ICT's Environmental Impacts In light of the Algerian Legislation

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Abstract:

The Information and communication technology (ICT) is very necessary in modern life as it is used in various Domains nowadays, in Addition to its rapid development. Thus, normally, the use of ICT must have its impacts on our environment just like every other technology, as it leads to a diminution of efforts, times and distances through what it offers.

This study focuses on two main types of negative ecological impacts of this technology, namely: The electronic waste problem coming from technological equipment, and the electromagnetic pollution resulting from phone base stations, by stating the position of the Algerian legislator from these.

The use of Information and communication technology also results in positive ecological impacts when its use contributes to the protection, preservation and improvement of the environment. This study addresses some of them, namely: its use in raising awareness and environmental culture, environmental monitoring and smart buildings.

Keywords: Technology; Information; Communication; Environment; Impacts.

Introduction:

Environmental subjects are of public interest in the last few decades of the 20th century on both the national and international levels, as it is of deep relation with human life and his fate in the present and the future. The right for a safe environment has become one of human's most crucial rights stated in many international texts, constitutions and laws of most countries.

The protection of this right involves facing contemporary ecological problems that threaten all kinds of life on planet Earth, due to the rapid evolvement of sciences and technology and its effect on production and consumption. The course that this evolvement has taken in general, and in the industrial side in particular contributed to providing a more luxurious life for individuals, especially in the developed world, but it is considered one of the biggest reasons for environmental degradation. Where factories use a huge amount of natural resources in order to raise production and achieve more profits, leading to the depletion of these resources on one hand, and the spread of environmental pollution on the other.

The technology of information and communication takes up a big part of the scientific development that humanity has reached as it created a revolution in modern life, where it is commonly used in various domains, which led to big impacts on the environment and human health.

In light of this context, this paper entitled **"ICT's Environmental impacts in light of the Algerian Legislation"** treats the following problematic:

Do negative impacts of information and communication technology on the environment form a barrier against its use in a protective way that preserves and improves environment?

To answer the problematic, and the questions that come with it, this study treats two main axis, namely:

SECTION I: General concepts on ICT and the environment.

SECTION II: The environmental impacts of ICT.

SECTION I: General concepts on ICT and the environment

The relation between ICT and the environment is considered a new subject that first requires the treatment of some general concepts in order to distinguish and understand terms and expressions used in it, and to erase the mystery that may exist around them. In this section, we will talk about both concepts, the technology of information and communication, and the environment.

1. The concept of information and communication technology:

Human life has been associated since antiquity with development in various fields, and with time passing, humans were able to overcome many of the difficulties encountered in their continuous quest to meet their needs. Among the aspects of contemporary development is what we know today as information and communication technology, which is witnessing great use, and diversity, where it is the most influential and directing to human life. In order to understand this concept, we first deal with its definition, and then move on to some of its characteristics.

1.1- The definition of the technology of information and communication (ICT)

This concept is formed as obvious of three main terms: Technology, information and communication. Thus, we will first deal with each term then treat the definition of the subject as a whole.

A. Technology:

It is a Greek word formed of two parts: the first one is "**Techno**" which means a craft, skill, or art, and the second: "**Logy**" means science or study. The combination of the two syllables results in "**Technology**" meaning the science of making systematic knowledge in the arts of applied science. (ZIMAM & SOLEIMANI, 2013, p. 156)

Technology can be defined as the technique of production methods or the outcome of technical or scientific knowledge related to the production of goods and services, including

production tools, generation of energy, extraction of raw materials and means of transportation, it is sometimes called applied science.

B. Information:

Knowledge obtained from investigation, study, or instruction. (MERRIAM_WEBSTER, s.d.)

Ibrahim Imam defined information as the dissemination of facts, news, ideas and opinions through various media. (ABU MINSHAR, 2017)

C. Communication:

A process by which information is exchanged between individuals through a common system of symbols, signs, or behavior. (MERRIAM_WEBSTER, s.d.)

Muhammad Abdul Hamid defines it as "the social process by which information, opinions and ideas are exchanged in symbols between individuals or groups within society, and between different cultures, to achieve certain goals". (SULTAN, 1437 hi - 2016m, p. 7)

D. The technology of information and communication:

Based on the definitions of the previous words, we can define information and communication technology as the technology by which facts, news, ideas and opinions are published and exchanged between individuals or groups within society, and between different cultures through various written, audio, and visual media, and others.

