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Role of Social Media in Environmental Crisis

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ABSTRACT

The current environmental and social crises are directing human beings toward extinction. This has come about after using an economic development model for hundreds of years that has depleted natural resources that can no longer be reproduced and caused the extinction of thousands of plant and animal species. Through this study, the development of information and communication technology has been compared over time with environmental degradation and conservation actions. Separate growth paths that have found a point of contact with climate marches and have continued together for more than a decade. The message among humans is increasingly passing through social channels enjoyed by mobile devices. Some generic user data were analyzed on a global and continental level, while the demographic and territorial characterization of Italian users was explored in depth. Through this article, we aim to show that it is important to use social media for the involvement of people in addressing environmental crises. The increasing use of these communication tools allows through targeted messages their active involvement.

INTRODUCTION

The continuous release of carbon dioxide into the atmosphere, over hundreds of years, has led us to the current dramatic situation where man is no longer in balance with nature and his way of life has caused desertification, pollution (of air, water, and soil), destruction of biodiversity, extinction of animals and plants and alteration of the water and nitrogen cycle. This is a devastating process that began three hundred years ago but accelerated sharply after World War II (Butera, 2021). The ongoing climate change, caused by the exceeding carbon dioxide concentration in the atmosphere (400 parts per million), has raised the temperature by more than 1°C compared to the pre-industrial value when CO_2 concentration was 280 ppm. Lowering CO_2 concentration levels would require reviewing our lifestyles, giving up many conveniences, and being careful about various daily behaviors. Achieving these renunciations in a voluntary and conscious form will take years, in which the temperature will continue to rise, activating chain reactions that will inexorably endanger the lives of many human beings. The Earth has already experienced higher temperatures than today in the Pliocene, about 3 million years ago, when the temperature was about 3 degrees higher than today's values and the sea level was 10-20 meters higher than today. The problem is not for the Earth but it is for humans who have never in their evolutionary history faced such high temperatures and with the rise of the seas so high they risk losing entire countries resulting in mass migration, food shortages, and disease (Butera, 2021).

The current rise in temperature has already caused an increase in the number and intensity of extreme weather phenomena causing heat waves, extreme cold or heat spikes, droughts, and hurricanes. The Earth system has a dynamic, nonlinear equilibrium that is achieved each time by the interactions of numerous variables. Action must be taken in multiple directions and on multiple levels to achieve an optimal situation for humans and nature. Every day 8 billion individuals with their actions impact environmental variables by unknowingly altering their state and changing the balance of the Earth system. Trying to rebalance

this complex system will require the involvement of all human beings who will need to be trained and informed about all available communication tools. It is essential in addition to the contribution of individuals, families, communities they belong to, political, cultural, and religious representatives. In this context, the role of social networks is crucial as it can reach people and their target groups directly, inducing them to change their behavior when it is contrary to nature.

This article traces the history of innovations and inventions that have marked human evolution over the past three hundred years, with special attention on the area of technology and communication. Parallel to these developments, the environmental degradation that has occurred in every area of the planet is brought to the reader's attention. Burning non-renewable natural resources while heavily impacting the environment was justifiable until a few years ago when communications were poor and the majority of the population was illiterate. Currently, this is no longer acceptable in a hyper-connected social environment where information and misinformation travel very fast and reach a large number of people at once. A society that forces connection and digitization must find training tools to enable everyone's participation, because only in that way can they be involved locally in the ongoing process of change. We all have an obligation to do our part to restore a new and different balance with nature. The digital revolution of the last twenty years has been made possible by the concomitant development of smartphones and the advent of social networks. A combination of factors has occurred that has led to billions of people connecting with each other by taking advantage of a considerable mass of accessible information.

Generally in the literature, issues related to technology and communication are never associated with environmental attention, instead, it is necessary to interweave all this information to understand how communication is crucial to act effectively in addressing the consequences of environmental damage.

In the literature, it has been studied how other people we are in contact with on social networks or collective actions can influence our pro-environmental practices (Kyoi, 2024). However, there are behavioral approaches that argue that the individualistic approach does not lead to a more sustainable society and a low-emission economy (Bamberg, 2015). The problem related to the perception of environmental crises is that psychologically they are distant in time and space and thus are downgraded in favor of more proximal problems (Brick, 2021). Social networks have become the agora of the 21st century, and environmental crises depend on global decisions and discussions. Through social, citizens can interact with researchers and policymakers (Sun, 2024). Individuals can learn about environmental crises from multiple channels that can lead to reflections on environmental damage and empower them to pro-environmental behaviors (Rosenthal, 2022). This work demonstrates the importance of using social networks to achieve the engagement of individuals and communities through education and information messages. This is at a time when there is the maximum development and spread of these communication tools used by more than 5 billion people. In this study, we see how this level of information was arrived at and what developments both technology and communication had to go through. A theoretical contribution to the debate on the effectiveness of social networks in solving environmental and social issues.

