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HIGHER SCHOOL OF ECONOMICS

E. Chernovich

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E. Chernovich[1]

TECHNOLOGY AND PRO-ENVIRONMENTAL BEHAVIOR IN URBAN HOUSEHOLDS: HOW TECHNOLOGIES MEDIATE DOMESTIC ROUTINES

This paper investigates environmental behavior in Russian households by the analysis of 24 in-depth interviews conducted in typical households of the city of Moscow. Using the STS tools such as 'script' and 'moral agency' it discovers how technologies shape domestic routines and pro-environmental behavior of their users and how the users shape the resource consumption of technological artifacts. Depending on their environmental values and believes three types of residents are identified: committed environmentalists, occasional environmentalists and non-environmentalists. Each of the group of people appeared to have different agencies in relation to their domestic technologies. Technologies also seem to play different role in shaping moral actions of the three categories of residents.

JEL classification: D19, Q01
Keywords: Human-technology relations, environmentalism, domestic routines

[1] Elena Chernovich, Junior Research Fellow, Institute for Statistical Studies and Economics of Knowledge, National Research University Higher School of Economics, e-mail: echernovich@hse.ru.

Introduction

The impact of people's consumption on the environment becomes more and more visible; let it be the water and air pollutions or deforestation and extinction of wild animals (Vlek & Steg, 2007). People worldwide become more aware of pollution and rationale use of energy and natural sources. Consequently, according to a survey, conducted by Public Opinion Foundation, 74% of respondents in Russia are concerned about the environmental situation in their region (FOM, 2012). It seems that residents tend to reduce negative effects on environment. For example, 89% of respondents regulate their consumption of natural recourses in their households (such as electricity, gas and water), and 40% of respondents buy energy efficient domestic appliances (FOM, 2012).

On the other hand, the next-year survey showed that nearly half of residents collect their garbage after they have a countryside picnic and around 5% recycle toxic waste such as compact fluorescent lamps (CFLs), or old electronics and sort their garbage (FOM, 2013). Similarly the World Bank Group (2008) notes that the habits and social values of Russian residents are the obstacles on the way to more efficient use of energy in the buildings. The report concludes that environmental issues are not very important for Russians and have low impact on their energy consumption routines. In general people in Russia do not have enough knowledge to anticipate the harm they bring for the environment, and its consequences; moreover, they have the stereotype of inexhaustible natural resources in their minds (Gromov E., 2006).

These data trigger to investigate deeper environmental behavior in the households and environmental values of Russian residents. It seems that there should be reasons for low interest in the environmental and sustainable consumption. Therefore, habits and domestic routines of people and technology that facilitates and mediates such routines are taken into consideration in the paper.

This paper consists of three main parts: first it describes the relevant literature and the theoretical framework used in this research. The second part describes the research results; it discusses the relationships between domestic technologies and tree main types of their users: committed environmentalists, occasional environmentalists, and non-environmentalists. The next part of the paper discusses the results of the study and draws conclusions.

Pro-environmental behavior at home

Many studies seek to explain why people behave pro-environmentally. Pro-environmental behavior is such kind of behavior that according to Kollmuss & Agyeman (2002, p.240) "consciously seeks to minimize the negative impact of one's actions on the natural and built world (e.g. minimize resource and energy consumption, use of non-toxic substances, reduce waste production)". Literature examines how different factors (demographical, economical,

psychological, institutional, and knowledge, values, beliefs and intentions) influence pro-environmentalism. Extensive reviews of how those factors affect environmental behavior can be found for example in the papers of Luthenzier (1992), Kollmuss & Agyeman (2002), and Wilson & Dowlatabadi (2007).

Barr & Gilg (2007) in their model of environmental behavior describe social/environmental values, physiological variables, and situational variables to influence pro-environmentalism. Social order; environmental and other values as the drivers of environmental behavior are discussed in many studies. For example, Butler (2010) conducted a focus group study in UK, where respondents confirmed that in behaving environmentally is social norm, and is seen as moral behavior. Shove (2003) sees pro-environmentalism possibly as a part of being normal, though the scholar claims that convince and comfort to be on the first place for the residents. Mirosa et al. (2013) link personal moral values and energy expenditures in the households. The scholars conclude that the value of protecting environment has affect on the energy behaviors and decisions to buy energy efficient appliances, etc. However, they also stress the value of being intelligent and capable to be very important for the energy efficient behavior.

To the situational variables in the model belong "physical infrastructure, geographical location, socio-economic structure and knowledge" Barr & Gilg, (2007, p. 364). Depending on the availability and development of physical infrastructure Diekman & Preisendoerfer (1992) as sited in Kollmuss & Agyeman (2002), distinguish low – cost and high – cost model of environmental behavior. By cost environmental behavior the authors mean the efforts that need to be taken for the environmental action. Though people do not always act economically rationally, still according to Kollmuss & Agyeman (2002), economic factors can have significant influence on the environmental behavior.

Psychological variables described in the model of Barr & Gilg (2007) are different attitudinal constructs of individuals. Similarky Kollmuss & Agyeman (2002) describe internal locus of control or the feeling of the individuals to be responsible for their actions for as a driver of environmental behavior.

It can be seen that most of the models that seek to explain pro-environmental behavior consider many different factors; however, the role of technology in shaping pro-environmental behavior is neglected. The buying decision of for instance, energy efficient appliances can be the element of the model like the one by Barr & Gilg (2007); however, the researchers rarely consider the agency of technology, with only few exceptions (Aune, 2007; Hargreaves. et al., 2013).

