

**THE ATTITUDE OF THE ROMANIAN CONSUMERS REGARDING  
THE IMPACT OF CELL PHONES ON HUMAN HEALTH AND ON  
THE ENVIRONMENT**

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**Abstract**

*The paper analyses the Romanians’ attitude regarding the impact of cell phones on human health and on the environment.*

*We conclude how dependent Romanians’ are on mobile phones, they willing to buy the latest technical innovations, very few being those who prefer classic phones. It is surprising that in a civilized society there are still consumers who throw used mobile phones in the trash, without being aware of the danger of this gesture on the environment. It is needed the involvement of the government and of various civic organizations to increase the education level of the population, to have a more sustainable environmental behavior.*

**Keywords:** *health, mobile phones, environment, safety*

**JEL classification:** *M31, D18, I12, C10*

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**1. Introduction**

Mobile phones became available first in the United States in the 1990s, the mobile phone market increasing rapidly, all over the world. Because global cell phone subscription increased from 12.4 million in 1990 to 7 billion in 2013 and than from 7.9 billion in 2018 to 8.3 billion in 2019, cell phones have become an indispensable tool for a civilized life. Nowadays,

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around 90% of the adults from all over the world own or use a mobile phone. The number of mobile devices is forecast to grow to 16.8 billion in 2023 (www.statista.com, 2020).

While the number of users of cell phones is still growing, the time people use to spend on their phones is increasing. Cell phones bring a lot of advantages to our lives, but mobile phones industry generates health and environmental consequences, requiring public attention and scientific debate in the last years (who.int/mediacentre, 2019).

Mobile phones work by sending and receiving signals to and from the nearest base station, by using radiofrequency waves (RF). That means the radio waves produced by mobile phones try to find the nearest cell tower, some of them being directed at the people's body while using the phone, impacting in that way the natural environment, too. The impact of using mobile phones on the environment does not only refer to the link between the RF and the flora/fauna, but also to the metal or plastic components from which the phones are made, which, if not collected and recycled properly, can end up in the nature, generating long-lasting devastating effects on the environment. Furthermore, building every phone requires the polluting extraction of natural resources like gold, cobalt, copper, iron, aluminium, tin or lithium. When people mine for metals, it creates waste, more exactly mining waste, which look like mud, but it is a toxic substance, being a huge threat to ecosystems, hurting both aquatic and plant life. So, not only the human health might suffer from the permanently use of cell phones, but the equilibrium of Planet Earth too.

The objective of this paper is to analyse the Romanian population's attitude regarding the impact of using cell phones on human health and on the environmental equilibrium.

## **2. The impact of the cell phone use on human health and on the environment. A literature review**

Nowadays, scientists didn't know too much about the link between mobile phones, human health and the environmental equilibrium. Cell phones have only been widely used for about 35 to 40 years, these being the reason why nobody can be certain about the risks of long-term use.

Thousands of scientific studies have been conducted on the health effects of cell phone radiation since 1970, when the mobile phones production

started. In the last years, because of the rapid and growing climatic changes, researchers all over the world begun to study the impact of cell phone production and use on the environmental equilibrium, too.

### **2.1. The impact of cell phone use on human health**

Even if since the 1990s, a huge amount of scientific research has been done in order to find out the potential health effects of the mobile phone use, there's still some uncertainty regarding how safety is to use cell phones.

The reported health effects include cancer, impaired brain and nervous functions, head aches, sperm damages, DNA damage, neck pains, back aches, tinnitus, depression, behavioral problems in children, and so on. When people hold the cell phone next to the head or wear it on the body, they can absorb over 50% of the transmitted radiofrequency energy (RF) (Volkow et al., 2011).

Levels of exposure to radio waves from mobile phones are known under the name specific absorption rate (SAR). The units of measurement are watts per kilogram (W/kg) or milliwatts per gram (mW/g). The higher the SAR is, the more energy the body is absorbing.

There have been concerns that prolonged or frequent exposure to radio waves phones produce might be unsafe, causing various health problems, like cancer (especially brain cancer), infertility, and other disease. Frei et al. (2011) underlined that the International Agency for Research on Cancer (IARC) classified mobile phone radiation possibly carcinogenic, but to be sure of that, additional research into the long-term needs to be conducted.