The text is structured into four sections that follow the evolution of communicative information technology: in the first methodological section the methodology used is explained and with what data, in the second section the existence of individuals before the advent of the Internet is analyzed, in the third the transition from the Internet to social networks and in the fourth section, the conclusions.

MATERIALS AND METHODS

This research aims to test the importance of the use of social media in addressing the current environmental crises facing the planet. Through the use of international and Italy-related data, it was seen which groups of individuals were accessing the Internet and which were accessing different social media. How they were accessing these platforms and what actions they were taking. This made it possible to create profiles of users with common characteristics. With respect to the published work on these topics, it was decided to highlight how the evolution of information technology and the mode of communication is profoundly affecting society

and the way information is used. Highlighting the importance of using social networks to achieve the involvement of the population in targeted pro-environmental actions.

This study investigated data on population, cell phone numbers, internet access, and social account ownership by unique users for the period from 2012 to 2024. This information was analyzed both globally and by nation with a focus on the Italian situation. Comparisons were made for the five macro-areas represented by the continents. In addition, an attempt was made to understand, for the last available year, in detail how users' time was being used with regard to using the Internet, television, reading newspapers, listening to the radio, listening to podcasts, playing games, or social networks. It was also seen how the amount of time spent on using the internet and social globally has changed over the years. In addition, the distribution of the population was investigated both in relation to their gender and relative to age groups for the variables related to internet and social network use. Further assessment was made on the mode of internet consumption: through a fixed or mobile location. In addition, the percentages of the population using the Internet and social networks were grouped by macro-region to identify similarities between macro areas.

The survey on social networks covered both the global and Italian context by subdividing the population concerned according to their gender and age group. In the Italian case, further distinctions related to the place of residence were made to understand the behaviors of the population relative to the size of the center where they live and the geographical area. The same type of analysis was done on users' preferences regarding the sources of information they use and their consumption of multimedia tools. The data used for these analyses were obtained from www.datareportal.com. In addition to these quantitative analyses, historiographic research has been conducted to qualitatively understand the changes that have occurred in the world of information technology, communication, and environmental issues.

RESULTS AND DISCUSSION

For the first 4.5 billion years, Earth lived without the presence of humans. In the first billion years there was no life on planet Earth, then came single-celled beings, and after another billion years microbes appeared. To see traces of the first human being it was necessary to wait until 4.3 billion years had passed. Throughout this period without humans on Earth, there were at least five mass extinctions caused mainly by three factors: the huge increase in carbon dioxide emitted by volcanoes, large methane emissions from the sea, and falling meteorites. In the first 190 thousand years, due to an unfriendly climate, human beings had to move frequently to find places to live. In the next 10 thousand years the climate stabilized and human beings became settled by engaging in agriculture, and in time they gave birth to the first villages and later the first civilizations. Over time man discovered that to survive he had to use tools to make up for his physical shortcomings. For thousands of years, man adapted to nature by respecting its regenerative times without ever upsetting that delicate balance. The story changed when he began to use coal both to power the steam engine and to heat, cook, or move. After coal came oil and finally natural gas.

Before the Internet Came Along

In 2006, the British weekly New Scientist asked a group of scientists from different disciplines to describe what would happen to our planet if human beings suddenly disappeared because they were exiled to a reeducation camp in a distant galaxy. At the time of the article, there were 6.5 billion people on Earth, leaving plowed land, some aquifers dry and others polluted, nuclear waste, millions of hectares of forests cut down, invasive species, a changing climate, and several plant and animal mass extinctions at the time of disappearance. After one or two days of human absence, it was assumed that there would be the first blackouts that would turn off all the lights and reset light pollution to zero. After three months air pollution would be reduced and in fifty years rivers and lakes would be clean again and fish would repopulate the seas. After a few tens of thousands of years all traces of man's existence on Earth would have disappeared. Climate change would have lasted another 100 years because carbon dioxide in the atmosphere would have continued to impact the climate for another 1,000 years due to a physical process whereby surface waters absorb CO_2 in a few tens of years while it takes the ocean depths thousands of years. Despite a sudden freeze, the CO_2 concentration would still be 300 parts in a

million compared to 280 in pre-industrial times. (Holmes, 2006) This means that even if humans suddenly stopped all emissions, the inertia of the climate system would cause global temperatures to rise for a few years before stopping and beginning to fall (Vince, 2023).

