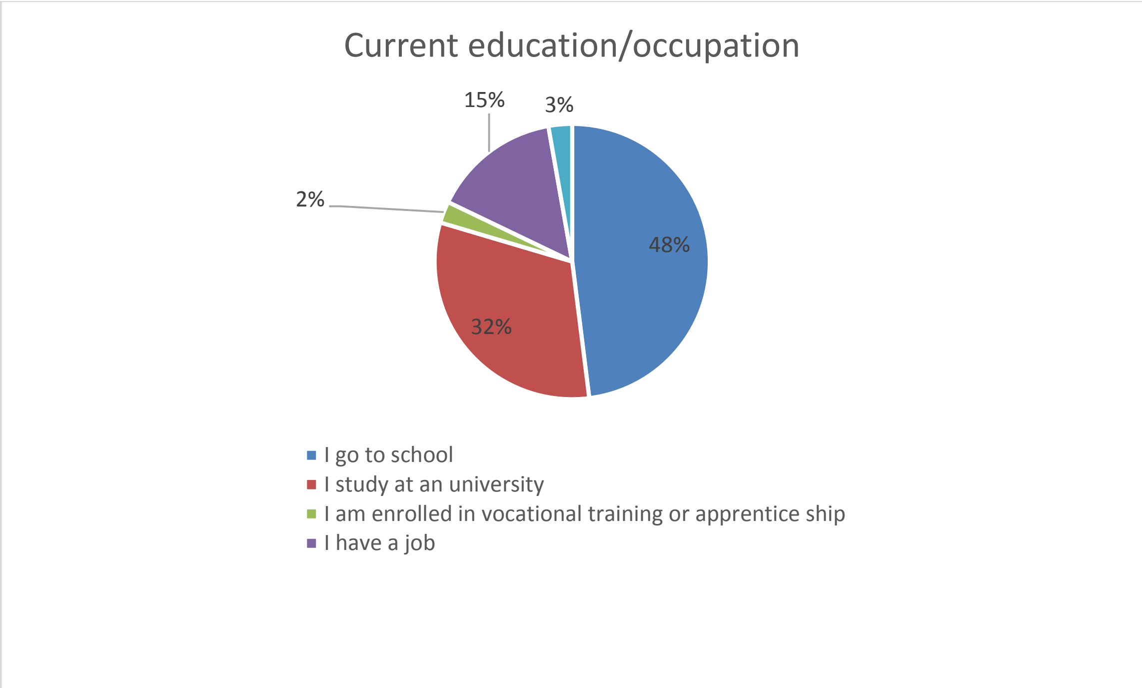


Fig. 14: Education/occupation of survey participants

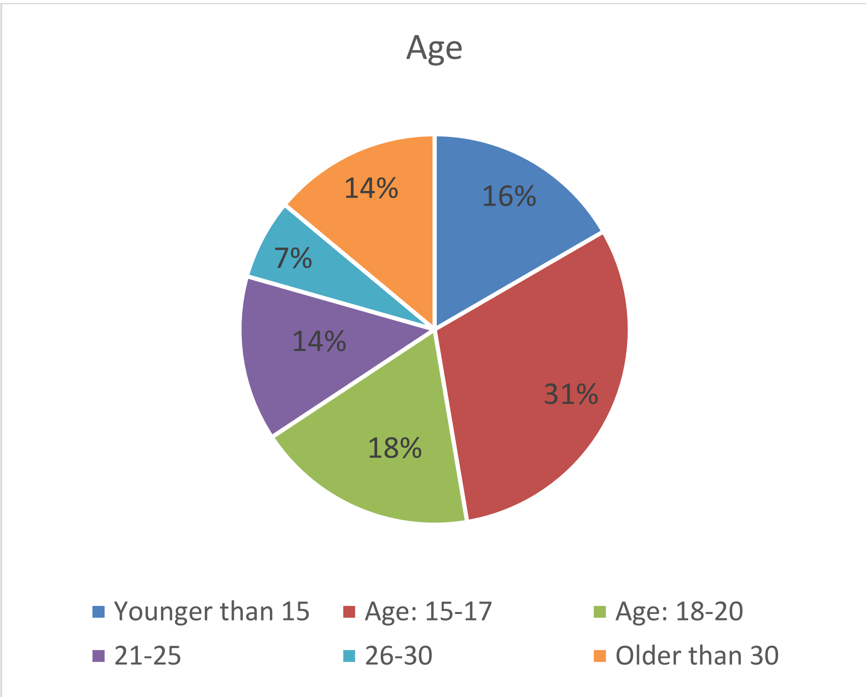


Fig.15: Age composition of second survey

Since the survey was open to all people interested in useITsmartly, the age distribution deviates somewhat from the original target group of the project (16-20 years). 65 % of the participants are 20 years of age or younger. 14 % are between 21-25 years, 7 % between 26-30 years and 14 % are older than 30 years. This age distribution can be interpreted as a positive sign for the work of the trained useITsmartly peers of all five countries (e.g. actively engaging with their families/household members) and also that the social media approach worked well in reaching people that only connected with useITsmartly online.

The graph below also shows that the younger survey participants were predominantly engaged by useITsmartly activities or by peers. The older age groups had a stronger online/social media connection and therefore joined the online questionnaire.