Domestic routines and technology

Domestic routines in contemporary households are performed by means of plenty technological artifacts such as vacuum cleaners, cookers, microwaves, etc. Science, technology and society

studies have shown that technological artifacts being used shape human behavior, habits and quality of life. (Latour, 1992, 1994; Akrich, 1992; Oudschoorn & Pinch, 2003; Callon, 1986; Verbeek, 2008). For example, because of using cell phones people tend to make fewer appointments in advance and prefer their active co-ordination (Verbeek, 2008).

The ability of technological artifacts to shape human actions and perceptions is analyzed by Verbeek (2005) as technological agency. Actor-network theory (Latour, 2005) equals the agencies of human and non-human actors in the socio-technical networks. In other words, human and non-human actors can equally shape the actions of each other. The agencies of technologies often become visible for the users in the form of scripts (Akrich, 1992). Technological script determines how and in which way technologies should be used. For example, if a modern fridge makes a sound when its door is being opened too long, and the user closes it after hearing this sound this means that the user follows the script of the fridge.

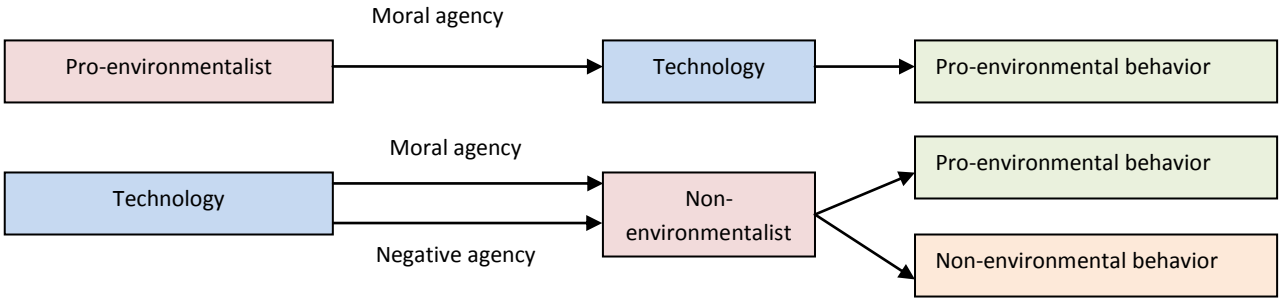
Literature shows that there many examples how technologies can be morally non-neutral. In other words it shows that technology can shape our moral actions and perceptions, or in ANT terms, have moral agency. Technologies influence our values, decisions, routines, goals, etc., sometimes in a positive and sometimes in a negative way *(*Swistera & Waebbers, 2012). For instance, the ultrasound technology shapes the decisions regarding unborn life (Verbeek, 2008). The use of efficient domestic appliances helps their users to consume less natural resources, and thus behave pro-environmentally. Jelsma (2008) gives an example of the moral agency of the toilet flush - the flush with two buttons encourages the users to consume less water, while one – button flush does not have such agency.

Technologies can make us more aware of the consequences of our actions like the energy meters do, but they can also hide from us such effects as many domestic appliances do, - they hide from us the consequences of their use. Water and air pollutions, dissociation of plastic, and many other negative impacts are hidden from our sights by technologies *(*Swistera & Waelbers, 2012). It is possible to say that domestic technologies bring things for us *ready –to- hand* (Heidegger, 1977), which means that individuals no longer have to think about the influence on the environment, and the consequences of their consumption. In this sense technologies become black boxes (Callon, 1986). Similarly Waelbers (2009) notes that socio-technical systems are so complex that it is rather difficult for individuals to take responsibility for their actions.

Domestic routines are actor-networks, where the action is performed together by humans and technology. The agency can belong both to human actors and non-human actors of the network. In other words, morally designed domestic technologies can encourage pro-environmental behavior, while other technologies can discourage this kind of behavior. The users of

technologies can also exercise environmentalism or non-environmentalism whiles the use of technologies.

Figure 1. Supposed relationships between environmental values, technology and pro-environmental behavior



As it is shown in the Figure 1, it is possible to assume that on the one hand in the actor – network of domestic routines human actors with environmental believes can have moral agency to shape the actions of technological artifacts. On the other hand, it seems that the behavior of human actors with no environmental concerns should be shaped by technologies that exercise moral or other type of agencies in relation to the human actors of the network.

This work aims at finding indicative evidence of the underlying relationship of people's perceptions towards technology and their actual daily behavior. It investigates further what kinds of agencies exist in the actor-networks of domestic routines, which actor they belong and how they shape the performance and behavior of other members of the networks.

Method and empirical data sampling

In order to investigate how moral beliefs, technology and energy saving behavior are connected 24 semi-structured in-depth interviews have been conducted in the city of Moscow. Moscow was chosen as the area of research due to few reasons: it is a big city, where new practices are likely to be performed in advance compared to the rural area, and different social groups in relation to environmental believes are easy to find.