A lot of population-based studies were carried out around the world on hundreds of thousands of human subjects in the last years, to determine if they exists a link between phone use and tumors. There are studies which show a dangerous link between the use of mobile phones and cancer, and others which are contrary with this theory.

Volkow et al. (2011) underlined the results of a U.S. study published in Journal of the American Medical Association which demonstrated that “just 50 minutes of cell phone use changes human brain glucose metabolism in the region of brain closest to the phone antenna”.

Frei et al. (2011) analysing a study involving 360,000 cell phone users in Denmark, found no association between cell phone subscription and the incidence of brain tumors.

A 2012 Swedish article reported a significantly increased risk of glioma associated with long-term (> 10 years) use of cell phones or cordless phones (Hardell and Carlberg, 2013).

A study involving 790,000 women in the United Kingdom in 2013 found no association between cell phone use and risk of brain or other cancer. But the researchers found a possible increased risk of acoustic neuroma in women who had used a cell phone for more than 5 years compared to women who never used a cell phone (Benson et al., 2013).

Hardell et al. (2011) underlined that “research data of the effects of wireless radiation on children is very limited”. A 2011 Swedish study suggested that people who start cell phone use before the age of 20 are 5 times more likely to develop a brain tumor. When it comes to children, health experts generally agree that children are more vulnerable to cell phone radiation. Children also have the potential of accumulating more years of cell phone exposure than adults do.

The Mobi-Kids study (2011) including 2000 young people aged 10-24 years with newly diagnosed brain tumors and 4000 healthy young people, found no association between childhood cell phone use and brain tumors (Aydin, 2011).

The main USA agencies that classify cancer-causing exposures, like the US Environmental Protection Agency (EPA) and the National Toxicology Program (NTP), have not formally classified cell phones as to their cancer-causing potential. Several other agencies like, for example FDA and CDC do not have scientific proves to link the health problems to cell phone use, underlining the need of more research (Volkow et al., 2011).

The Mobile Telecommunications and Health Research Programme (MTHR) released two reports, one in September 2007 and one in February 2014 (completed in 2012), which pulled together the evidence gathered in a large programme of research (done by the Advisory Group on Non-Ionising Radiation (AGNIR) and the Million Women Study). The reports published by the MTHR found no evidence of risks to health from the radio waves produced by mobile phones. But it was acknowledged that possible effects from long-term use could not yet be ruled out and further research was recommended.

In the Cosmos study launched in Europe in March 2010, scientists from the UK, Denmark, Sweden, Finland and the Netherlands are monitoring

almost 300,000 mobile phone users in Europe to identify possible health problems linked to the use of mobile phones over a long period of time.

The Interphone study (2000) collected data in 13 countries, to see whether mobile phone use is associated with an increased risk of head and neck tumors. The results indicated there was no increased risk of such tumors with mobile phone use. But the potential effect of long-term heavy use of mobile phones needed further investigation (Swerdlow et al., 2011).

The FDA's doctors, scientists and engineers continually monitor the scientific studies and public health data for evidence that radio frequency energy from cell phones could cause adverse health effects. The FDA will continue to monitor scientific information also regarding the potential impact of the controversial 5G. In 2018, the National Toxicology Program (NTP) published the results of two hazard identification studies conducted at the request of the FDA. The conclusions relating to public health risks reached by the FDA's scientists differ from those of the NTP, because this study did not demonstrate that cell phones cause cancer ([fda.gov/radiation](https://www.fda.gov/radiation), 2021).

In summary, the data published in that field in the mainstream media in the period January 1, 2008 to May 8, 2018 shows that there is no credible scientific evidence or causal link between RF exposure and cancer. The World Health Organization sustains also that a large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, no adverse health effects have been established as being caused by mobile phone use ([fda.gov/media](https://www.fda.gov/media), 2021).

In summary, most published studies have not found a link between cell phone use and tumors. However, these studies have had some important limitations. First, the studies do not follow people for very long periods of time. Secondly, mobile phone usage is constantly changing, and children's lifetime exposure to the energy from cell phones will be greater than of adults', who started using them at a later age.