This devastating impact of man on Earth began about 200 years ago with the first industrial revolution in England, but in the first 188,800 years, his presence on the planet had not been so impactful as to alter nature partly because human presence did not exceed 5 million individuals (Acot, 2011). For more than 4,500,000,000 years planet Earth did not see the presence of humans until 2,500,000 million years ago in Africa the first Homo habilis were glimpsed, which after a million years became Homo erectus and about 40,000 years ago Homo sapiens sapiens. Only when the climate began to warm, about 10,000 years ago, did the domestication of animals and the cultivation of grains occur. (Amoroso, 2021) Millions of years of evolution of the species to an ideal climatic situation are useful for developing skills needed to survive in extreme natural conditions.

In the billions of years before humans appeared on Earth there were ice ages, overheating, mass extinctions, violent eruptions, earthquakes, collisions with huge meteorites, and subsidence of hundreds of meters by the sea, but also periods when the climate was mild and allowed the development of living things. It is estimated that in the year 1 A.D., there were about 300 million people on Earth: 80 million in China, 75 in India, 35 in Europe, 35 in West Asia, and 15 in Africa (Behringer, 2013). This population doubled after about 1650 years but it took only 150 years to have a further doubling to the first billion humans (Haub, 1995). In the last 200 years, the population has increased 8-fold going to heavily impact all existing natural resources on the planet. Extreme climate situations have often been followed by catastrophic health problems, wars, or migration to more livable territories (Acot, 2011). About 10,000 years ago as temperatures warmed, humans began to become more settled and practiced agriculture in the East. It would be another 2,000 years before we saw it practiced in Europe as well. To have land to cultivate and to raise animals, man intervened heavily in the natural environment by burning forests resulting in the emission of much CO_2. For millennia the staple of man's diet was bread obtained through the cultivation of grains. In Africa and Southern India, millet and sorghum were grown while in South America the main crop was corn (Behringer, 2013). The growth of the human population over the past two thousand years has been possible both because of non-extreme climatic conditions and because of the many inventions and innovations that have taken place in all fields of human knowledge: from agriculture to health care, accompanied by numerous advances in industry, mobility, services, communication, and the use of materials. Moving over the years from the earliest work on stone and metals to micro-laser engravings on the human body has required centuries of study, experiments, and mistakes that have taken humans to levels of knowledge unthinkable a few thousand years ago (Bazzano, 2014).

Despite the fact that the two world wars have reaped 10 and 50 million individuals, despite the thousands of other smaller wars between neighboring states and the millions of deaths caused by plague, famine, and catastrophic natural events, it has reached the borderline figure of 8 billion individuals, which is likely to become 10 in the next 40 years. The positive balance of births and deaths over time is most likely explained by food availability, climate respite, and improvements in health. An estimated 117 billion human beings have lived on Earth, so the current 8 billion represent only 7 percent of the total. Very slow growth for the first 188,800 years and then growing very rapidly in the last 200 years (Kaneda, 2022). Essentially contributing to the increased sanitary knowledge and improved hygiene standards was the increased availability of food resulting from improved agricultural techniques such as continuous crop rotation to enrich the soil, the link between agricultural production and animal husbandry, all mechanization processes in agriculture (from the steam engine to internal combustion engine), and chemical inputs (for fertilization and plant health controls) (Bazzano, 2014).

From the 1700s, in addition to technical innovations on the plow and planters, there was a whole series of inventions that increased productivity in textiles and iron and steel, setting the stage for the Industrial Revolution of the 1800s. All of this was aided by a revolution in transportation, in England, shipping and railways

that enabled a reduction in travel time and costs. It would take half a century for Germany, the United States, and Belgium to follow in England's footsteps, and it would be necessary to wait until 1873 to see industrialization begin in northern Italy, while in Russia in 1861 serfdom was abolished and agrarian reform initiated. Meanwhile, France after the Revolution of 1789 imported machinery and skilled personnel from England. The only nation that kept up with the British was Switzerland, which specialized in processing imported raw materials and precision mechanics (Bazzano, 2014). In the late nineteenth century work was done to bring water to the cities while the construction of a sewage system that could prevent the frequent epidemic outbreak of typhoid and cholera began. After 1850 steel production grew more and more, and in 1884 the electric power industry was born, which radically changed people's lives. With the internal combustion engine in 1880 and the first automobile factories in France, Germany, and England, 400,000 cars were produced in 1913. It would take another 40 years, with two world wars, a revolution in Russia, and a great economic depression, before we saw mass production that would bring the achievements of science and technology into people's daily lives (Bazzano, 2014).