The climate team mandated by the Global Initiative for Electronic Sustainability to prepare a report on enabling a low-carbon economy in the information age defined it as "a set of devices and services that capture, transmit and display data and information electronically, including personal computers and their peripherals, broadband communications networks and their devices and data centers". (DICKERSON, TORRES, & Others, February 2011, p. 2)

This definition is consistent with the World Bank's definition of information and communication technology, which was "It

consists of hardware, software, information networks, and media to collect, store, transmit, process and display information in the form of voice, data, text, and images, ranging from telephone, radio and television to the Internet". (SULTAN, 1437 hi - 2016m, p. 7)

1.2 The characteristics of Information and communication technology:

The technology of information and communication has a set of characteristics, some of which are. (MUETAA, 2011-2012, pp. 9-11):

A. The conservation of time and effort, and the limitation of distances, that is due to the artificial intelligence included in this technology that processes information and data automatically, erasing time differences and distances between individuals, making distant places that are connected electronically somehow neighboring. In addition to its global scope, that allows the easy flow of information across the world, without the restrictions of existing borders.

B. Interactivity and asynchrony, that is, the possibility of the recipient of information to be a sender at the same time, moreover, the presence of the recipient is not required at the moment of sending messages, in addition to the ability to receive those at appropriate times for users.

C. Transferability, which is the ability to convert information from one form to another, such as converting audio information into written information.

2. The concept of the environment:

To understand the concept of the environment fully, we addressed it by definition, and then we addressed the elements of the environment and environmental pollution.

2.1 The definition of the environment:

We have to distinguish between "Ecology" and "Environment". As the first is concerned with the study of living conditions and the interaction between living organisms and their environment, while the environment is the field of our research, which we

address by definition from a legal and jurisprudential point of view. (Dictionary of the environment, s.d.)

A. The legal definition of the environment:

The French legislator defined it in Article 110 Paragraph 1 of the Law of July 10, 1976 relating to the protection of nature as: "Space, resources, the natural environment, landscapes and scenery, purity of air, species of animals and plants, biological diversity and balance, all of which form part of the nation's common heritage". (French Law n° 76-629 of July 6, 1976).

As for the Algerian legislator, in the seventh paragraph of Article 4 of Law 03-10 of July 19, 2003 related to the protection of the environment within the framework of sustainable development. It is mentioned that: "The environment consists of abiotic and biotic natural resources such as air, atmosphere, water, land and subsoil, plants and animals, including the genetic heritage, and the forms of interaction between these resources, as well as places, landscapes and natural features. (Algerian law n° 03-10 of July 19, 2003)

Here it becomes clear that legislations in general did not provide a definition of the environment, but merely mentioned its elements.

B. Jurisprudential definition of the environment:

As for legal jurisprudence, jurists differed about the possibility of developing a specific legal definition of the environment, as it is a value that law aims to protect and preserve, some did not hesitate to consider it without a meaning because it means everything. (LAKHAL, 2012, p. 223).

Michel PRIEUR considers it an unsteady, changing and colorful concept, as it means quality of life, luxury, natural resources, landscapes, urban and architectural heritage, and the urban environment, all at the same time. (ITOUROU SONGUE, 2021, p. 1).

DESPAX goes on to consider the environment for the jurist: a kind of mercury that cannot be perceived, disappearing whenever one thinks he has caught it. (LAKHAL, 2012, p. 224)

2.2 Elements of the environment:

The environment includes two main elements: the natural element and the human element.

A. The natural element: It is everything in the environment that man has not directly interfered with. (ASHAOUI, 2010, aljazayir, p. 17)

B. The human element: Lies in the means and tools invented by man to extend his sovereignty over nature and the institutions and social systems that he built, it is the method by which human societies organize their lives by adapting the natural environment to their advantage and to meet their various needs. (ASHAOUI, 2010, aljazayir, pp. 17-18)

2.3 Environmental pollution:

The Algerian Law on Environmental Protection 03-10, previously mentioned on the eighth paragraph of its 4th Article, defines it as every direct or indirect change to the environment caused by any action that takes place or may cause a harmful situation to the health and safety of humans, plants, animals, air, atmosphere, water, land and property, whether it is collective or individual. (Algerian law n° 03-10 of July 19, 2003).