Muscovites (the citizens of Moscow) were interviewed about their domestic routines, their attitudes toward nature, and natural resources, and their domestic appliances. Interview guide was based on the environmental behavior patterns described by Barr et al. (2005), and adjusted for Russian households. The respondents were asked in detail about their consumption practices, recycling experience, and purchase decisions. Interviewees told how they cook and heat their food, how they use the fridge, how they do the washing up. They also described their cleaning and washing routines, and said whether they iron their clothes, and how they heat, cool and ventilate their flats. Further the residents discussed their lightning practices and the way they use electric appliances such as lap tops, chargers and TV. In the end of the interviews residents said

whether they installed water meters in their apartments, and the reasons for that, and their attitude toward water and energy tariffs and the value of their utility bills.

The interviews lasted between 20 and 75 minutes. The sample was designed in such a way that residents of different age and sex, and education, family structure, income and environmental values were interviewed. In detail the interview sample is presented in the table 1. For the interviewers of environmental activists snow ball sampling technique was used. In order to compare the regular residents' behavior and behavior of environmentally concerned ones, several environmental activists and people working for the environmental organizations have been interviewed.

Table 1. The survey sample

No	Age	Sex	Education level	Environmental beliefs	Family structure	Income*
1.	52	male	University degree	Committed,	Wife and dog	b
2.	27	female	University degree	Committed	Sister	b
3.	56	male	PhD	Committed	Wife and dog	b
4.	28	male	University degree	Committed	Wife and two little children	a
5.	29	male	University degree	Committed	Lives alone	b
6.	27	female	University degree	Committed	husband	b
7.	26	female	University degree	Occasional	Partner and brother	b
8.	38	female	University degree	Occasional	Two teenage children	a
9.	27	female	University degree	Occasional	Husband and baby	b
10.	30	male	University degree	Occasional	Wife and baby	a
11.	24	female	University degree (PhD student)	Occasional	Husband	a
12.	49	female	University degree	Occasional	Husband and teenage sun	a
13.	25	female	University degree	Occasional	Partner	b
14.	68	male	PhD	Non-environmentalist	Wife	b
15.	54	female	technical school degree	Non-environmentalist	Husband 2 adult sons	b
16.	22	female	University degree	Non-environmentalist	Lives alone	b
17.	53	male	PhD	Non-environmentalist	Wife, adult daughter	b
18.	50	female	University degree	Non-environmentalist	Husband and adult son	a
19.	39	female	High school degree	Non-environmentalist	Tree children, husband, dog	b
20.	50	female	University degree	Non-environmentalist	Husband, teenage daughter	a
21.	49	female	University degree	Non-environmentalist	Wife, daughter	a
22.	54	male	University degree	Non-environmentalist	Son	a
23.	50	male	technical school degree (secondary special musical education)	Non-environmentalist	Wife, 2 sons, dog, cat	a
24.	40	male	University degree	Non-environmentalist	Wife, son	b

*Interviewees were offered choose between different statements regarding their income. All of them either choose one of the following options:

a) *We have enough money to buy all necessary goods and clothes, but for the bigger purchases we have to save first*
b) *We can buy most of durable products, but we cannot afford to buy an apartment*

The interviews were conducted in the residents' homes, but also via Skype, and several interviews were taken in the offices of respondents and in a café. The interviews were recorded and later the transcripts were made. Interviews were analyzed using the coding techniques (Auerbach & Silverstein, 2003)

Households in Moscow

In 2008 Russian president signed a decree according to which one of the strategic targets in Russia was to decrease energy intensity of the Russian economy by 40 per cent by the year 2020 and in 2009 among other measures to increase energy efficiency it resulted in the restriction of the sale of incandescent light bulbs with the capacity more than 75 watt.

This research analyzes the households in Moscow. All but one interviewee live in apartment houses that are provided with electricity, hot and cold water and sometimes gas. All flats have central heating system, and heating season starts around mid October and ends around end of April, depending on the weather. The price for heating is fixed for each apartment and the amount of heat that comes to the apartments usually cannot be reduced or increased by the residents:

> *In Russia we do not have personal one-apartment heat meters, the meters measure the total amount of heat necessary for the whole apartment building. The price for heating is calculated depending on the size of apartments. (Interview 1: male, 52)*

Each apartment is equipped with a simple electricity meter. There are water meters in some of the apartments, and in other there are no. If there is no water meter, the price calculated depending on how many people are registered in the flat. Several of interviewees noted that when they installed the water meter for their apartments, the water bills have been significantly reduced. Installing water meters was considered as a pattern of environmental behavior:

> *We installed water meters ourselves. There are 6 people registered in this flat, and we used to pay too much. We definitely do not use that much water and it was a pity to pay as much. (Interview 8: female, 38)*

There is almost no infrastructure for the garbage separation and recycling in Moscow. Even though in 2010 Moscow authorities introduced CFL recycling points in every district, respondents had little knowledge about them. There are several places in Moscow where one can bring toxic waste, plastic, glass and paper for recycling, but the information about their location first has to be found.

As we have seen, due to the lack of infrastructure environmentalism requires more efforts from individuals in Russia compared, for example to the EU countries. The frequent absence of the water meters and total absence of heat meters also can influence environmental behavior.

Findings

This research showed that domestic routines of most of the interviewees are shaped by various household technologies. It appeared that people with different environmental believes show diverse relations with domestic technologies, and indeed the process of mutual shaping in different forms takes place.

As a starting point for the analysis personal environmental beliefs or their absence were taken. Similarly to Barr et al. (2005) it was possible distinguish several types of environmental behavior. Out of the groups of described by these scholars the following group of people are identified in this study: committed environmentalists (6 of the interviewees), occasional environmentalists (7 interviewees) and non- environmentalists (11 of the participants of the research).