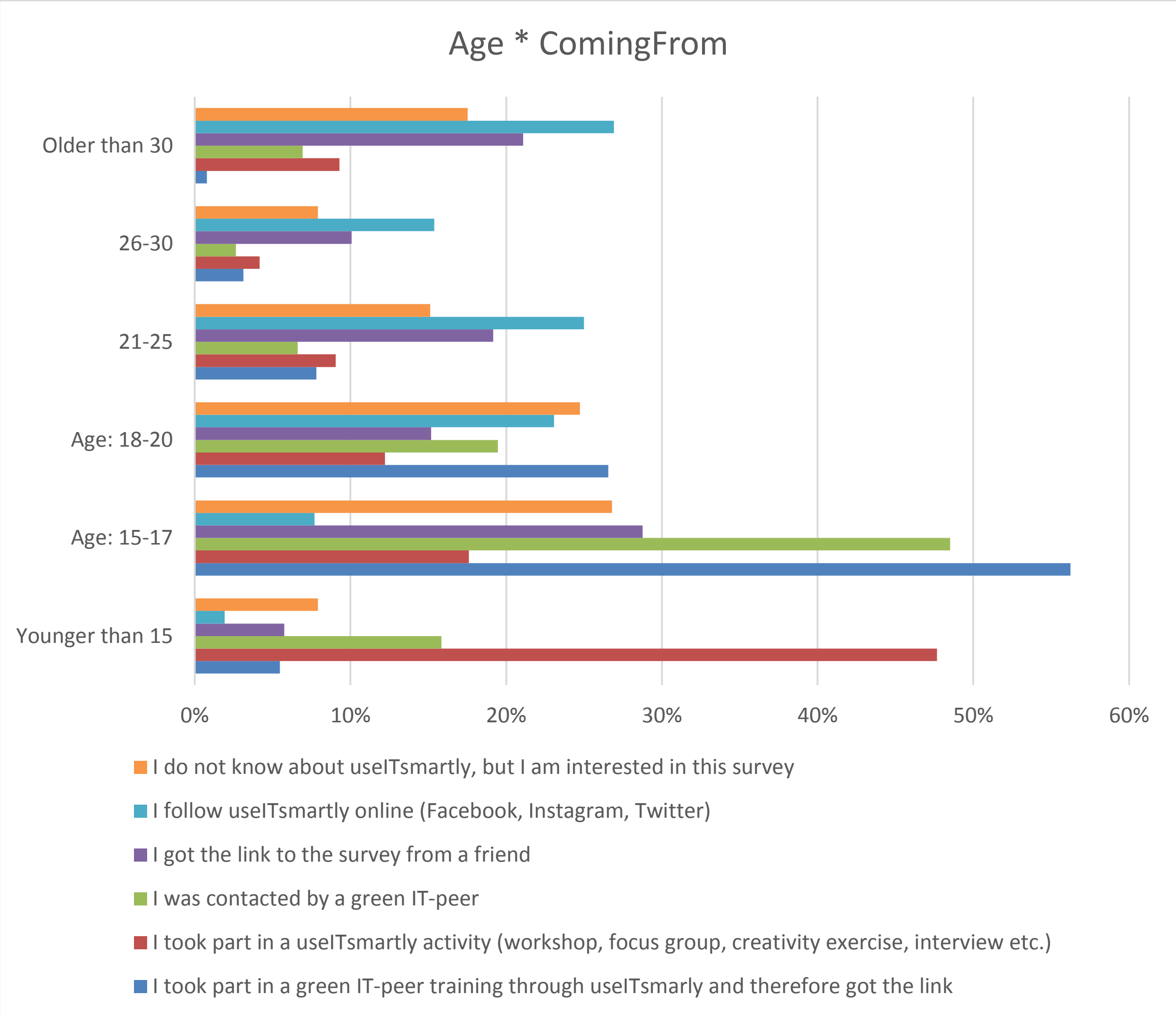


Fig.16: Age in comparison with incentive to participate in second survey

2.2.2 Willingness to extend usage time of mobile phones

The first question is interested in the willingness of young people to prolong their usage of mobile phones (smart phones and classic mobile phones were seen as one type of device for practical reasons). 57 % of the participants already keep their phones for more than two years and about 20 % are planning to keep their mobiles for longer than two years in the future. Of

the 20 % that plan to alter their future behaviour, 33 % took part in a peer-training and 21 % took part in a useITsmartly activity (project activities that were not part of the original peer training phase or events organised by peers themselves to educate among their peer group). This can be interpreted as a very positive effect of the impact phase of the project.
Only 14 % of the participants have no intention to prolong their phone usage.