In summary, the present existing scientific evidence can not prove whether cell phone radiation is harmful to humans.

## **2.2. The impact of cell phone industry on the environment**

In the last years, a lot of studies worldwide investigated how cell phones impact the environment. But the number of these studies is lower than

the researches which analysis the link between cell phone use and human health.

When we study the impact of cell phone industry on the natural equilibrium, we have to point out three global tendencies:

1. How the growing consuming trend of mobile phones determine an increasing trend of exploitation the rare natural raw materials (natural resources) needed in the industrial process of those devices?

2. How the wastes from old mobile phones impact the environment?

3. What is the effect of radiation and electromagnetic fields emitted by the mobile phones on the global flora and fauna (wildlife)?

Regarding the above mentioned first tendency, we have to underline that at the middle of 2021, the number of smartphone users in the world was 3.8 billion and 4.88 billion users had mobile phones, which means 48.20% of the world's population for smartphones and 61.90% of people which own mobile phones nowadays (bankmycell.com, 2021).

This is an environmental disaster, because building every phone requires the polluting extraction of elements like gold, cobalt, copper, iron, aluminium, tin or lithium. All phones require around 16-17 rare-earth materials. Those metals come from mines in Brazil, Peru, and China. Mining is unhealthy for the environment, because besides contaminating the atmosphere, the process destroys ecosystems and generates toxic byproducts which seep into the soil, water and finally, in the natural ecosystems. In addition, the extraction process generates mercury and cyanide waste which contaminates river systems and drinking water. Mining in the above mentioned countries means also deforestation, translated in more carbon in the air, with negative impact on the global climate change (bbc.com/future, 2021).

Byrne and Hudson (2018) underlined that around 80% of each cell phone carbon footprint is generated at the manufacturing stage. This is due to the mining, refining, transport and assembly of the dozens of chemical elements that make up cutting-edge tech: iron for the speakers and microphones, aluminium and magnesium for the frames and screen, copper, silver and gold for the electronic circuits, graphite and lithium for the batteries, silicon for the processor, and lead and tin for the solderings. Smartphones generate more greenhouse gases than any other consumer electronic devices. This sort of industrial activity is a global problem which

affects people, as well as ecosystems. So, the production process of cell phones is unsustainable.

After calculating the carbon footprint of devices such as mobiles, laptops, tablets and desktops, scientists came to the conclusion that these are damaging the environment and will have the biggest carbon footprint in the tech industry by 2040.

Regarding the above presented second issue we have to mention that mobile phones are damaging badly the environment, when after a short life people replace the old devices with new phones, sending the old ones to the landfill. An average consumer switches phone every two years, generating toxic waste and squandering materials. Even after these devices are thrown away, toxic metals in phones will continue to contaminate water and soil if they end up in landfill sites, where harmful chemicals can leak into groundwater and affect both human and plant life. Only in 2020, 12 millions tons of landfill waste was provided by cell phones.

While there are a huge number of scientific studies which analysis how cell phone consume impact human health, they are lack of studies concerned with how RF waves might influence the flora and fauna all over the world. The use of cell phones has increased the health risks among living organisms including animals and plants. For example, as many other species, honeybees are becoming extinct in the world; this phenomenon is called the Colony Collapse Disorder. Many reasons have been proven to be behind this environmental disaster like climate changes, pesticides, fungal pathogens and others, especially, since in recent years wild life has been exposed to microwaves and radio frequencies' radiation signals from various sources, including wireless phones. Radiations generated by mobile phones' antennas disturb the life cycle of honeybees and affect their reproduction system and honey producing, more exactly the honeybees' whole life system (Nashaat et al., 2014).

Sharma et al. (2010) demonstrated that cell phone radiation influences honey bees' behavior and psychology, reducing the activity of worker bees followed by a masse migration and movement toward the cell phone.

There are also studies which show the negative effects of electromagnetic waves emitted from mobile phones on germination, root growth and mitotic division of root of *Lens culinaris Medik* (Akbal et al., 2012), or on different types of beans (Hsuan-Yu and Chiachung, 2014).