Innovations also heavily impacted the way people communicated on a daily basis. Gestural communication for over 2.5 million years became oral in the last 10,000 with Homo sapiens, and also written in the last 5,000 years (Morisson, 2023). For thousands of years, human beings handed down experiences and information orally because of widespread illiteracy among the population, who were informed by town criers shouting the news on street corners. The beginning of printing on paper occurred around 1400 with the birth of Gutenberg's movable type printing, but it would still be necessary to wait for the arrival of the Industrial Revolution in 1800 to have a true diffusion of serial documents thanks to the steam press (1795), the telegraph (1837), the rotary press (1843) and linotype (1850). Large-circulation newspapers began to emerge in those years, enabling the transition from the orality of news to its writing (Baldassari, 2014).

Over the years, newspapers would grow more and more specialized and differentiated in type, periodicity, spatial coverage of information, and target readership. In the early 1900s they will suffer competition from radio, which will see the light of day in 1895 with Marconi's invention of the telegraph and the first overseas radio broadcast in 1902. Newsreels will be born in France in 1907 and developed over the course of the two world wars, ending in the 1970s with the advent of television. (Baldassari, 2014) Before we get to the first newsreel, half a century of inventions in photography passes: from Niepce's permanently printed image (1826) to celluloid (1861) and an early rudimentary movie camera in 1888, to the first films by the Lumiere brothers in 1895. The succession of innovations and inventions in writing, image, and sound that would see the light of day before the twentieth century would be the pillars on which the future digital revolution of the twentieth century would be built. With the typewriter with keyboard (1873) and Bell/Meucci's telephone (1880), the first tools were created that would begin print journalism, radio, and later television. From the invention of television in 1927 by Farnsworth [Prasad, 2018] it would take another 23 years before we would see it grow rapidly to a widespread presence in almost all homes around the world. In the United States in the following decade, television was present in about 60 percent of American homes. In 1980, punch cards invented a few years earlier, were used in the United States to take the population census.

In 1924 the census company took the name International Business Machine (IBM) and began work in 1930 on what thirteen years later would be the first electromechanical machine in history, the Harvard Mark I. Those same years saw the birth of the first digital computer, which proved very useful in deciphering messages between Hitler and German generals. The first fully electronic computer saw the light of day in 1946: it weighed 300 tons and occupied 200 square meters. With the first chips, smaller and cheaper third-generation computers were born in 1958. It would have to wait until the late 1960s to see the first chip containing RAM (Random Access Memory) take shape, which initiated the fourth generation computers: personal computers. In the following decade, attempts would be made to facilitate its use through the mouse (1965), writing software, and an attempt was made to make computers work over a network.

In 1976 Jobs and Wozniak founded Apple and within months produced the Apple I. In the 1980s Microsoft founded by Bill Gates entered into an agreement with IBM to install the Disk Operating System (DOS) operating system on all computers, this gave it an early market advantage that allowed the company to grow dramatically (Kelly, 2022). In 1984 Apple launched on the market the first computer with a graphical interface (the Macintosh) while Microsoft, a few years later, would give birth to the first operating system with graphical interfaces: Windows. The first modems capable of converting digital data and transmitting it by telephone cable saw the light of day in the 1950s, but it would be necessary to wait until October 1969 to see the first connection activated between two computers at two American universities: the first node of the ARPANET connection created by the Agency for Advanced Research Projects. In the 1980s, two other networks were created to connect American universities (CSNET) and European schools and research centers (EUNET) (Bazzano, 2014). In parallel with these innovations, telephony moved from the fixed network of the early 1900s to the mobile network of the 1970s: satellite phone (1970) and cellular phone (1973) (Prasad, 2018).

Environmental Before Internet

All the revolutions that followed in these years had a price in environmental, social, and health terms that became apparent over the years. In 1856 American scientist Eunice Newton Foot at the tenth annual meeting of the American Association for the Advancement of Science unable to present her research paper because she was a woman, delegated Professor Josef Henry's demonstration that moderate increases in carbon dioxide concentration could cause a significant increase in global warming. Foot had demonstrated the existence of the greenhouse effect, but since the proceedings of the assembly were never published, credit for this discovery was assigned to Irish physicist John Tyndall in 1859 (Saavedra, 2019). Only in 2011, after 155 years, was the article found and historical justice restored to the scientist. In Eunice's time, around 1850, we were already beginning to see the first ecological movements denouncing the destruction of natural resources that occurred with the first industrial revolution.

In 1863 the English Aktali Act regulated the release of harmful dust and gases into the atmosphere and waters caused by the massive use of coal. In those years the Cool Smoke Abatement Society the first ecological nongovernmental association was born in England. In 1875 the Public Health Act obliged furnaces and boilers to have smoke abatement systems, and after a few years, other European countries also passed legislation similar to the English one. During the period of the two wars, not much was said about environmental issues, and it would be necessary to wait until the 1960s-1970s before the issue took on a certain level of media attention. The first real environmental tragedy occurred in London from December 5 to 9, 1952, when a wave of smog caused 6 to 12,000 deaths as well as about 100,000 sick people. The first international institutional intervention on the need to protect the environment was held in Stockholm in 1972 with the participation of 112 member states of the United Nations. [Cobianchi, 2022] Shortly after this conference the UNEP (United Nations Environment Program) was created which united 193 countries to find solutions to climate change, loss of nature and biodiversity, pollution, and waste (www.unep.org).