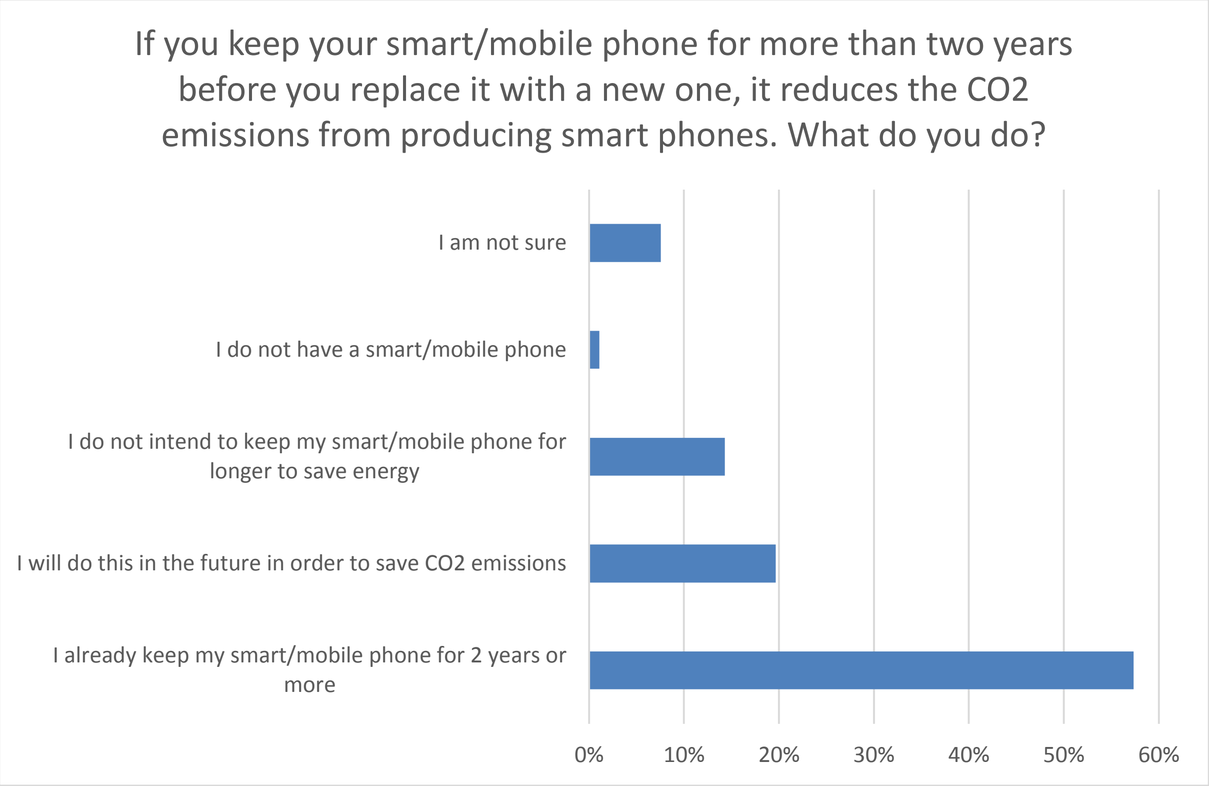


Fig. 17: Extending phone use

2.2.3 Reducing HD-streaming

The second question tackled the ever-increasing energy consumption of online high-definition streaming. As mentioned in section 2.1 before, the energy consumption connected to this practice is heavily embedded in the ICT infrastructure with comparably minimal costs for the end consumer.

41 % of the participants do not intend to reduce their weekly online streaming time and thereby dominate the answers to this specific question. However, 45 % of those who will not reduce their streaming know useITsmartly only through online and social media activities

21 % plan to reduce their streaming in the future and 10% already altered their streaming consumption. These two options are dominated by persons that took part in an IT-peer-training or project activity and by youths that got in direct contact with IT-peers.