We can conclude that smartphone technology is impacting both, humanity and the environment. To reduce the environmental and health risks of mobile phones, it is needed to put an accent on sustainability, more exactly on energy consumption, recycling, reusing and take back, in order to mitigate and minimize the negative impacts of mobile phones. Sustainable strategies are needed in guiding consumer intentions to use mobile phones with minimum risks to health and environment (Velmurugan, 2016).

In our opinion, to lower the negative impact of this technology on the environment and human life, both, consumers and industry have to change their behaviour in order to become more sustainable. First, consumer should take care of the devices, and if something on a phone breaks, he should repair it instead of buying a new one. When it's time to get a new phone, consumer should recycle their old phone instead of throwing it away. But this is not enough. The current industrial manufacturing quality standards of these devices must be regulated so that a new phone must last for more than 2 years. A way to save planet Earth is keeping the cell phone longer (treehugger.com, 2021).

### **3. Research methodology**

The present study is limited to the West Region of Romania and the sample consists of clients of some mobile phones companies, able to help us to understand the mobile phone industry - consumers' health - environment relationship.

The purpose of the survey was to get an understanding of the Romanian consumer's position regarding the cell phone safety, and the impact of the mobile phone industry on the environment. The interview was conducted with questions covering consumers' habits and knowledge regarding the environmental/health concerns of cell phones.

#### **3.1. Materials and Methods**

14 questions were distributed directly to 200 consumers' from the West Region of Romania, in May 2021, to explore the consumer's attitude and position regarding the social and environmental impact of the mobile phones industry. We had a direct contact with the consumers.

We considered education and age as being primary influence factors in explaining the consumers' behavior in that field. Gender and provenience

are secondary determinants, but they are not the only ones. The consumers perception on mobile phone safety, the level of trust in the safety of cell phones, the environmental consciousness are determinants which influence the consumers' attitude regarding the impact of cell phone industry on the consumers' health and on the environment. We will use descriptive statistics to draw up some conclusions obtained from the respondents' answers, aggregated from the questionnaires.

The motivation of each question is, as follows. The first 5 questions underlined the relevancy of mobile phone companies, brand, and average screen time spent daily at phone. Questions 6 and 7 intend to test if consumers are cell phone dependents, while questions 8, 9, 10, 11 aimed the impact of the mobile phones use on human health and on the environment. The last questions intend to highlight how education, age, gender and provenience of the respondents may influence the consumer's position regarding the analysed aspects.

**Table no. 1: The respondents' attitude regarding mobile phone safety**

<b>The surveys questions</b>	<b>Variables</b>
1. The name of the used network	46% <i>Orange</i> 21% <i>Vodafone</i> 18% <i>Telekom</i> 15% <i>RDS</i>
2. The phone brand	<i>Samsung with 39%</i> <i>iPhone with 38%</i> <i>Huawei with 23%</i>
3. How many mobile phones do consumers own?	83% <i>only one</i> 12% <i>two</i> 5% <i>more than two</i>
4. Do Romanian consumers prefer classic or touch screen mobile phones?	97% <i>prefer touch screen phones</i> 3% <i>prefer classic phones</i>
5. Average screen time spent daily at phone?	5% <i>less than one hour</i> 80% <i>between 2-3 hours</i> 15% <i>more than 3 hours</i>
6. Do you think your phone creates addiction?	60% <i>answers with yes</i> 29% <i>answers with no</i> 11% <i>didn't know</i>
7. Did you know that cell phone addiction causes a disease called <i>nomophobia</i> ?	98% <i>incompletely informed</i> 2% <i>totally informed</i>
8. Did you know that exposure to cell phone radiation can pose a health hazard and harm the environment?	78% <i>yes</i> 12% <i>no</i> 10% <i>don't know</i>
9. How dangerous do you think the use of a mobile phone is for your health?	43% <i>considers cell phone very dangerous</i> 39% <i>dangerous</i>