A year earlier, Greenpeace was founded in Canada, which worked early on against nuclear testing in the Pacific Ocean and later in defense of whales and seals [greenpeace.org]. It was in 1961 that the World Wildlife Fund (WWF) was founded in Switzerland to raise funds for the International Union for the Conservation of Nature (IULM) and other environmental groups (www.worldwildlife.org). In 1962 Rachel Carson published Silent Spring, a text that sold 500,000 copies in 24 countries and raised awareness of the danger of pollution to health and the environment. A few years later, in 1969, U.S. Senator Gaylord Nelson after witnessing the oil spill in California, organized the first Earth Day in America to protest the deterioration of the environment. April 22, 1970: 20 million Americans (10% of the population at the time) crowded streets, parks and auditoriums to protest industrial policy. This initiative led to the creation of the U.S. Environmental Protection Agency and the passage of numerous laws in defense of the environment (https://www.earthday.org/history/).

Environmental Before Social

In 1979, the first World Climate Conference was held in Geneva, and four years later the United

Nations established the World Commission on Environment and Development, assigning the chairmanship to Gro Harlem Brundtland, who produced a report where sustainable development was defined by changing the paradigm of not doing (safeguarding) to doing well [Cobianchi, 2022]. In the same year that the Brundtland report came out, a convention limiting the use of Cfc (chlorofluorocarbons) to protect the stratospheric ozone layer was signed in Montreal by 120 countries. After Seveso, two other catastrophes occurred in the 1980s that shook world public opinion: the industrial accident at the Bhopal chemical plant in India on December 2, 1984 (causing more than 2,000 deaths that night and several thousand in the following days) and the Chernobyl nuclear accident in the former Soviet Union on April 26, 1986. In 1992, the first world conference of heads of state on the environment was held in Rio de Janeiro, which produced a series of official documents: the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, Agenda 21, and Principles on Forests. These were joined by a series of treaties, the drafting of the Earth Charter, and the establishment of International Water Day. Following this conference, annual climate change conferences referred to as COPs began to be held.

The most significant ones were COP 3 in 1997 on the Kyoto Protocol where binding reductions in greenhouse gas emissions were agreed upon for each individual country, and COP 21 in Paris in 2015 for emission reductions with the goal of not raising the world temperature by 2° above pre-industrial levels. The massive media coverage of Rio 1992, manifested the damage of the environmental catastrophe to the general public, triggering a series of international initiatives that followed over time (Kandel, 1999; Villeneuve, 2008, La Camera, 2005). Article 10 of the 1992 Rio Declaration urges countries to involve citizens interested in environmental issues by giving them access to all information on the environment held by public authority. This principle was taken up by the Aarhus Convention in 1996 to facilitate a partnership between the state and society to manage future changes and prevent social conflicts. This convention creates obligations for states but also expectations for civil society to organize and participate by having a certain level of skill and expertise on the subject matter (Jones, 2008).

From the Internet to Social Network

Communication that for thousands of years was one-way conveyed by televisions, radios, and newspapers, while the world of computers was transforming from a hobbyist's machine to a mass consumer product moving from a specialized to a mass audience. The first mass consumer personal computers were the Apple II, Commodor PETs, and Tandy TRS-80s. Thanks to these new machines, application software also took off, allowing useful tasks to be performed without the need to know how to program. Extremely important was video game programming, which enabled the emergence of a large group of young programmers. Business application software focused on spreadsheets, word processing, and databases. In 1981 IBM introduced a personal computer that was an unexpected success that revolutionized the market and "forced" other companies to produce similar machines that ran the same programs. In 1983 Dell managed to be competitive in price and in customizing the assembly to customers' needs, succeeding in becoming the largest personal computer company in the world within sixteen years. However, the biggest beneficiaries of this competition among personal computer manufacturers were Microsoft and the microprocessor company Intel: because 80 percent of computers had their software and processors (Kelly, 2014). Microsoft began in 1980 with 38 employees and sales of $8 million arrived in 1990 with 5600 employees and $1.8 billion in sales. It managed to enter the market when the barriers to entry were very low and was able to consolidate at a time when the market was running on compatible personal computers while many software companies had to exit the market. The MS-Dos operating system was indispensable for linking application software to hardware.