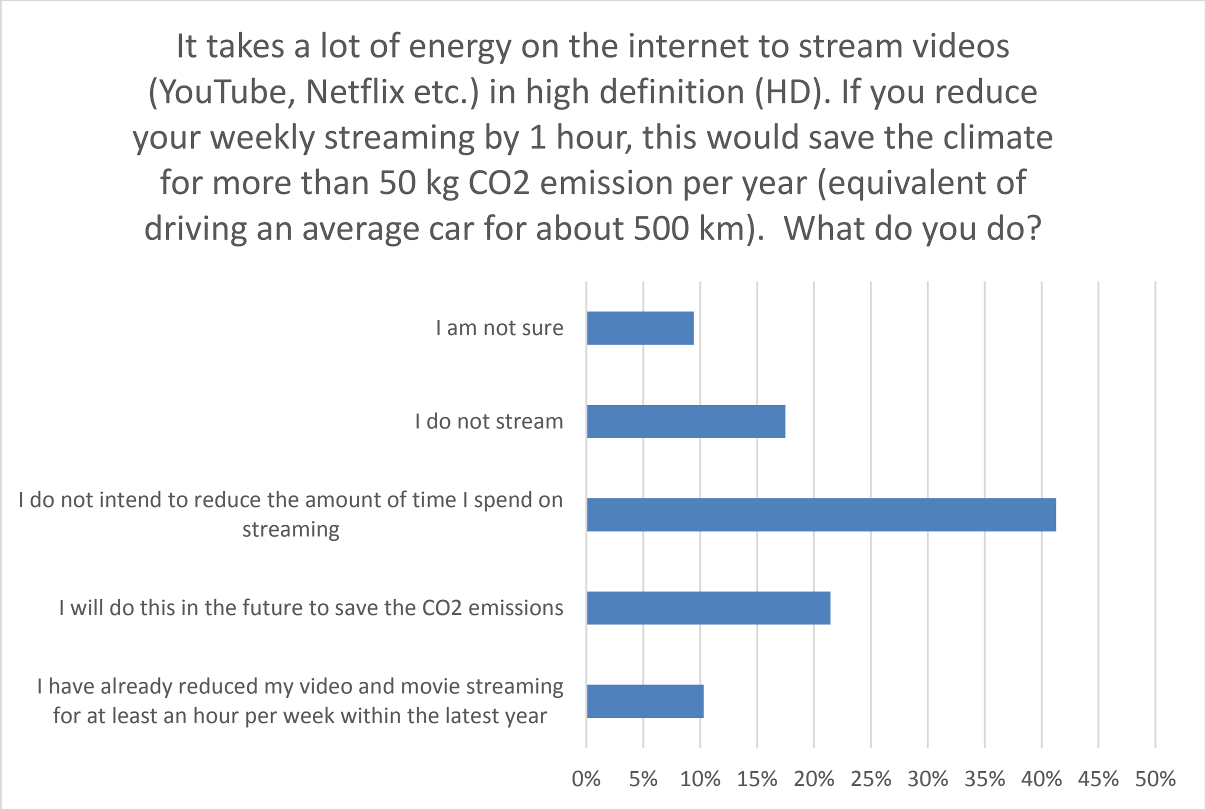


Fig. 18: Reducing HD streaming

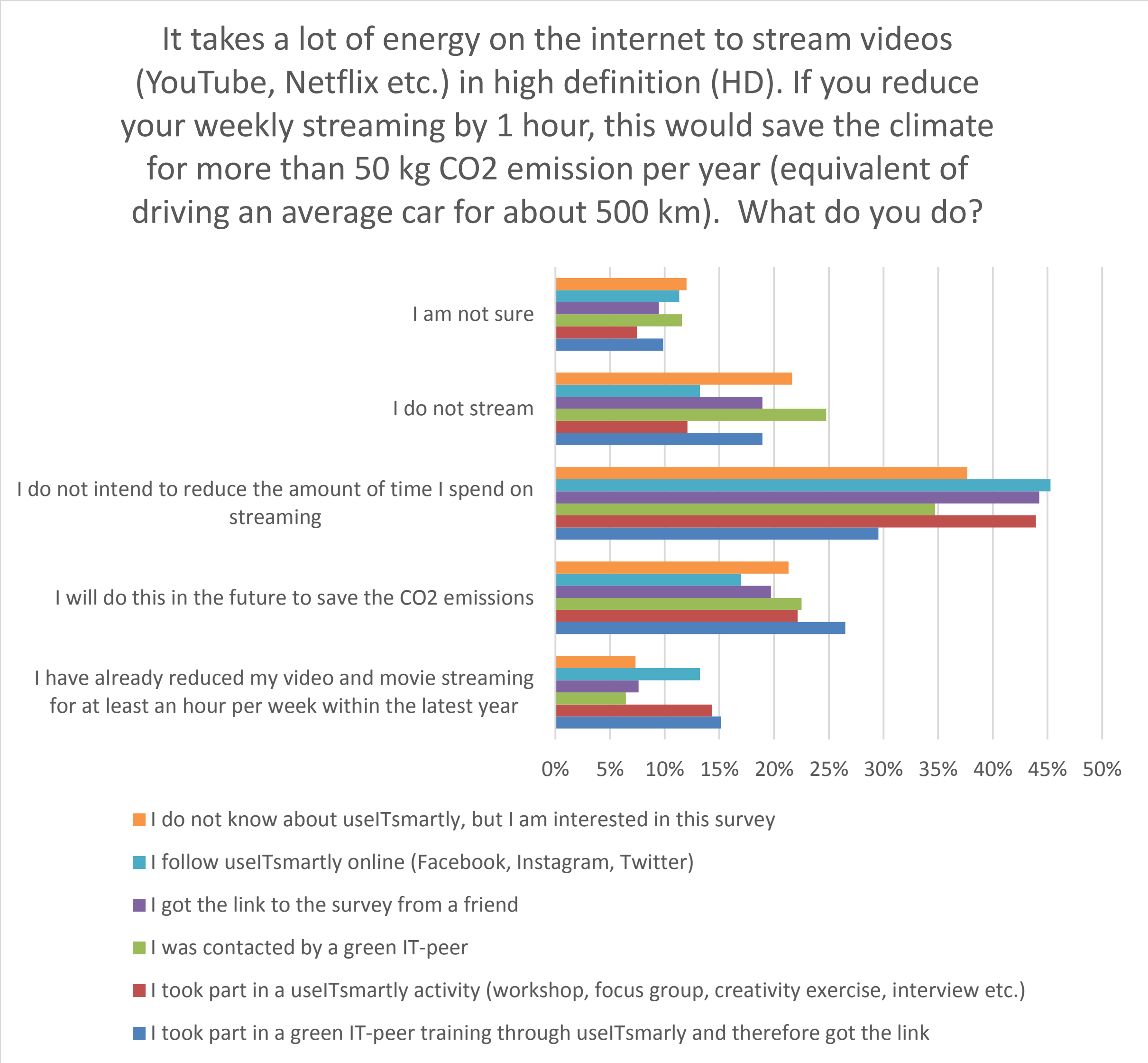


Fig. 19: Willingness to reduce HD streaming and contact to useITsmartly

2.2.4 Willingness to reduce TV time

The next question aimed at the energy consumption when watching with TV-sets. 40 % of the surveyed persons already reduced their TV-set use-time for about an hour a day during the last two years. The majority of this group participated in useITsmartly trainings or activities.

About 18,5 % are planning to reduce their TV-time. Only 20 % show no intention to change their behaviour (the majority, 25,2 % lies with persons that do not know useITsmartly).