The main criteria for the group division were the amount of efforts and time that residents spend to reduce their environmental impact. Following the logic of Diekman & Preisendoerfer (1992) the residents who showed high cost environmental behavior (i.e. participated in forest cleaning evens, recycled their entire waste, etc.) were named committed environmentalists, while the ones who indicted the patterns of low-cost environmental behavior (for example occasionally recycle batteries and CFL, and safe water and electricity) were named occasional environmentalists. If there were no environmental efforts and values identified, the respondents were included to the group of non-environmentalists.

It appeared that technologies used by all types of interviewees can be divided into two categories: basic technology and moral (contemporary and efficient) technology. The latter type of technologies was "moralized" (Jelsma, 2006) by their designers, by inscribing scripts into them. Such technologies are modern, efficient and appeared to have different kinds of agencies towards their users. Unlike them basic technologies (such as old fridges, old washing machines, and heating systems) are usually non efficient, out-of-date, and were designed in order to fulfill their function, and do not have any moral significance.

In short, three groups of people have shown different relations with basic and moral household technologies:

- *Committed environmentalists, who* tended to make the functioning of both types of technologies more environmental.
- *Occasional environmentalists, for whom* the moral use practices of household technologies were usually ensured by moral technologies. Basic technologies in this case encouraged higher spending of recourses.
- N*on-environmentalists*, in relation to which on the one hand both types of domestic technologies appeared to be black boxes, hiding the consequences of their consumption for the environment. On the other hand, moral technologies encouraged this group of people to behave environmentally.

Committed environmentalists

As it was noted above committed environmentalists in this research are people who have strong environmental values. Some of them work in environmental NGOs, some participated in the

forest cleaning events, some consciously try to minimize their impact on the environment by not eating meat, and consuming as little as possible. Those are people who try to reduce their plastic consumption and recycle plastic, Tetra Park, and other recyclable waste. Usually this category of people would use energy efficient domestic appliances, and reduce the use of non ecological detergents. Domestic routines of committed environmentalist in a way differ from the routines of the rest of interviewees because they seem to be strongly shaped by their environmental values. Describing their consumption practices at home such people said they don't want to waste resources, and not because of economical benefits:

> *I try not to waste water, not to litter and not waste electricity because of my moral beliefs. Wasteful lifestyle is not godly, and this is enough for me. (Interview 3: male, 56)*

Committed environmentalists usually are able to see the consequences of use that technologies hide from us. For example in case with water supply the plumbing no longer a black box. People realize that before water comes to their home it has to be properly prepared:

> *We have to consume little water because it (water) needs preparation, it is a recourse, it does not come directly from the mountains, and it is specially treated at the wastewater treatment plant. So the less we use it the better it is. (Interview 1: male, 52)*

Because wasting energy and water is considered to be immoral or not rational, committed environmentalists tend to shape their washing routines to consume as little energy as possible. All of them said that they used more efficient regimes of the washing machines, contemporary washing powders and wait for the full load, and sometimes wash with hands, if there is only one piece to wash, instead of washing in the machine. In other words committed environmentalists usually follow the scripts of the washing machines that offer different energy and water savings regimes. Also they follow the scripts of the washing powders that tell to wash with lower temperature. In this case, technology helps to achieve the environmental behavior, chosen by the human actor:

> *I know that contemporary detergents wash effectively in any temperature therefore we try not to wash with the temperature above 30 degrees Celsius. So we never use the regimes of 40, 50, 60, 70 degrees. (Interview 1: male, 52)*

One interviewee showed how he shapes the electricity consumption of his fridge. He said that he regularly takes ice packs out of the freezer and puts them into the fridge. This is an example when human actor has the agency to shape the action performed by technology. Another interviewee tried to minimize the impact on the environment by being vegetarian and eating fresh food, and the consequence of this is the reduction of the fridge use, its size or even no fridge use at all:

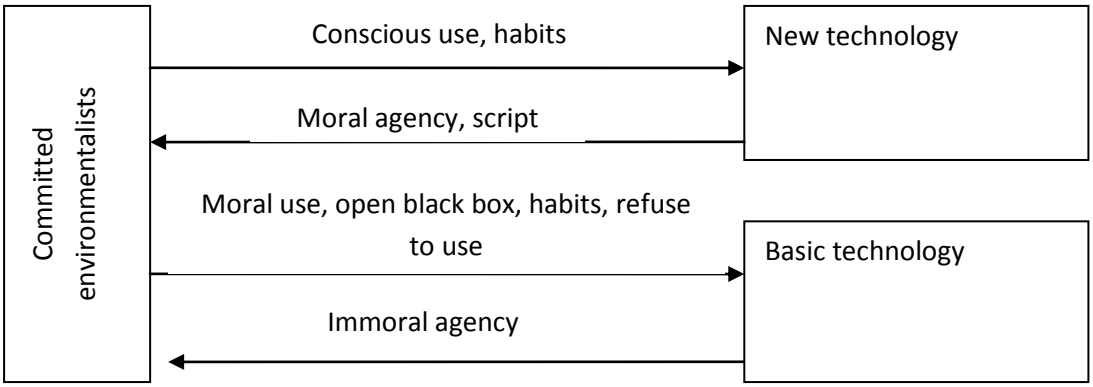
I have a fridge but I did not use it for some time. I kept my food on the balcony. It was in autumn. Soon I will be able to keep my food there again. If you are vegetation then you eat vegetables in summer, and they do not rot. (Interview 5: male, 29)