In 1984 Philips and Sony marketed the first CD-ROMs (Compact Disc- Read Only Memory) that were hundreds of times larger than floppy disks. With this technology, users could have a great deal of information but still, it was static material that became obsolete fairly quickly. To make the personal computer truly accessible to everyone required an easily understandable graphical interface and the ability to open up to the world. The real digital revolution came in the early

1990s when we began to see the possibility of connecting computers to the Internet. By 1995 about 10 million computers were on the network and five years later it would become 100 million. It took about 20 years of research before thousands of computers were connected, and a major boost came from the strong user demand for e-mail, which began to be developed in 1971 and was immediately popular with early networked users (Kelly, 2014). By the late 1980s in the United States, the majority of users with computers also had access to the Internet. The birth of the World Wide Web in 1991 marked the path to the digital revolution of the 2000s.

In 1993 CERN (Conseil Européen pour la Recherche Nucléaire) made the source code for this software available to all, allowing anyone to create Web pages. In Italy, in the spring of 1993, the first Web site www.crs4.it of the Center for Research, Development, and Studies in Sardinia was put online. A detected contribution to the growth of the World Wide Web came in 1994 from the Netscape company, which made the Mosaic browser available, free of charge, to users. The world was moving from closed proprietary networks to the open Internet. Many companies, including Microsoft, did not immediately understand what was happening and were displaced by this paradigm shift that in a few years would enshrine the rise of Netscape. It was not until 1998 and after a $100 million investment that Microsoft reached the technical levels of Netscape through the Internet Explorer 4 browser. In that same year, Google was launched, which in a few years would become the most widely used search engine in the World. Instead, it was in 1995 that two commercial sites, Amazon and eBay, saw the light of day and would over time become the world's largest retailers, although in the early years, they were struggling to make a profit.

In the early 1990s, advances in microprocessors and improvements in LCD screens enabled manufacturers to design increasingly thinner, lighter, and more powerful notebooks with a near-quality ratio to desktops [Kelly, 2014]. In the field of mobile telephony in those years, in 1994, the first smartphone was put on the market: produced by IBM and distributed by BellSouth. It was not a great success and we had to wait a few years, 2005, when Google acquired the Android mobile operating system and a few years later with Apple's release of the iPhone: with thousands of catchy games and applications (Kelly, 2014). We are at the dawn of yet another digital revolution that will radically change people's lives. The advent of social networks will change the approach of users on the Internet, and also fundamental will be the evolution of smartphones that will allow connections without time and space limits to the Internet. Users will no longer be merely passive receivers of online information but will themselves become producers of information and will be able to use some of these tools to increasingly organize their social and working lives. Smartphones would accompany individuals in their daily routines, either occupying downtime or enabling optimal management of activities required for work/study, travel, or recreation. The ease of use of these tools allowed a substantial segment of the population to be integrated into the social context and play an active and proactive role without possessing special technical knowledge, as was required in case one wanted to use a computer. In contrast, there was, and still is, the risk of overexposure of users, especially very young ones, which risked alienating them from offline relationships by living in so-called “echo chambers” or closed “social bubbles”.

Social Networks and the Digital Revolution

In May 1996, with the birth of SixDegrees.com, the first social networks took shape with users being able to create profiles and list their friends, and in the following year, they were given the ability to browse friend lists. Born in New York City from the idea of Andrew Weinreich, this site came to count up to 3.5 million subscribers, was sold two years later, and closed for good in 2000 (Ngank, 2011). From that site, too far ahead of its time, other sites that allowed users to create personal, professional, and dating profiles saw the light of day: AsianAvenue, BlackPlanet, MiGente, Cyworld, LunarStorm. Sites many times originated with purposes other than social networking but over time directed their programming toward this type. The birth of the second generation of social sites occurred after 2001 with Ryze.com, Tribe.net, and LinkedIn sites that were intended to connect corporate and commercial entities. Of these only LinkedIn has continued to be widely used to the present day. In the same year, Friendster was launched, which quickly reached millions of people

who were interested in meeting friends of friends for a chance to meet their soul mates, but it could not technically handle the rapid growth and had to close in 2015 (Boyd, 2007).

In 2003, the third generation of social networks came to life with the birth of Myspace, a virtual space where music bands met with their fans; Dogster, where dog lovers met; MyChurch, a meeting place for the Christian faithful; Flickr, for photo sharing; Last.FM, for music lovers; and YouTube, for video sharing. All of these socials had the characteristic of associating with each other people with strong interests in specific topics related to their passions. Even Facebook in 2004 was reserved only for Harvard students but over time it opened up to other universities and later to other schools, eventually opening up to the whole world (Boyd, 2007). Parallel to the growth of social networking sites that occurred in those years the birth and subsequent growth of smartphones, which will change the lives of billions of people forever and will also heavily impact the use of social networks. It started in 1994 with IBM's Simon, but it would be the advent of the BlackBerry in 1999 and iPhones in 2007 that would radically change the world of telephony and communication (Rossi, 2022). The shift from the one-way to the two-way web was disruptive and forced journalists to engage with their audiences directly, and newsrooms had to change the way news was presented and the speed at which it was published. The advent of Twitter in 2006, Facebook Messenger in 2008, WhatsApp in 2009, Instagram and Pinterest in 2010, Telegram in 2013, and TikTok in 2014 will allow for an exponential multiplication of sources of information both written but especially visual. Information sites will incorporate into their pages the contributions that come in from users and enrich them with analysis, articles, and in some cases more in-depth investigations.