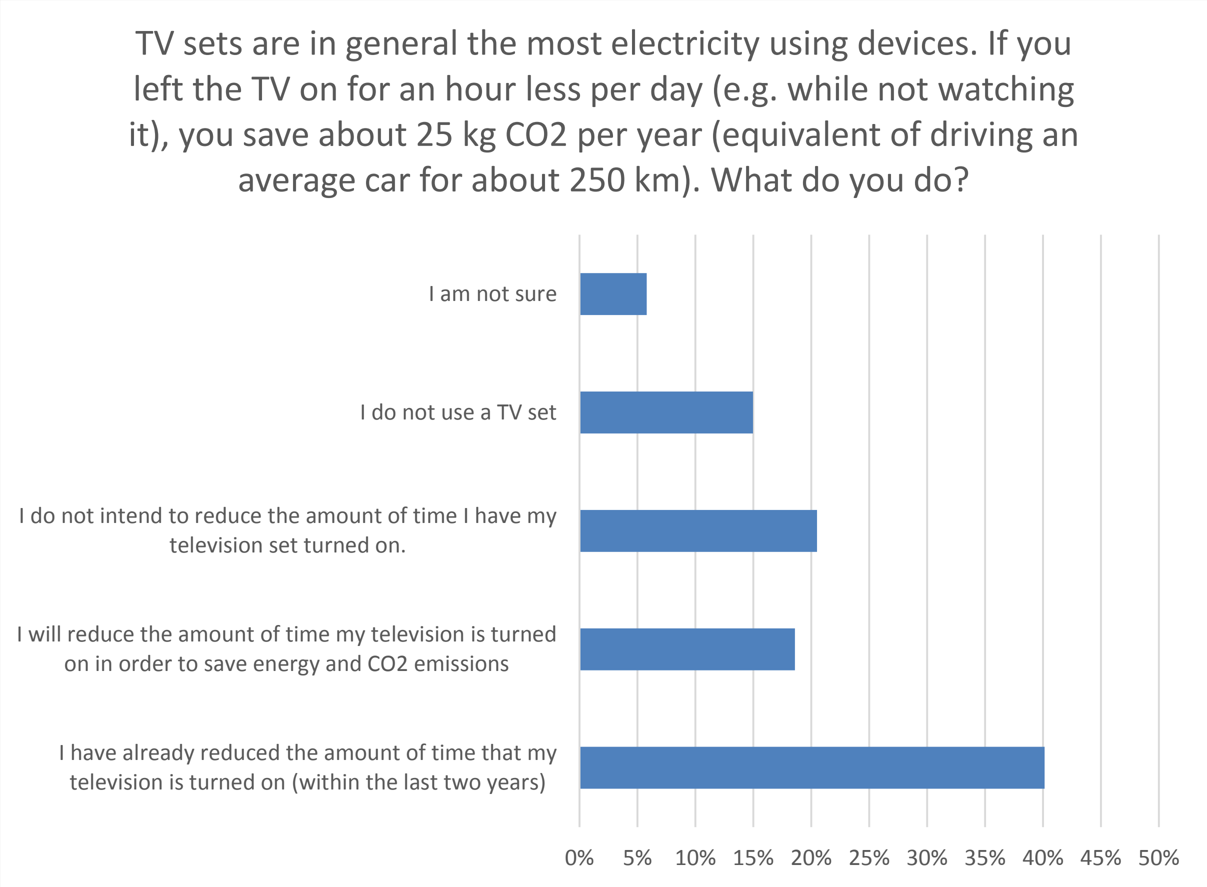


Fig. 20: Reducing TV time

2.2.5 Avoiding stand-by

The fourth question focused on one of the main energy intensive ICT practices. The stand-by energy need of IT-devices is still an important factor in the discussion about domestic energy consumption. Therefore, we asked our survey participants on their willingness to reduce their household stand-by consumption. Within the last two years 40 % of the participants have switched off some and 26 % all ICT-devices when not using them (about 33 % have taken part in an useITsmartly peer-training). Additional 14 % plan to turn off their devices in the future when not using them.

Only 14 % of the surveyed persons have no intention to reduce their stand-by consumption.

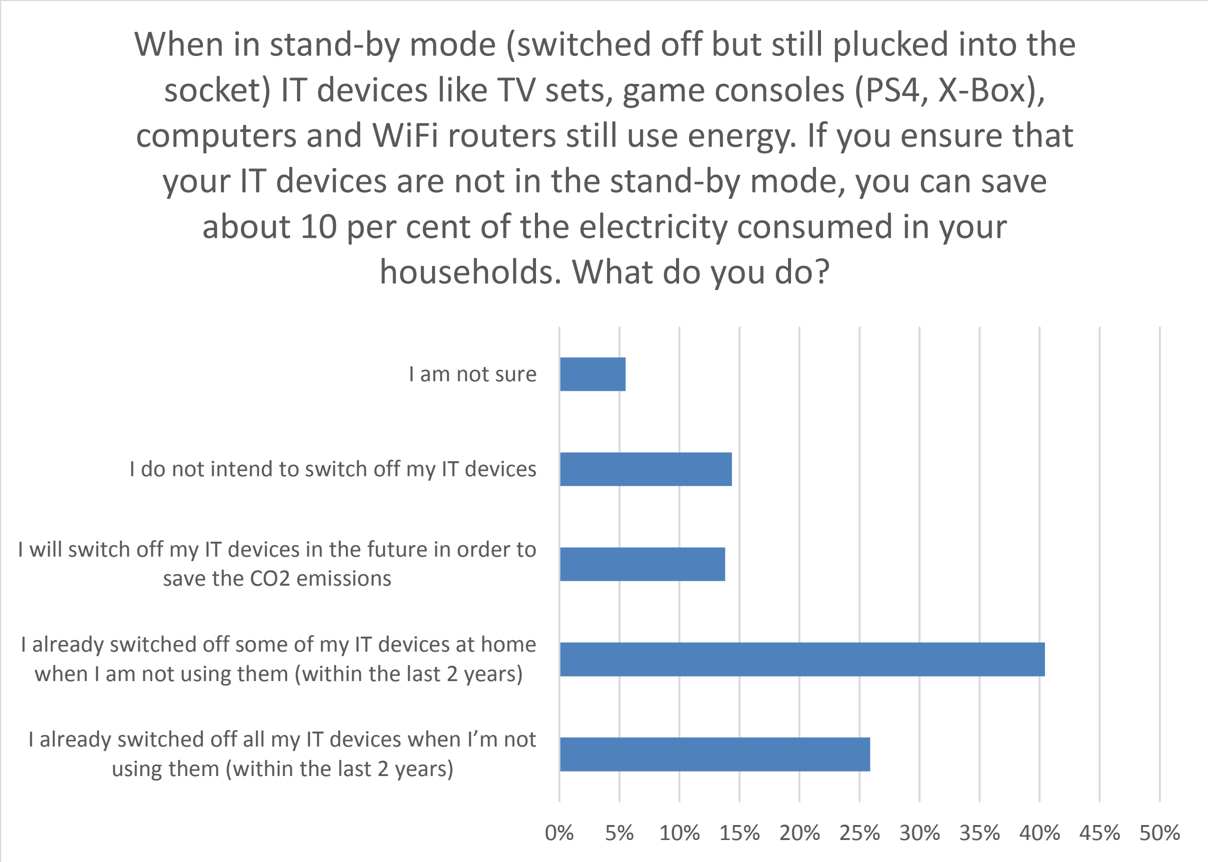


Fig. 21: Avoiding standby consumption

2.2.6 Willingness to recycle or upgrade old PCs

The final question of this second survey tried to estimate the potential for individual ICT recycling. The life-cycle of electronics is hard to calculate in general and so the decision was made to focus the question on one specific device. Desktop-computers are in decline since laptops and smart phones are on the rise in use numbers in the last years (about 18 % of the survey participants do not have a desktop PC anymore).

36 % of the participants already recycle their old desktops and 29 % plan to recycle their old PCs. Only 9 % have no intention to recycle their old computers in a correct manner.