One can see that human actors have agency to shape the actions of technologies to become more environmental. Often technologies help humans to achieve this goal by having appropriate scripts. Moreover, sometimes committed environmentalists (due to different reasons) refuse to use some technologies. "I do not use microwave oven. I started to feel the taste difference if you heat on the stove or in the microwave. And later I learned that there is plenty of experimental data that is it very bad. (Interview 2: female, 27)" Similarly, several interviewees mentioned that they do not use electrical kettles: We do not have electric kettle and therefore I boil water in a regular saucepan. (Interview 4: male, 28)

Dealing with heating technology some of committed environmentalists try to shape its consumption if it is possible. For example they try to switch it off when it is too hot. *We can adjust the heating, but the payment will not be reduced. But I only learned about that this spring. I thought that I cannot adjust it but it turned out that you have to push the valve harder. (Interview 2: female, 27*) However, it is not always the case. Some of committed environmentalists claimed that their heating temperature cannot be adjusted and they open the window to have a comfortable temperature at home. In other words, if it is possible committed environmentalists shape technology by their moral use, however if not, they follow the script of immoral technologies.

Similarly to the findings of Crosbie & Guy (2008) committed environmentalists not always use energy efficient light bulbs: "We do not have energy efficient light bulbs at home because I don't like their light, it is white. We have incandescent lamps at home, they are yellow" (Interview6: female, 27). In this case immoral technology is used because the moral one does not have necessary properties. Still some other committed environmentalists claim to use energy efficient light bulbs. To go further this group of people shows the moral use of lightning technologies: they tend to switch off lights in unused rooms and install energy efficient light bulbs, which if broken they bring to a special place to recycle.

Figure 2. Co-shaping of committed environmentalist and technology



In several cases moral use of technologies is also explained by the habits of the residents. For example, discussing the time respondent keeps the fridge door open, he replied: *My grandmother taught me not to keep the fridge open for a long time. It is just a habit, but now I also know that one can harm the fridge if the door is opened for a long time. (Interview 5: male, 29)*

To sum this part up it can be seen that the process of mutual co-shaping of committed environmentalists and their household technology takes place as it is shown on Figure 2. Usually this group of people has moral use practices, in relation to both old and new technologies. In the human technology network moral agency belongs first to human actors and then later is delegated to non-human ones. However, in some cases not moral technologies were used, as in the case of incandescent light bulbs, where pro –environmental values were replaced by other such as creating cosines at home.

Occasional environmentalists

This group of people includes residents who even though are aware of environmental problems usually take little or no actions to reduce the impact of their consumption on the environment. The motives to save natural recourses are usually the economical benefits, rationality, health and habits, and rarely environmental concerns. Nevertheless, it is usual for this group to recycle batteries and CFL and occasionally show some other patterns of environmental behavior. Occasional environmentalists would like to do more for the environment, for example separate and recycle their waste if it would be more convenient.

> *I am concerned about waste recycling, to be more precise I am concerned about its absence. I think there is much to be recycled. If it would not be so complicated I would be ready to do this (recycle) (Interview 8: female, 38)*

This group of people occasionally shows patterns of environmental behavior. Even one person can in some routines show pro-environmental patterns while in the others not.

When I do the dishes I pour water in the sink, add detergent, wash everything, then rinse in the running water I believe that thus I follow some environmental rule...(Interview 10: male, 30)

When I take shower I do not turn off water no way! Our country is reach in water resources. Poor Africans cannot afford that. (Interview 10: male, 30)

Usually occasional environmentalists try to save water and electricity because they consider wasting those resources not rational and expensive and sometimes environmentally unfriendly. For example one interviewee said that: "*Since I was living with my parents I am used to turn off water when I wash my hair. Why shall I waste water? It is not rational, it comes from somewhere, it is being cleaned (*Interview 7: female, 26). *Another* respondent said that they bought energy efficient lamps *"in order to save energy, to pay less for the electricity" (*Interview 12: female, 49*)*

Technology for this group of people usually hides the consequences of their use for the environment. Occasional environmentalists are not really concerned where the water in their homes comes from, or how much energy their appliances consume. Still, as mentioned above they generally realize where their garbage goes, and most of them bring the dangerous waste to a special place instead of putting it into a regular garbage chute.

New technologies usually shape the environmental behavior of occasional environmentalists by encouraging resource savings. For example, the water meters make them aware of how much water is spent and encourages wasting less: *We installed water meters…now you realize how much water you spend and it appears to be less.* (Interview 11: female, 24). Similarly the fridge with the sound function has the agency to teach the human actor to waste less energy. The sound function ensures that the fridge is not being open for a long time.

> *Now my fridge does not make sounds, but in my parents' house it used to. Actually being taught by that fridge I try to close this one more often and not to leave it open for a long time, because I know that it really makes sound not just because, it needs to keep the temperature... (*Interview 11: female, 24*)*

Occasional environmentalists on the other hand also ensure that technologies that they use do not waste water and electricity. In their washing routines they usually wait until the full load or wash by hand if there is one piece to wash, usually they use the regimes of daily or fast wash, sometimes they are aware of the energy efficiency class of their washing machines. Usually this group of people reduces the temperature of their wash till 40-30 degrees C. So in the other words they shape the actions performed by technology by making them pro-environmental.