Environmental pollutants can be classified into five main categories:

A. Organic pollutants that are degradable into their raw materials such as sugars, proteins, etc.;

B. Organic pollutants that have great ability to settle, which do not decompose in the environment for a long time, such as hydrocarbon-chlorinated pesticides. The easier their decomposition is, the less damage they cause;

C. Toxic elements such as heavy metals that do not decompose, for example: lead and mercury;

D. Organisms that cause disease to humans and animals.

E. Physical and chemical pollutants such as nuclear radiations, electromagnetic fields, heat and noise.

SECTION II: The Environmental Impacts of ICT

The information and communication technology is witnessing a rapid development and a wide use in various fields. As much as it provides of services to humanity, and what it saves of time, energy and efforts, in addition to its facilitation of communication and data gathering, its use has many big impacts on the environment, as it has a positive and a negative side to it at the same time.

1. The negative impacts of ICT on the environment:

The revolution made by information and communication technology in the lives of societies has not been of all good achieving prosperity at all levels, as it has caused dangerous negatives impacts on the environment and on public health, those of which can be limited to two main elements: Electronic waste, and electromagnetic pollution.

1.1- Electronic waste:

The electronic waste of information and communication technology is set to three main categories. (HOSNI, 2016, p. 36)

A. The waste resulted by industry and production operations which contain a lot of plastic and metal materials, glass, oils and greases containing heavy metals such as lead, cadmium, nickel, zinc, gold, silver, and others.

B. Use waste, such as batteries, charging cards and other expired parts.

C. Expired devices that can no longer pace with the technological development and contemporary needs in the field of information and communication due to the rise of new devices that are more effective and developed.

The negative impacts of electronic waste lays in their improper disposal, such as resorting to burning them in the air, or disposing them like regular garbage, or in water circles, this leads to

dangerous emissions of their harmful components to natural environment and public health.

According to **Consoglobe Planetoscope** website of global statistics, 53.6 billion Kgs of electronic waste were produced in 2019, with a rate of 7.5 Kgs per individual and 1.4 tons produced every second. In addition, according to the International Union of Telecommunication, 80% of 44.7 Million tons of electronic and electric waste are ditched or burned without recycling. Moreover, in Europe, only 1/6 of this sort of waste is handled correctly from a total of 12.3 million tons although they contain valuable materials such as Gold, Zink and Copper. As the worth of thrown waste in Europe is estimated to be 48 million Euros every year despite the harmful components it contains such as Chrome and Mercury. (Planetoscope, s.d.).

Till nowadays, no legislative texts related to the disposal and treatment of electronic waste were published in Algeria, in light of the prevalence of the consumption culture among citizens, and their ignorance of the extent of danger of such waste, which is disposed in random ways, leaving serious impacts on the environment and public health.

1.2- Electromagnetic pollution:

Electromagnetic pollution is considered one of the biggest negative impacts of information and communication technology on the environment, because of what results from phone base stations and used devices of electromagnetic waves, added to waves resulting from high voltage power lines. In addition, humans, plants and animals have a high percentage of water in their bodies, thus, they are considered some of the most absorbing mediums of these waves that harm the environment and health.

The World Health Organization indicated in 2006 that the prevailing concern about cellular telephone stations and local wireless communication networks was caused by the belief that there could be long-term health damages resulting from long exposure to electromagnetic waves. (Organization, World Health, s.d.)

On September 13, 2017, 170 scientists from 37 countries gathered to demand a voluntary halt to marketing the 5th Generation of mobile phones, due to the significant increase in exposure to electromagnetic fields, which will add on to the electromagnetic fog emitted by the spread of previous generations (2nd, 3rd, 4th and Wi-Fi). These scientists are hoping to persuade stakeholders to stop marketing 5G immediately until serious and independent studies are carried out on its impact on health and the environment. (CHONÉ, s.d.).

These scholars' call constitutes an honest and explicit demand to activate the precautionary principle, which is stipulated by most environmental legislations, including the Algerian law 03-10, July 19, 2003 related to the protection of the environment within the framework of sustainable development. In the fifth paragraph of Article 3, according to the principle, it is stated that, the absence of certitude, given the availability of scientific and technical knowledge, should not provide a reason for delaying the adoption of actual and proportionate measures to prevent the risk of serious harm to the environment on an affordable economical cost. (Algerian law n° 03-10 of July 19, 2003)

The precautionary principle is not only limited to seeking to be careful to prevent possible risks, but also aims primarily to assess these risks at an early stage in order to be fully prepared for confrontation.

Although the previous law 03-10 stipulated the precautionary principle, and made it one of its basic principles, its activation remained behind in the subject of public exposure to electromagnetic fields resulting from information and communication technology.