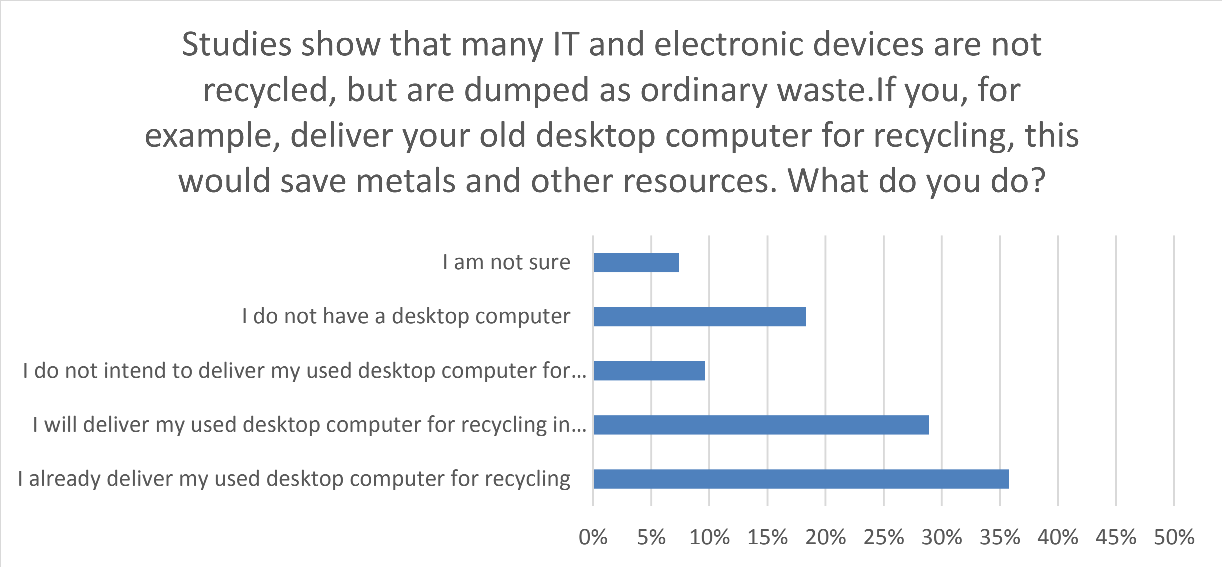


Fig. 22: PC recycling

2.2.7 Survey results

In general, the results of this second questionnaire can be seen as very positive and in line with the efforts of useITsmartly. Except for the question on the reduction on HD-streaming, there seems to be a great willingness by a large proportion of the participants to change their ICT practices to more sustainable patterns. A lot of the surveyed persons already implemented energy saving measures in their every day practices and their also seems to be a high commitment to change in the future.

The unwillingness of the majority of the surveyed persons to reduce their online streaming is an interesting exception. Contrary to the other four questions, there is no direct way for the users to observe or experience the consequences of their actions since most energy is consumed through the infrastructure that enables HD streaming. If you keep your phone longer, you can save money and maybe experience the aging of the equipment. Reducing TV-time is an active decision that may lead to more time for other leisure activities. Preventing stand-by ultimately leads to a reduced energy bill for the private household and to take an old desktop PC to a professional recycler is also a conscious act. Individual relatability seems to be an important factor of motivation. We think that it helps a lot in terms of motivation when the actual behavioural change can be experienced by the person who makes the change. How all the answers to our five questions can be quantified will be discussed in the next section.

Part 3 – Conclusions

During the evaluation efforts of this project 3.080 persons were surveyed in total. 602 in the first long term survey on the ICT user behaviour and 2.478 on the potential to change energy intensive ICT usage patterns to a more sustainable way. The first survey, conducted throughout all phases of the project that engaged with the target group, aimed at understanding the different devices usages among young persons. This enabled us to identify energy intensive energy practices and also showed potential entry points to change said unsustainable patterns.

The second survey tried to determine if our various strategies to inform and motivate adolescents to change their everyday device uses are successful methods. During our direct contact with adolescents in the useITsmartly activities we experienced a lot of interest in the general topic of useITsmartly and on using ICT in a more energy efficient way (this can be read in detail in the five country reports). However, to get a grasp on the actual willingness to change user behaviour and to estimate these potential changes among a significant group of people (about 10% of the planned reach of the project) we needed to design a questionnaire that could be translated into quantitative estimates. It would have been not enough just to survey the involved peers since the number of persons is not significant and the rational of the useITsmartly approach also heavily relies on the multiplication effort of all trained IT-peers.

3.1 Estimated impact

In addition to the aim to analyse young people's willingness to change energy consumption practices, there was also the ambition to quantify these actual and potential changes related to the useITsmartly project. In order to achieve such a quantitative estimation, answers to the different questions asked in the survey were translated into estimates for energy and emission savings of the reported behavioural change. The following assumptions and figures were used to do so:

- Question 1: *If you keep your smart/mobile phone for more than two years before you replace it with a new one, it reduces the* CO_2 *emissions from producing smart phones. What do you do?*

The operation time (use time) of a smart phones is about 1.75 years[8]. Greenhouse gas emissions related to producing a smart phone are about 19 kg CO_2e[9]. If it is possible for a person to extend the usage time of a smart phone with 6 months, this would reduce the annual CO_2 emission per smart phone owner by 2.5 kg CO_2e/year.

- Question 2: *It takes a lot of energy on the internet to stream videos (YouTube, Netflix etc.) in high definition (HD). If you reduce your weekly streaming by 1 hour, this would save the climate for more than 50 kg CO_2 emission per year (equivalent of driving an average car for about 500 km). What do you do?*
  1 hour of streaming in HD (5 Mbit/s) equals 2.33 GB/hour. The energy consumption for the data transmission of 2.33 GB/hour * 0.2 kWh/GB amounts to 0.47 kWh/hour. Every person can save 24 kWh per year when reducing HD streaming for one hour a week[10].

- Question 3: *TV sets are in general the most electricity using devices. If you left the TV on for an hour less per day (e.g. while not watching it), you save about 25 kg CO_2 per year (equivalent of driving an average car for about 250 km). What do you do?*
  The impact for this particular question had to be adjusted after the survey was finished. If somebody is willing to reduce the use of his/her TV set with 1 hour per day, this would result in a saving of about 13kg CO_2/year/person and not the proposed 25 kg CO_2/year/person[11]. So the estimated impact in the following tables will use this adjusted number for the impact calculation of question 3.