I try to have the full load of the washing machine; sometimes I use the half load regime. You have to choose this regime in the menu, everything is drawn there. Usually I wash with 30 or 40 degrees, as clothes are not that dirty to be washed by 90. (Interview 8: female, 38)

However this group of people in their domestic routines occasionally shows non - environmental behavior. The availability of technology encourages such type of behavior. For example this happens if the residents want to wash something, but don't wait for the full load. Still, they choose the regime that consumes less recourse than their usual regime. The new washing machines by having such regimes facilitate to waste less recourses:

When I needed to wash 2 t-shirts which were not that dirty, I choose fast cold wash, and washed them even without the washing powder. (Interview 10: male, 30)

Verbeek & Slob (2006) analyze such behavior as rebound effect. Even though technology was designed to increase efficiency of the daily wash and make it less resource consumptive, in reality it often becomes more consumptive because people start to wash more often.

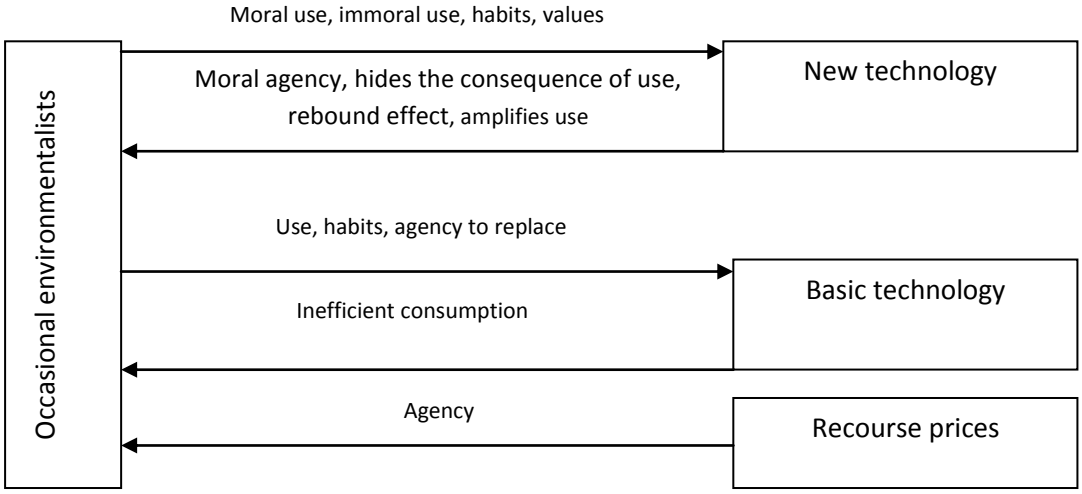
Occasional environmentalists recognize that technology can ensure their moral behavior and delegate some of their routines to technology. For example one interviewee declared that she does not trust her brother to wash the dishes as he wastes too much water:

When my brother washes one plate, he does it for a long time. And I start to grumble – we installed water meter! I think our dishwasher consumes as much water as he for one plate. It uses up to 40 liters of all the dishes … (Interview 7: female, 26)

Not only environmental values, technology, and high bills influence environmental behavior, but also habits play a great role there. Thus some of occasional environmentalists said that they always turn off the lights when they leave the room. Other said that they like when there is light everywhere, and technology makes this possible:

*I like when there is light everywhere and when I go from one room to another I don't have to switch it on and off. But I do not think that the lamps consume much electricity, I don't want to save on that. ((*Interview 12: female, 49*)*

Firgure3. Co-shaping of occasional environmentalists and technology



As it can be seen on the Figure 3 above, the actor network for domestic routines of occasional environmentalists consists of their values, technologies, habits, and prices. All those actors influence the behavior of this group of people. The agency to encourage moral behavior belongs to new technology, to the human actors and to the energy prices. People shape the performance of their technologies by for example waiting for the full load of the washing machine, and they also delegate moral action to technology as in the case with dishwasher.

Non-environmentalists

Non environmentalists in this research are people who did not really state that they try to protect environment. Even though every one of this group considers the environment in Moscow to be in a very bad condition, none of them wants to reduce the impact of their consumption for the environment. In case with non- environmentalists technology can hide the consequences of their use. For example, everybody from this group throws away the dangerous waste in the regular trash can near their houses. A typical answer to the question whether they personally do anything to protect the environment would be:

> *Nature has to be protected. But I don't do anything. Energy-saving light bulbs, in my opinion, shall be taken somewhere, but I do not do it, I do not know. (Interview 15: female, 54)*

So, it seems that non-environmentalists do not show any patterns of environmental behavior. They do not recycle and care about environment. Still, they try to reduce the consumption of resources mostly because of the economical reasons or their habits. Such people would say that*: "I try to save electricity and water, it is a habit, and penny saved is a penny earned" (Interview 20: female, 50).*Because of this reasoning such people install water meters sometimes use efficient light bulbs.

Technology seems to have agency to facilitate the savings. For example the water meters could encourage wasting less water. However, it appeared that several non-environmentalists do not install such meters because they use much water and do not want to limit this. In this case human actors recognize the agency of technology to shape their behavior and therefore do not want to have this technology.