This digital revolution, still ongoing, started in 2004 by Tim O'Reilly with Web 2.0, has placed users at the center of global connections where social represents the primary channel of data and news dissemination. The extraordinary collision of web pages, social networks, and smartphones has placed each individual in a position to produce and use an unprecedented amount of data (Rossi, 2022). This information overload many times challenges individuals in the act of understanding and handling the news to be able to make decisions. In this case, the work of journalists who should verify sources and make as objective a summary of the facts as possible is crucial.

In this context of global connectivity, where information travels fast and every individual can access it freely through a smartphone, we are witnessing the world's greatest attention to environmental issues. This enormous spread has led to increased polarization: with the contrast between alarmists and deniers. The consumption and sharing of news on the Internet and social media has amplified the problem but it has not been perceived by all as an alarm, and those who are concerned about it still have delays in turning facts into behavior (Wu, 2021).

The problem from informational, becomes educational and therefore the role of schools but also experts in the various scientific disciplines to which the environmental issue is related is essential. More than half of the population receives information from social media, but they do not suffer it passively as was the case with TV, radio, and print media. More often than not, they are users who in turn produce news or opinions that amplify the news. The greatest risk is the reliability of the source from which the news originates (Azzimonti, 2023).

Disinformation and polarization are the greatest risks incurred when information passes over the web and especially social networks (Azzimonti, 2023). These aspects should not obscure the enormous contribution that digital communication is making for disaster management, damage assessment, requests for help and resilience (Zou, 2023) or in increasing knowledge of a phenomenon, as support to lessons or for teacher-learner interactions (Shafiq, 2023). Internet use in many cases has replaced television viewing and time spent on offline relationships (Schemer, 2021). The downside lies in the excessive amount of time spent on online activities, which can cause people to lose touch with reality and base their perspectives on unrealistic models and images that crowd the Web and especially social networks. The effects produced by the many platforms, widely used by adolescents, based on visual versus textual information need to be tested over time (Harriger, 2021). Unrealistic images presenting body perfection may affect the self-esteem of less mature

minds more vulnerable to appearance language. (Paxton, 2022). This does not mean that sites or social networks should be demonized or banned, but to better prepare children to deal with this kind of information, contextualizing the message and making them understand where the illusion ends and reality begins. Digital media are powerful tools that need to be used to the fullest to reap the benefits without becoming overwhelmed or irrationally influenced.

Environmental Activism

The environmental activism that has moved the 18- to 33-year-old Generations in recent years has been greatly aided by social network platforms that have enabled collective organizing for worldwide mobilization. Social networks have been crucial for information, recruitment, and coordination of groups to organize simultaneous marches and demonstrations in multiple parts of the world. The 2018-19 climate marches represented the high point of the global environmental movement that broke out of the experts' niche and brought millions of people to the streets around the world demanding more attention to environmental issues (Boulianne, 2022).

In 1988, the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) formed the Intergovernmental Panel on Climate Change (IPCC) with the aim of providing countries with scientific information to use in developing climate policies. Thousands of experts from around the world provide input to this body, which in the past twenty-five years has provided six reports of the highest value that earned it the 2007 Nobel Peace Prize along with Al Gore (https://www.ipcc.ch/about/). In 2012, UNEP established the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) a body similar to the IPCC, however, with regard to biodiversity issues (https://www.ipbes.net/history-establishment). To coordinate government actions on climate change and biodiversity. In 2021 IPCC and IPBES produced a joint report of considerable scientific importance for the adoption of coordinated and effective environmental policies. In August 2018, Greta Thunberg went every day in front of the Swedish Parliament with a sign that read “school climate strike” and said she would go every Friday until Sweden complied with the COP 21 Paris climate change agreements. Inspired by this protest thousands of students demonstrated in November that year in Australia and in 270 cities around the world in December. This Swedish student's protest had come to the attention of many students around the world who brought millions of young people to the streets on March 15, 2019, replicated on May 24 in 124 nations around the world (https://www.bbc.com/news/world-48392551).