- Question 4: *When in stand-by mode (switched off but still plucked into the socket) IT devices like TV sets, game consoles (PS4, X Box), computers and WiFi routers still use energy. If you ensure that your IT devices are not in the stand-by mode, you can save*

[8] http://smallbusiness.chron.com/life-expectancy-smartphone-62979.html
[9] Toke Haunstrup Christensen with contributions from Ruth Mourik, Sylvia Breukers and Tomas Mathijsen and Herjan van den Heuvel (2014): Identify relevant areas of energy-efficient IT use, user practices and possibilities and barriers for change. Technical Report, http://useitsmartly.com/uploads/media/UseITsmartly_WP2_report_D2.1_FINAL_01.pdf
[10] Coroama, V. C.; Hilty, L. M.; Heiri, E.; Horn, F. M. (2013): The Direct Energy Demand of Internet Data Flows. Journal of Industrial Ecology 17(5):680-688.
[11] The CO_2 intensity of electricity generation in EU-27 is about 350 g CO_2/kWh according to *Power Statistics 2010* – www.eurelectric.org. If 32” B-labelled television with 100 W power consumption is turned off two extra hours a day => annual saving of ~75 kWh/year

about 10 per cent of the electricity consumed in your households. What do you do?
As mentioned before, the energy loss due to devices left in stand-by mode cannot be understated. If a person is willing to turn all devices that are not used off, the energy reduction can be estimated with 10 % of the average household electricity consumption. If a responded is planning to turn off devices in the future or is already turning of some devices we estimate a reduction of the household energy consumption of 5 % (this is actually a conservative estimate).
For the estimate we use an average of the household energy consumption (4036kWh/a) of the five participating countries (adjusted for Norway; for further information see D2.1)[12].

- Question 5: *Studies show that many IT and electronic devices are not recycled, but are dumped as ordinary waste. If you, for example, deliver your old desktop computer for recycling, this would save metals and other resources. What do you do?*
  The last question on recycling old desktop computers is a hard one to gauge. One of the business partner of useITsmartly is specialized in recycling and upcycling old PCs. Based on their experience 550kg of CO_2e can be saved if a PC is professionally re- or upcycled. We assumed a replacement rate of 4-5 years and therefore factored the answers with 0,2.

The following table shows the absolute numbers for the answers given to questions 1 to 5 and an estimated number of energy and CO_2 savings attributed to them based on the rationales described above.

Questions 1 and 5 cannot be simply translated into energy savings since there is no sufficient information on the overall energy needs that occur during the production of smart phones or computers. The estimates for questions 1 and 5 will therefore only be given in CO_2 savings. Questions 2, 3 and 4 will be estimated in energy (kWh) and CO_2 savings since a conversion is possible in these three cases. To provide an overall aggregated number of estimated CO_2-savings for all questions we use an average EU emission factor for the questions that provided

[12] Toke Haunstrup Christensen with contributions from Ruth Mourik, Sylvia Breukers and Tomas Mathijsen and Herjan van den Heuvel (2014): Identify relevant areas of energy-efficient IT use, user practices and possibilities and barriers for change. Technical Report, http://useitsmartly.com/uploads/media/UseITsmartly_WP2_report_D2.1_FINAL_01.pdf

estimated energy savings[13]. It has also to be noted that our estimates are quite conservative since there are a lot of potential secondary savings that cannot be quantified. The actual savings are very likely to be higher than our calculations for the estimated impact of the project below.

Question	Number of answers/persons	Estimated impact	
		CO_2/a	kWh/a
Q1: I already keep my smart/mobile phone for 2 years or more	1417	3,542.5 kg CO_2e/a	-
Q1:I will do this in the future in order to save CO_2 emissions	486	1,215 kg CO_2e/a	-
Q2:I have already reduced my video and movie streaming for at least an hour per week within the latest year	255	12,750 kg CO_2e/a	27,717.4 kWh/a
Q2: I will do this in the future to save the CO_2 emissions	531	26,550 kg CO_2e/a	57,717.4 kWh/a
Q3:I have already reduced the amount of time that my television is turned on (within the last two years)	989	24,725 kg CO_2e/a	53,750 kWh/a
Q3:I will reduce the amount of time my television is turned on in order to save energy and CO_2 emissions	458	11,450 kg CO_2e/a	24,891.3 kWh/a
Q4: I already switched off all my IT devices when I'm not using them (within the last 2 years)	634	117,705.9 kg CO_2e/a	255,882.4 kWh/a
Q4:I already switched off some of my IT devices at home when I am not using them (within the last 2 years)	991	91,992.5 kg CO_2e/a	199,983.8 kWh/a

[13] http://www.eumayors.eu/IMG/pdf/technical_annex_en.pdf

Q4:I will switch off my IT devices in the future in order to save the CO_2 emissions	338	62,751.7 kg CO_2e/a	136,416.8 kWh/a
Q5:I already deliver my used desktop computer for recycling	880	96,800 kg CO_2e/a	-
Q5:I will deliver my used desktop computer for recycling in the future	711	78,210 kg CO_2e/a	-

Table 3: Estimated savings per question

The following table lists the added numbers for questions 1 to 5. The savings are split in savings that have been already accomplished (when survey participants said that the already made certain behavioural changes) and savings that will arise out of claimed willingness to do so in the future:

2nd Survey sample	**CO_2/a**	**kWh/a** (questions 2, 3 & 4)
Already saved	347,515 kg CO_2e/a	537,333 kWh/a
Will be saved	180,177 kg CO_2e/a	219,025 kWh/a

Table 4: Combined estimated energy and CO_2 savings of 2nd survey sample

Assuming that the second survey is a representative sample for the whole number of people reached by useITsmartly (39.716 persons) we can now give an estimate of the overall impact. The sample of the second survey amounts to 6,24 % of the aforementioned overall reach. We also need to consider for a high percentage of first and second IT-peers in the second survey (about 56 %) who were very motivated and also participants who had no knowledge of the project other than the questionnaire. Considering this circumstances we factor the estimates of the second survey with 7,5 for the overall estimates. These estimated overall impact is again listed in a table.

Overall	CO_2/a	kWh/a (questions 2, 3 & 4)
Already saved	2,606,369 kg CO2e/a	4,030,002 kWh/a
Will be saved	1,351,327 kg CO2e/a	1,642,691 kWh/a
Total	3,957,696 kg CO2e/a	5,672,693 kWh/a

Table 5: Estimated aggregated CO_2 and energy savings for the overall reach of the project

3.2 Changing attitudes, knowledge and behavioural aspects of green IT use of youths

UseITsmartly had an internal learning curve integrated in the project that proved to be very ambitious. Several interconnected steps were packed into three years: learning about the target group and their ICT practices (1), confronting and learning from the target group and thereby developing possible solutions for the identified problems (2), designing a pedagogical impact concept that is usable in five different countries and tackles aforementioned ICT problems (3) and developing tools to measure the success of the process described before (4).