> *We haven't installed water meters…they say that we will have to install ones by 2014. My boys like to take bath often, so it won't be profitable for us. But if we have to install the meters, they will take bath less frequently. (Interview 18: female,50)*

For many non - environmentalists technologies shape the comfort of their life and become a kind of amplifier (Midden at al, 2007). Due to technologies the behavior of residents becomes more resource – consumptive. For example, one of the interviewee described her cooking routines as a laboratory where she has all kinds of household appliances, two fridges and so on. She likes her household to be comfortable and cozy:

> *Besides all other appliances we have two fridges. We use their entire surface. We freeze the berries from our garden, also make fruit compote and store there. (Interview 15: female, 54)*

Basic technologies by being uncomfortable in some cases encourage the residents to install new and more comfortable devises. For example several of non-environmentalists confirmed that they changed their old radiators for the new ones that are equipped with valve to be able to control the temperature in their apartments. These interviewees complained about extra heat they got by the old radiators.

Technologies with environmental scripts such as fridges have moral agencies in relation to humans. Similarly to occasional environmentalists, non environmentalists learned to close the door of the fridge when it makes sound. One of the interviewee answering the question whether she keeps the door of the fridge open for a long time, answered that she keeps it open until it makes sound. Furthermore when she was asked how she reacts to this sound the interviewee said that

> *I close the door, I come there and close, because my kid sometimes does not close the door, or I take out a big saucepan, and bring it to the table, so if it (the fridge) starts to squeak, I come and close the door. (Interview 19: female, 39)*

Similarly new washing machine changed the washing routines of one of the non-environmentalist. This woman said that before she was using a very old washing machine, and washed in hot water. The interviewee admitted that her new washing machine taught her how to wash:

My new machine has different regimes, I am so happy, and everything is written there, I now learned how to wash properly, not everything in 90 degrees, now I can wash at30 and 40, (Interview 18: female, 50)

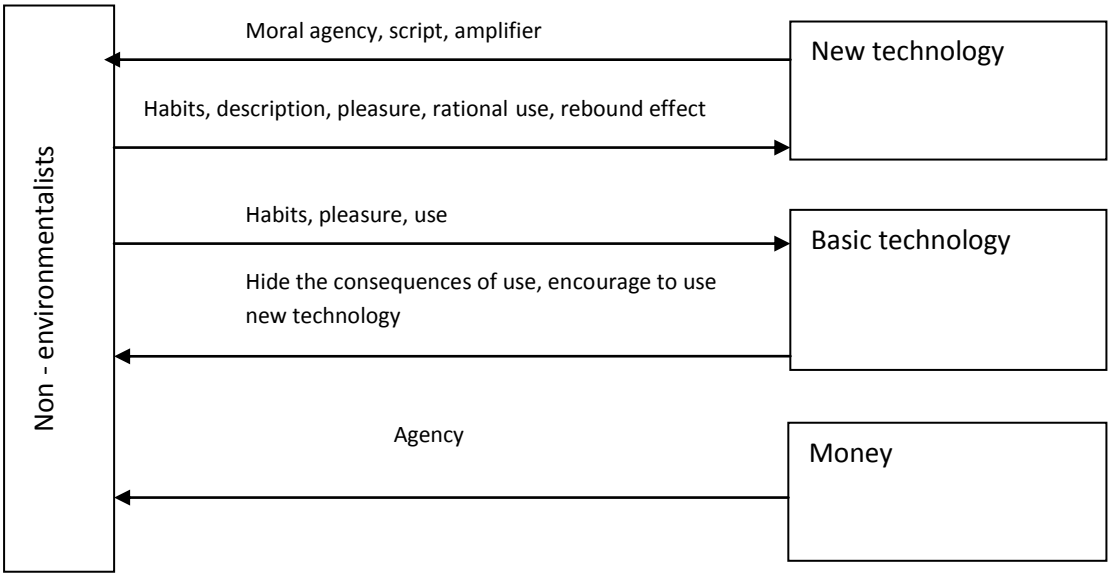
However, in line with the findings of Slob et al (1996) the amount of the washings that this interviewee does increased, but in this case it is because she has loved to wash with the new washing machine. So the interviewee also delegated agency to choose the regime to technology.

With my old machine my washing was not successful, and now I love to wash, and I do it often…you see what is a good technology, now I wash more often. There is a function 15 minutes for the things you wear for 2-3 days, the machine is so smart, it squeaks when the washing is ready so I come and take it out. (Interview 18: female, 50)

Delegation of agency to technology took place in the other case as well. Another interviewee delegated to her washing machine responsibility for the energy saving: "*I do not care about energy saving because my washing machine knows what program to choose". (Interview 20: female 50,)*

It can be seen that there is a process of mutual co-shaping of non-environmentalists and technology they use in their households. This shaping process is presented in the Figure 4 below:

Figure 4. Co-shaping of non-environmentalists and technology



In relation to basic technologies non-environmentalists appeared to have agency to replace such technologies by more efficient and therefore more moral ones. Basic technologies in their turn shape the consumption of resources by doing that not efficiently. Non-environmentalists turned out to have various relations with their new technologies. Firstly, they delegated the moral agency and responsibility to technology. And secondly, they learned some environmental behavior patterns from their technologies such as washing machines and fridges. This means that

indeed moral technologies have agencies to shape the moral behavior of their users. However, sometimes new technologies amplify the consumption of their users by shaping the comfort of their lives.