The global climate activist movement Friday for Future takes action through demonstrations and mass rallies but also by seeking the collaboration and active involvement of citizens. Focusing on the social and generational justice of a power that has marginalized them from decision-making. In the movement's interventions, they have gone from denouncing climate change as a climate and environmental crisis that must be solved very quickly (Reichel, 2022). On October 31, 2018, an international movement of peaceful civil disobedience - Extinction Rebellion - spontaneously came to life in London's Parliament Square. The goal of this movement is to prevent mass extinction and minimize social collapse (https://extinctionrebellion.uk/the-truth/about-us/).

All of these movements have come to life and subsequent lifeblood thanks to social networks that have enabled the organization of planetary initiatives without having much economic means or structured organizational apparatus. At the birth of social networks, there were about 5.8 billion people living on Earth, which had become more than 8 billion by 2023 with an increase of more than 2 billion in 26 years, or about 74 million per year. These increases provide a backdrop to the significant growth of the digital world with increasingly ubiquitous connections and considerable increases in users with cell phones (5.61 billion), connected to the Internet (5.35 billion), and active on social media (5.04 billion). Average annual population increases of 1 percent have been matched by increases of 7 percent in Internet connections and 4 percent in cell phone ownership and 12 percent in active social media users. Over the past nine years while the population grew by 1.2 billion (+17%) and cell phones by 1.7 billion (+49%) the internet and social networks grew by 3 and 3.3 billion users increasing by 148 and 220% respectively. In 63 countries around the world, internet adoption rates have exceeded 90%

of the population, while in 9 countries the rates are still below 20%. The 26 million people living in North Korea's regime can access the Internet only with special government permission, and this generates very little access. India and China, countries of about 1.42 billion people, have the largest share of the population not yet using the Internet: 730 million and 375 million, respectively. This is despite the fact that they have percentages of connected users around 49 and 73 percent.

CONCLUSION

In the next twenty years, human beings will have to solve an unprecedented climate and environmental crisis, and to do this they will need everyone's contribution. To achieve this goal 8 billion individuals populating the Earth have 5.44 billion cell phones, are connected to the Internet 64 percent of the time (5.16 billion), and to social networks 60 percent of the time (4.76 billion). It will be necessary to go through these forms of communication if the goal of stopping climate change and all the catastrophic consequences it brings is to be achieved. Widespread communication requires action on social media and the Internet, an information channel for many people, in parallel with the more traditional media (television, radio, daily, weekly, monthly). In the last nine years, the population has grown by 17%, cell phones by 49% while the internet and social have increased by 148 and 220%. In Africa, the population has grown by 44%, cell phones have doubled while access to the internet and social has quadrupled and quintupled. In Europe and the Americas, the population grew by 14 and 12 percent, cell phones by 11 and 16 percent while internet and social grew by an average of 80 to 120 percent.

In addition to these growths, the structural difficulties still present in the most deprived areas should be noted, which in China and India do not allow some 1.4 billion people to use the Internet. Over the years there has been a mutation in the use of the net: there has been a shift from fixed locations with computers to mobile locations with smartphones. This shift has enabled an exponential growth of the internet and social networks that has completely changed the daily lives of many people and especially in the choice of leisure enjoyment. The main actors in this transformation have been women and young people who have brought to public attention the environmental and social issues in which they live. Women for all age groups prefer Pinterest and TikTok while males use the other social networks more: Facebook, YouTube, Instagram, Twitter, Snapchat, Linkedin, and Messenger. Dissecting by gender and age we see that in Snapchat and Instagram males are more present up to 34 years old and females from 35 and up. In Facebook, YouTube, and Messenger, males are most active up to age 54 and females 55 and over.

Finally, in Linkedin, males are more active for all age groups. This gender and age difference in the use of social platforms advises us to use different content and forms for each type of information posted. Campaigns on environmental issues need to reduce the psychological gap between the writer and the reader, use good quality images that intrigue and interest, avoid paternalistic messages or making moral judgments, and focus on local micro-goals that can engage people and get results. To take action, human beings must first understand the significance of the environmental crisis to understand what consequences it may have for their lives and the lives of more distant populations. This crisis has been generated by a consumption pattern adopted by most of the world's population. To survive, the human species will have to change its consumption and learn to learn, cope, resist, and recover from extreme weather events that will occur in the coming years. Deforestation practices will have to be stopped, beef consumption reduced to zero, switching from industrial to organic farming, switching from fossil fuels to renewable energy, and zeroing out all waste. To implement these actions, it is necessary to have everyone's input and therefore it is also necessary to speak to skeptics and environmental deniers. There is a need to implement a comprehensive education and information campaign that reaches every single individual capillary from all media. There is a need to adapt the language to the audience in front of one's face and to stimulate those emotions that will prompt the listener to act. Dispersion must be avoided by classifying the target audience not according to socio-demographic characteristics but according to passions and interests.

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