The ICT practices of youths are strongly embedded in daily routines and the necessities of modern everyday life. This became very clear in the first research phase of useITsmartly and is also reflected in the first long term survey of project participants. Youths are online on a daily basis, they communicate, connect, learn and create through digital media with the help of smart phones, laptops and other gadgets. The knowledge of adolescent ICT users about ICT energy consumptions and the embedded energy in their devices and infrastructures is varying[14]. However, young people are very much aware of and/or interested in the sustainability issues connected with ICT and the negative environmental impacts that arise of the ever growing digitalisation of our life.

After the first exploratory phase, useITsmartly identified seven energy intensive ICT practices

[14] Toke Haunstrup Christensen with contributions from Ruth Mourik, Sylvia Breukers and Tomas Mathijsen and Herjan van den Heuvel (2014): Identify relevant areas of energy-efficient IT use, user practices and possibilities and barriers for change. Technical Report, http://useitsmartly.com/uploads/media/UseITsmartly_WP2_report_D2.1_FINAL_01.pdf

and tried to develop solutions with young motivated persons (the second survey also focused on said practices). We conducted a series of creativity workshops that tackled these problems. A huge amount of ideas and creative solutions was gathered in the five useITsmartly countries, then categorised and later presented for evaluation in two expert workshops. The experts came from a range of different fields and backgrounds (research, industry, education, governance etc.), but representatives of the target group of the project were also integrated to get feedback from the perspective of young people. These activities were fed into an online toolbox[15] that gives various groups of interests the possibility to increase their energy efficiency concerning ICT by clicking through a range of options and information. Based on these experiences and gained knowledge on adolescents and ICT usage the impact phase of useITsmartly (IT-peer-trainings) was designed.

In the useITsmartly peer trainings two approaches worked. Training young people in a voluntary setting required that the very training can be useful for the participants and/or the topic is interesting for them. In the case of green IT that meant working with young people who were either already very motivated to learn about environmental issues or offering them possibilities which are valuable for them, like a green IT certificate which helps them finding an internship or even a job. Green IT as an additional qualification was especially relevant for students from technical vocational trainings who can profit from such an useITsmartly certificate. Including experts from green IT companies to the useITsmartly training was adding credibility to this certificate and brought first-hand experience to the training. Additionally it worked to credit the training with points/grades etc., which they can use in their school education. With this approach highly motivated and committed people can be reached. The downside of this approach is its limitedness, as only certain people are attending technical (vocational / high) schools and only a smaller number are interested in green IT.

The second so called vehicle approach works with whole school classes, attending green IT courses which are integrated in their school curricula. Students are not necessarily interested in either technology or environmental issues, groups are sometimes very heterogeneous, and the training success is also depending on the commitment of the participating teacher(s). Therefore useITsmartly worked with the so called vehicle theory[16] connecting the green IT topic to youth

---

[15] http://www.useitsmartly.com/toolbox/

[16] Thaler, Anita and Zorn, Isabel (2010): Issues of doing gender and doing technology - Music as an innovative

interests like fashion, music, video games, etc. and using a very participatory approach to build up enthusiasm and motivation for the useITsmartly topics. The prototypes and products stemming from these trainings (solar fashion items, videos, posters etc.) have then be used in the multiplication process too.

This was another lesson learned from the useITsmartly trainings. Only if the peers are also trained in didactical skills, and when they are committed to the green IT cause, they feel comfortable to educate their peers face to face and/or use their own social media accounts for spreading useITsmartly ideas. This was very much the case in the voluntary approach. But to reach more and more diverse young people, it was necessary to try other ways of multiplication for students with a useITsmartly school training ('obligatory training'). Here it could be shown that letting school classes work on their own projects (vehicle projects like solar fashion) could lead to a higher commitment in the end. Nevertheless peers should then be allowed to find their own way of multiplying their green IT knowledge, for instance by sharing self-made YouTube videos or using the useITsmartly social media accounts to spread ideas.

3.3 Reflexion of project process and recommendations

As a first step, every professional or project consortium should familiarise with and acknowledge the realities of modern ICT use and the patterns of daily practices they shape and change and then work within these practices to create entry points and opportunists for change. Simplified normative approaches that deem certain ways of ICT use as wrong or unethical (from an environmental or globalisation angle) will not motivate young persons and are more likely to create resistance or indifference. Professionals that work in related fields and are committed to similar tasks should especially pay tribute to the fact that young persons between 16 and 20 years old are a hard group to engage in long term commitments. Schools and therefore contacts to teachers presented themselves as a very valuable asset to useITsmartly. The more pre-established these contacts and/or partnerships are the better.

To reach adolescents outside of educational settings is even more demanding. Simple social media and internet dissemination does not generate a lot of feedback. Organisations that have youth programmes (e.g. alpine clubs, pathfinder clubs, environmental NGOs etc.) are recommended in this regard, but it needs to be considered that these NGO partners need to see value

---

theme for technology education, European Journal of Engineering Education 35 (4): 445-454.

for themselves to partner up with the aim of the project. Such commitment building needs time and should not be crammed into an already ambitious project timeline, but already be started during the conception phase of a project.

As mentioned before, social media are no silver bullet to engage with young people or to generate response and feedback or even active commitment. It has never been so easy to publish contend, promote events, share pictures or videos, but it also has never been as hard to get attention as it is nowadays. It is crucial to have a clear idea what purpose should be gained by using social media channels. Applications like Tumblr proved useful as a kind of dashboard in the Austrian vehicle trainings since it provided the possibility to share development steps and a time line for documentation. But the actual traffic (klicks, likes, followers etc.) on Facebook, Instagram or Twitter should not be seen or instrumentalized as measurements for success in terms of target group involvement. Most of the online traffic among youths is not tangible anyway, since the communication happens through WhatsApp, Facebook messenger or other private chat applications and are therefore hidden. Social media, in the experience of this project, should be seen as a tool to work with when it makes sense, but not as a quantitative measurement for success.