To sum up this part of the article we have seen how technologies shape the resource consumption and behavior of three groups of people that differ in the environmental values that they have. Also we have seen how users can shape the performance of their technologies. The scheme proposed in the beginning of the paper was adjusted for each of three groups of people and actors and agencies have been added. Now those three schemes seem to provide an overwhelming picture of the relationships between domestic technology and people. However this work has few limitations. Due to the qualitative character of this research it is not possible to identify all kinds of relations that people might not have with the technologies. Still the main trends in those relations can be analyzed in a qualitative study.

Discussions and implications

This research has studied the behavior of residents with different environmental values. It focused on technological artifacts and systems that are used in the households and studied their role in shaping environmental behavior. It also investigated how people shape the resource consumption of their technologies. Despite the limitations because of the qualitative character of the study it still pictures the main relations between users and technology in a typical big city household.

It turned out that the scheme describing relationships in the actor network of domestic routines that was offered in the beginning of the paper needs to be adjusted. First of all, it appeared that depending on the values there are three groups of human actors: committed environmentalists, occasional environmentalist and non-environmentalists. The groups differ in the efforts people make to protect the environment. While committed environmentalists participate in various environmental activities, occasional environmentalists only show the patterns of environmental behavior when this does not require much efforts. Non-environmentalists in their turn do not undertake any environmental actions.

To go further it appeared that there are more actors in the network that are shown in the scheme. Thus similarly to what Shove (2003) says, habits and comfort played a role in pro-environmental behavior. Often the habits of people were the only drivers for pro-environmental behavior, especially in the case of non-environmentalists. Similarly, comfort is a driver for a non-environmental behavior, for example when interviewees said that they do not feel comfortable or enjoy the light of energy efficient light bulbs. Surprisingly this was the case despite strong environmental attitudes of people.

Another actor in the network that was not mentioned in the beginning is the price of energy resources. In some case for non-environmentalists the high utility bills were the only reason to save water, and electricity. Interestingly enough no matter how high their income is, committed environmentalists did not claim economical benefits to be the reason for their sustainable consumption.

This research revealed many different roles of technology that were not considered in the beginning. It should be noted that technologies appeared to be either basic and usually inefficient or they appeared to be new and efficient. Basic technologies (e.g. central heating systems functioning since 1960-s) were called basic and they were designed when there were no ideas of sustainably and energy efficiency. New, or moral technologies (such as contemporary washing machines) were designed in recent decades and therefore are inscribed the values of sustainability and environmentalism as Jelsma (2006) shows.

In case with non-environmentalists technologies both encouraged and discouraged moral behavior. Basic technologies were often replaced by the new ones, which means that they had the agency to encourage those changes. New technologies were often used for comfort and coziness at home (Midden et al., 2007). Correspondingly, with the ideas of Swistera & Waelbers (2012) technological systems such as the waste managing one hide the consequences of consumption from the eyes of non-environmentalists.

Other new technologies that had strong environmental scripts had the agency to shape the behavior of humans. Thus many interviewees confirmed that their fridges by making sound make them close their doors. The washing machines often showed their users how they should be used properly. For example one of the interviewee said that such new machine compared to the very old one she had before taught her how proper washing should be done. Also these people used to delegate the responsibility for their actions and the choice of how much to consume to technology, because they declared that their smart technology "knows better".

For occasional environmentalists domestic technologies played multiple roles as well. On the one hand, new technologies also served as amplifier, for example, the washing machine with the function of everyday wash that lasts 15 minutes. Several interviewees admitted that they use the machine even if they need to wash one or two things, and they use this regime for this purpose. The agency of technology is dubious in this case: it is has the script for the fast wash but this implies more frequent wash. Verbeek & Slob (2006) describe such increase of use of an efficient technology as rebound effect.

Occasional environmentalists tend to choose their domestic appliances looking at their energy consumption and water consumption levels. They do it because they delegate to do some work to technology, for instance the washing up, and want to be sure that less water is wasted compared

to the situation when they wash the dishes themselves. Therefore, they recognize the agency of technology for to do environmental action.

Technologies that show the consequence of use (Swistera & Waelbers, 2012), for example, the water meters had the agency to encourage water savings among occasional environmentalists. Still, many of them declared to save water no matter if there is the meter or not.

Regarding committed environmentalists the agency for the environmental action usually belongs to the human actors. This group of people was able to open the black box of technology and became aware of the consequences of their domestic consumption. Therefore they shape the performance of their appliances to become more sustainable, as in the example of one interviewee who used to put an ice brick into his fridge to consume less energy. Still as noted above sometimes even committed environmentalists use inefficient technologies like incandescent light bulbs, which is totally in line with the findings of Crosbie & Guy (2008). This can be explained by the need of comfort.

To conclude this research has shown that environmental behavior is the outcome of the interactions of different actors in the network. Technological artifacts are inevitable actors in such networks, and they mediate and shape domestic routines. It became clear that non-environmental behavior of Russian residents is shaped by old and new technologies, which both on the one hand can encourage resource consumptive behavior, and on the other can trigger, and facilitate pro-evvironmental behavior. People can shape the performance of their technologies if they are aware of environmental problems and consciously use them. Therefore when discussing the reasons why people behave pro –environmentally together by other factors such as habits, financial reasons, etc., the agency of technology in shaping such behavior should be taken in consideration.

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E. Chernovich
Junior Research Fellow, Institute for Statistical Studies and Economics of Knowledge, National Research University Higher School of Economics, e-mail: echernovich@hse.ru

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