	<i>18% very little harmful</i>
10. How often do you buy a new mobile phone?	<i>35% yearly 45% at two years 5% several times a year 15% at four years</i>
11. Where do you throw your used mobile phone?	<i>38% in the electronic waste collection box 18% in the trash 0% in the middle of nature 24% other variants</i>
12. Age	<i>18-25 with 48% 25-35 with 30% 35-45 with 11% 45-60 with 8% &gt; 60 with 3%</i>
12. Gender	<i>123 male 77 female</i>
13. Provenience	<i>41% urban 59% rural</i>
14. Education	<i>55% high education 45% medium education</i>

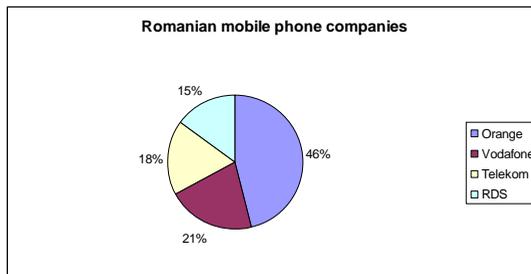
Source: Authors' own contribution

### 3.2. Results

The results of the questionnaire confirms that people are aware of the dangers that mobile phones cause to their health and the environment, but this fact does not stop them from using them daily.

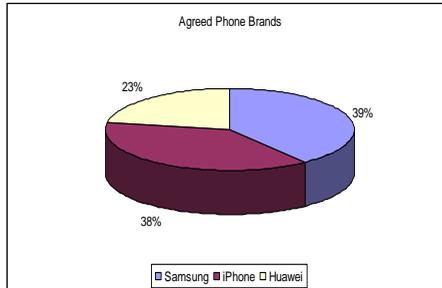
The first question in the questionnaire refers to the type of network used. The mobile phone company preferred by the majority of the Romanians is Orange (46%), followed by Vodafone (21%), Telekom (18%) and RDS (15%).

**Figure 1: Preferences for Romanian mobile phone companies**



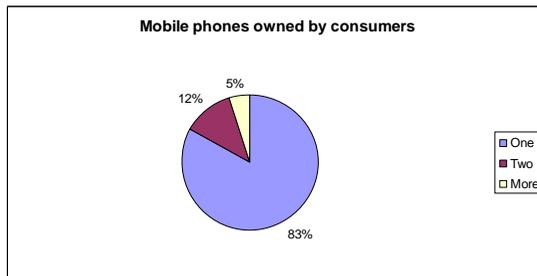
The next question refers to consumers' preferences regarding the phone brand. The most agreed phone brand is Samsung (39%), iPhones (38%) and Huawei with 23%.

**Figure 2: Mostly agreed phone brand**



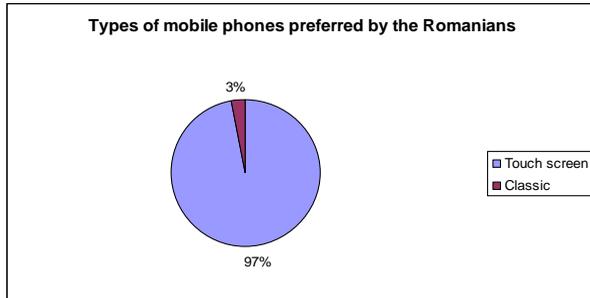
From the point of view of the number of mobile phones that consumers in general have, the greatest part of the consumers own only one mobile phone (83%), two phones (12%) and more than two (5%).

**Figure 3: Number of mobile phones owned by the Romanian consumers**



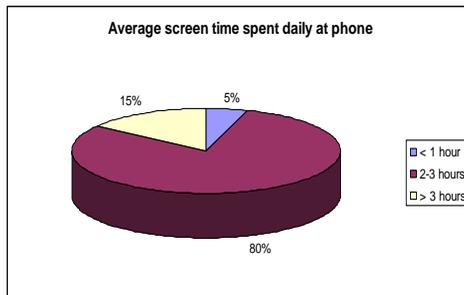
As performance and design, 97% of the Romanians prefer phones with touch screen, while 3% prefer the classic one.