Law 2000-03 of August 5, 2000 promulgated to define the general rules related to post and telecommunications, stipulated in the sixth paragraph of Article 13 exploitation licenses and postal and telecommunication equipment approval. Determining the specifications and standards that must be met, and submitting every recommendation to the oversight authority of posts and

telecommunications (established under Article 10 of the same law), prior to granting, suspending, withdrawing or renewing licenses. (Algerian law n° 2000-03, 2000)

However, no legislative text or regulatory procedure followed this law to determine the level of vibrations issued by mobile phone stations and the effect of electromagnetic fields emanating from them, despite the existence of international referential levels concerning this matter and despite the previous marketing of the first three generations of mobile phones and granting exploitation licenses for them.

In order to fill the legal void in the regulatory aspect of this matter, mobile phone operators based their contracts of the construction of telecommunication towers in urban areas on the correspondence received from the Directorate of Prevention of the Ministry of Health, Population and Hospital Reform of June 27, 2004. (Directorate of Prevention of the Ministry of Healt, 2004). That correspondence stated that no scientific study was able to provide convincing evidence that there is a detrimental effect on the health of populations living near base stations of mobile phones, given their weak electromagnetic emissions. The same correspondence urged workers to respect the basic requirements related to protecting the health and security of people, and to direct their options for installing and designing their equipment within the framework of respect for environmental standards in view of the quality and fragility of natural environments, and for the referential limit values of electromagnetic fields.

Sixteen years after the issuance of the previous 2000-03 law, in the year of 2015, the Regulatory Authority for Posts and Telecommunications issued for the first time the resolution n° 82 of September 09, 2015 setting the limit values for public exposure to electromagnetic fields. (Postal and Telecommunication Regulatory Authority , 2015) That decision was based on The International Telecommunication Union Recommendation (UIT-T K.52) issued in 2009 concerning the limit values of such fields. The same decision stipulated in Article 6 that regular and

unexpected monitoring of the site should be carried out to ensure that the radiation levels specified in its Article n° 5 are met and respected (Postal and Telecommunication Regulatory Authority , 2015).

Administrative oversight in Algeria, aimed at protecting the population from exposure to electromagnetic fields, remains limited and ineffective in the field of communications, compared to other countries that addressed this problem at an early stage, and are constantly working on developing and improving the means of control. Especially with regard to informing the public with actual values of the frequencies emitted by wireless communication stations around the clock using a software developed for this purpose, and their dissemination on the Internet, and the active participation of the public through civil society organizations in choosing the appropriate sites to install and establish these stations.

Organizations of the civil society in many countries play an effective role in drawing the attention of authorities to the extent of damages caused by electromagnetic pollution to public health and to the environment, enabling them to put in place the necessary legislative and administrative controls in this field. Moreover, in raising awareness among the population of the extent of danger of this type of pollution enabling them to participate in relevant decision-making process. An example of these organizations is the National Society for the Safety of Health in Wireless Technologies "Robin des Toit's" in France. (National Association for Security in Wireless Techology, s.d.).

As for Algeria, there is only one association, which is the Association for the Protection of the Environment from the Risks of Technology "Green Tech", approved in March 2017, whose activity is limited to the province of Blida, as it is a local association, the risks of information and communication technology are considered part of its activity.

2. The positive impacts of ICT on the environment:

Despite the negative repercussions of information and communication technology on the natural environment and human health due to the huge volume of electronic waste that it leaves behind, which is difficult to treat in a proper way, and electromagnetic pollution resulting from devices and base stations of this technology, it can be used to protect the environment. Some of the positive aspects of the impact of information and communication technology on the environment is the possibility of communicating with the public to spread environmental awareness and culture, and the massive and rapid flow of information it provides that helps monitor environmental phenomena and anticipate their risks, in addition to so-called Smart Buildings.

2.1-The use of ICT in spreading environmental awareness and culture:

This is achieved through influencing the public, and guiding their interest towards the environment, in an attempt to evaluate and fix their behaviors to what serves the environment in urban and rural fields, agriculture, industry, commerce and others. Due to the insufficiency of legislation alone in deterring violators of environmental protection rules. Means of education, awareness and sensitization are necessary to transform an individual from a pollutant to an important factor in the course of environmental protection, considering that radio, television, and the internet are the most related to individuals and influential to their behaviors, they could play an important role in this course.

The television and the internet are the most attractive to the public, most influential to social behaviors, and the most successful media in guiding public opinion, because the feature of combining sound, image and writing distinguishes them from other means of media. Knowing that the more senses are used in receiving an idea or information, the more the latter is absorbed by the recipient and firmly established in their mind. (SHAABANI, 2012, p. 215)

2.2-Environmental monitoring:

Represented in the use of information and communication technology to monitor the state of the environment, and to provide the necessary information to confront and adapt to environmental risks, such as remote sensing to monitor natural disasters such as earthquakes, hurricanes, tsunamis, weather conditions, and others.