**Figure 4: Types of mobile phones preferred by the Romanians**



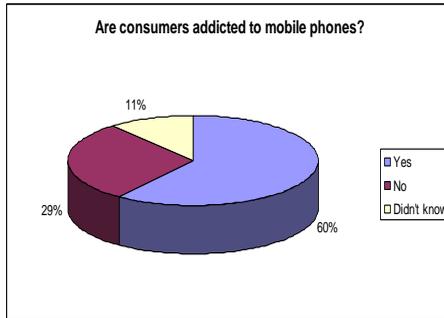
Regarding the question about the time spent in front of the mobile phone, 80% of the Romanians use to spend daily 2-3 hours with cell phone conversations, 15% more than 3 hours and 5% less than one hour.

**Figure 5: Average screen time spent daily at phone**



If we analyze the consumers' dependence on using the mobile phone, 60% of the consumers are sure that cell phones creates addiction, 29% didn't believe in mobile phone addiction, while 11% didn't know what to believe.

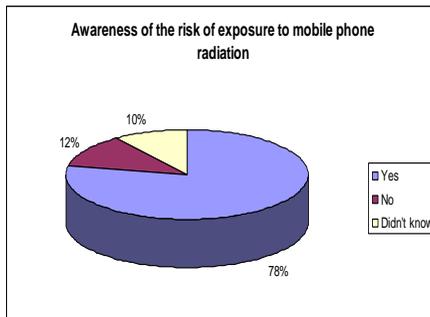
**Figure 6: Romanian consumers' addiction to mobile phones**



Only 2% of the respondents are totally informed regarding the disease called nomophobia, while 98% of consumers have never heard about nomophobia.

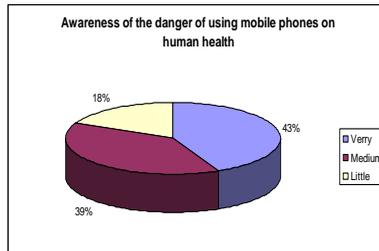
Regarding the health and environmental hazards generated by the radiation emitted by mobile phones, 78% of the consumers know that exposure to cell phone radiation can pose a health hazard and harm the environment, 12% refuses to believe in health hazards, while 10% didn't know the answer to that question.

**Figure 7: Awareness of the risk of exposure to mobile phone radiation**



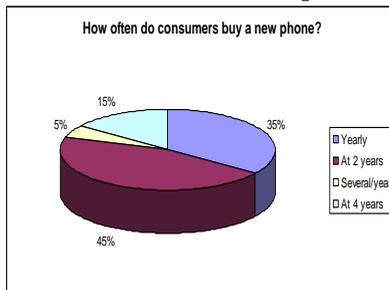
43% are aware that mobile phone radiation is very dangerous on people's health, and 39% think that radiation are medium dangerous.

**Figure 8: Awareness of the danger of using mobile phones on human health**



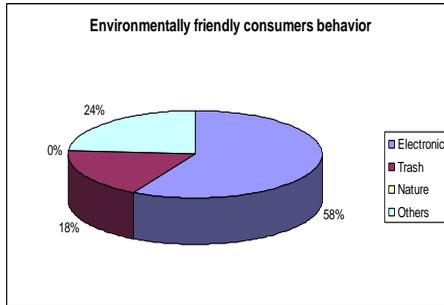
45% of the consumers use to buy a new phone once in two years, 35% acquires an new phone yearly, 5% several times in a year while 15% once in four years.

**Figure 9: Consumer habits related to the purchase of new phones**



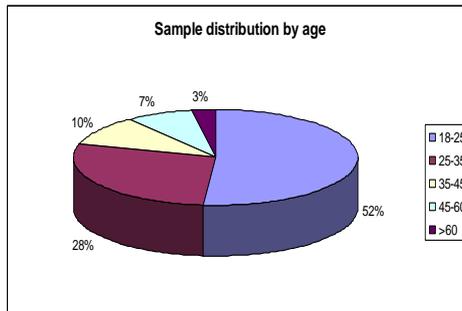
58% from the respondents have an environmentally friendly behavior when throwing away cell phones, while 24% are not worried about the impact on the environment.