As an example: The Latin American Telecom Company has taken an initiative to develop an early warning system in an attempt to reduce natural disasters, in cooperation with the Research Center for Nino and the Ecuadorean National Institute of Hydrology and Meteorology. This led to the development of a mobile information system of climate change, which alerts residents of the coast region of Ecuador on climate disasters using text messages sent to their mobile phones, (DICKERSON, TORRES, & Others, February 2011, p. 3) ICTs are also used to confront deforestation and forest degradation, and to control emissions that cause environmental pollution of all kinds.

2.3-Smart Buildings:

The use of ICTs has spread through all fields of human life, such as the use of Smart Buildings, as many developed countries are witnessing a real revolution in urbanism due to the inclusion of information and communication technologies in designing smart buildings that are friendly to the environment and to humans. These buildings provide a real substitute to traditional buildings that negatively affect the environment.

Smart buildings for instance contribute to the reduction of power use through the methods used to control internal lighting by sensing human movement in rooms and halls, according to the natural light sensed in each place. This type of buildings is also able to use solar power as a renewable energy, and to provide automatic systems to control air conditioning and heating according to external weather conditions. (DICKERSON, TORRES, & Others, February 2011, p. 3).

Moreover, smart buildings provide great services to humans, through distant communication, warning them of any imminent danger, such as a spark of fire, electricity, gas or water leakage

inside, through text messages directed to their mobile phones, or to remind the owner of the house to take their medicine on time. Smart buildings may also call the police to inform them of a theft crime happening in place or call the owner's relatives in the event of a fainting or a heart attack, in addition to securing money and valuables in a tightly closed room, which can only be open by hand, eye and voice prints. (LATRASH, 2016, pp. 110-111)

Added to what we already mentioned concerning the use of ICTs in environment protection, there are many other uses, including: limiting the need to travel through traditional means of transportation, as this technology allows for the possibility of holding virtual meetings and conferences. This helps in saving financial resources on one hand, and reducing energy consumption and relative reduction of emissions from various modes of transportation on the other.

Conclusion:

We conclude from our research that information and communication technology is now effectively present in all aspects of life, allowing easy access to information and its circulation between people and organizations, at all times and places, ICT constitutes a substantial tool in face of various environmental risks and damages.

At the end of our study, we reached the following results and suggestions:

Results:

- If scientific and technological advancement is the main reason behind the emergence of contemporary environmental problems, it is more than necessary to use this advancement in searching for proper solutions.
- ICT has many negative impacts on the environment and public health, represented mainly in electronic waste and electromagnetic pollution coming from ICT equipment and base stations. Despite this, this technology also offers a set of positive impacts on the environment if it is properly used.

- One of the positive impacts of ICT is the spread of environmental culture and awareness among individuals in order to change their behaviors accordingly towards the environment and its preservation from all risks. In addition to enabling people to participate in decision-making related to their environment, and help them draw authorities' attention to abuses affecting the environment, making them intervene for the sake of its protection.
- ICT can be used for constant monitoring of the environmental situation to provide necessary information, in order to take proper decisions and adapt accordingly to the risks threatening the environment.
- ICT is used in countries that have made great strides in sustainable development, in the design and construction of smart, environmentally friendly buildings and cities, providing people with unprecedented services, and putting an end to the waste of depleted energy.

Suggestions:

- Providing help to developing countries in the use of ICT to protect the environment, through financing, transferring technology, and capacity building.
- Linking national information systems with international ones on the regional and global levels to facilitate the reach and sharing of environmental information.
- Improving and developing the role of various media in consolidating and spreading environmental awareness and culture among individuals, benefiting from the experiences of leading countries in this field.
- Working to provide electric power from renewable energy sources for media and communication networks that are in constant operation to eliminate environmental damage resulting from traditional energy sources, saving a significant percentage of financial resources.

- Updating legislations related to waste management and treatment in Algeria to keep pace with contemporary developments in this field, especially with regard to electronic waste.
- Activating administrative oversight over the establishment and operation of mobile phone stations and communication towers, and developing their systems to minimize electromagnetic pollution they emit, and to provide and publish related information on the widest scale to enable public view.
- Activating the role of environmental associations concerning protecting the environment and individuals from the negative impacts of ICT.

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