**Figure 10: Environmentally friendly consumers' behavior**



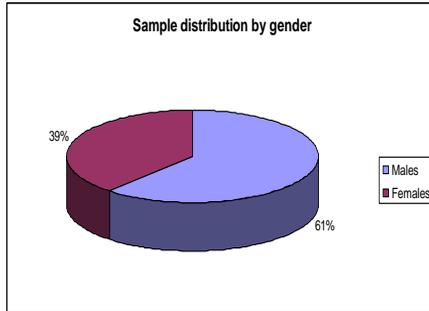
From the total number of the respondents, the predominant age segment is 18-25, with 48%, 30% being adults with the age 25-35, 11% adults with the age 35-45, and 8% age 45-60.

**Figure 11: Sampe distribution by Age**



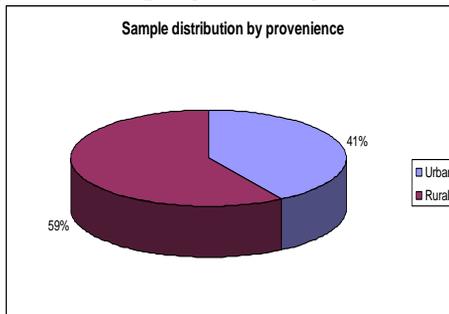
123 males and 77 females completed the survey, which means 61.5% of the respondents are males and 38.5% females.

**Figure 12: Sample distribution by Gender**



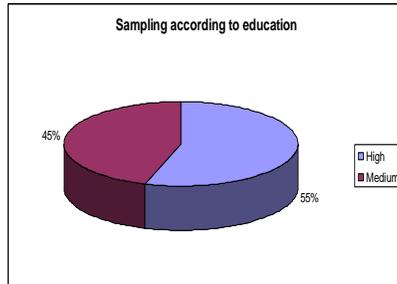
41% of the respondents are living in urban area and 59% in the rural area.

**Figure 13: Sampling according to Provenience**



55% of the respondents have high education and 45% medium education.

**Figure 14: Sample distribution by Education**



From the survey we conclude how dependent Romanian consumers are on mobile phones, despite the awareness of a large part of them of the negative impact of radiation emitted by mobile phones on human health and on the environment. Romanians always seem willing to buy the latest technical innovations, very few being those who prefer classic phones (3%). It is surprising that in a civilized society there are still consumers who throw used mobile phones in the trash (18%), without being aware of the danger of this gesture on the environment and human health. For the most Romanian mobile phones consumers', environmental and health impact does not change their consumer attitude, because 35% of the consumers use to buy yearly a new smartphone. From the above mentioned reality we can draw the conclusion that it is needed the involvement of the government and of various civic organizations to increase the education level of the population, to have a more sustainable environmental behavior.

#### **4. Conclusion**

As depicted in this paper, many unknown health and environmental impacts are related to the use of cell phones. Mobile phones may be harmful to the environment and health, and waste disposal issues may be associated with its discharge of radiation.

Concerns have been raised recently about the sustainability of mobile phones and its effects on people's health and the environment. We are in the eage of technology development and digitalization, including the telecommunications branch, which means that we will always have now types of cell phones on the market, more efficient and practical, making consumers curious and eager to always buy the latest generation of cell phones. But we

still want to attract attention on the hidden dangers regarding their excessive use; that's why consumers must be fully informed before buying a new device.

From the analysis of the answers we can conclude that the new generation of mobile phones which emit more radiation thus being more harmful for the consumers health than the older phone generation, are in the top of consumers preference. Some of these consumers are aware of the dangers they are exposed while using them and how harmful they are to the environment. As an important result of the survey we conclude that, the environmental impact of the cell phones industry is less visible among the Romanian consumers'. A way to reduce the negative environmental impact of smart phones is to recycle them at the end of their lives cycle.

We concluded how dependent Romanian consumers are on mobile phones, despite the awareness of a large part of them of the negative impact of radiation emitted by cell phones on human health and on the environment. We believe that knowing the direct health impacts of mobile phones on consumers' would impact positively the consumer shopping attitude and behaviour.

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