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# Impact of information and communication technologies in sustainable tourism

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## Abstract:

Information and communication technologies are powerful tools that can be used to improve the quality of life of populations and contribute to the achievement of the Sustainable Tourism Goals. However, ICTs can also have negative effects on sustainable tourism. It is therefore important to take these effects into account and find solutions to reduce the negative impacts of ICT on sustainable tourism. Businesses and governments can take steps to reduce the negative effects of ICTs on the environment and social inequalities. Consumers can also take steps to reduce their energy consumption and e-waste by purchasing environmentally friendly products and recycling their old products.

**Keywords:** sustainable; tourism ; technologies; information; communication; digital; environment.

## 1. INTRODUCTION

These days, tourism is seen as a vital component of development and a major force behind the international economy. Every nation across the world takes advantage of its natural and cultural resources and showcases them to draw in travelers eager to experience new things and expand their horizons. Globally, the tourism industry accounts for almost 10% of GDP. Every nation in the planet aspires to make tourism their top priority. This can be achieved by welcoming more tourists and benefiting from their beneficial effects on the economy and other areas. To put it another way, tourism unites a number of industries that work together harmoniously to promote the sustainable development of a certain region.

Information and communication technologies (ICT) have had a significant impact on sustainable tourism. On the one hand, they have facilitated access to information and enabled rapid and effective communication, but on the other hand, their excessive use has also led to negative consequences on the environment and society. This study will examine the impact of ICT on sustainable tourism by detailing the advantages and disadvantages of their use. They have had a significant impact on the way we live, work and interact with each other. Many innovations have been introduced in recent years that have revolutionized the way we communicate, work and manage our lives. However, these technologies have also had consequences for the environment, society and the economy. This study will examine the impact of information and communication technologies on sustainable tourism, exploring the advantages and disadvantages of these technologies. Information and communication technologies (ICT) have brought many benefits to sustainable tourism, but they have also created new challenges and issues. For this, a fundamental question arises:

*How do ICT actually influence sustainable tourism?

There is no denying that the goal of sustainable tourism is to balance the interests of society, the economy, the environment, and governance. The investigation of the relationships between these four pillars is challenging due to the transversal nature of ICT, particularly because it can be challenging to quantify the impact of digital technology on the economy and social structure. For these reasons, we use the following general hypotheses to guide our research:

*The direct effects of digital infrastructures on the environment are increasingly better known and measured: energy consumption, toxicity of components, etc.

- Improvements in energy efficiency through ICT can be offset by increases in the number of products or services used.

To carry out this research, we have structured our work into three main parts.

## 2. Definition of ICT and sustainable tourism

Information and communication technologies (ICT) have grown exponentially over the past decades and have had a significant impact on all aspects of human life. Sustainable tourism, on the other hand, is a key concept that aims to meet the needs of the present without compromising the ability of future generations to meet their own needs. In this dissertation, we will examine the impact of ICT on sustainable tourism by examining two hypotheses: first, that ICT has a positive impact on sustainable tourism; secondly, that ICT can also have negative effects on the environment and sustainable tourism.

### 2.1 Definition of Information and Communication Technologies

Any economy in the world is made up of three main axes, businesses and individuals and the tool or support that manages these two elements, from this concept, over the years, the world's economists are looking into research modern and adequate tools which increase production while keeping the individual relationship stable and coherent, that is to say a company which respects the social aspect of the individual and the economic and ecological aspect in addition to the productivity aspect of the business.

According to HERBERT SIMON (Nobel Prize for Economic Sciences 1978), ICT makes it possible to make «Any information accessible to humans, in verbal or symbolic form, will also exist in computer-readable form; books and memoirs will be stored in electronic memories … **»**[1].

Information and communication technologies (ICT) are a set of tools and technologies that enable the communication, storage, processing and dissemination of information. ICT includes technologies such as computers, mobile phones, the Internet, social networks, mobile applications, database management systems, robotics, virtual reality, artificial intelligence, and much more.

With this in mind, Yekini Nureni Asafe defines ICT as follows: «Information technology communication is defined as the convergence of audiovisual, telephone and computer networks through a linking system. It's a combination of all these elements, topped off with a vision for how technology can help an organization achieve its goals»[2].

ICT has transformed the way we communicate, work, learn, play and access information. They have also had a significant impact on the economy, society and the environment. ICTs have facilitated the globalization of trade and access to

information, but have also created new economic and social inequalities. ICT has also opened the way to new challenges, such as the protection of privacy and data security, the regulation of social networks, the management of electronic waste and the reduction of the environmental footprint of ICT.

Overall, ICTs have become a central pillar of our daily lives and have a major influence on the economic, social and environmental trends of our time. And have had a considerable impact on sustainable tourism. ICT can be used to improve the quality of life of populations and contribute to achieving sustainable tourism objectives.

## 2.2 Definition of sustainable tourism

Sustainable tourism is defined by the World Tourism Organization (UNWTO) as "tourism that takes full account of its current and future economic, social and environmental impacts, meeting the needs of visitors, professionals, the environment and host communities". It aims for balance between the three pillars of sustainable development in the production and implementation of tourist activities.

According to Jacques Theys: «Sustainable tourism is a form of development that integrates environmental, social and economic concerns into development policies and strategies. It aims to ensure that the needs of present generations are met without compromising the ability of future generations to meet their own needs»[3].

According Ignacy Sachs: «Sustainable tourism is a process of economic and social transformation that ensures the needs of the present are met while preserving ecosystems and natural resources for future generations.»[4].

According to these definitions, sustainable tourism is considered as an objective to be achieved in the long term while rationalizing the consumption of current natural resources with the use of the means and tools available to businesses and economic operators in order to 'optimize the satisfaction of needs while preserving the ecological environment. Knowing that ICT can play a key role in achieving sustainable tourism. Indeed, ICT can contribute to reducing the environmental footprint by enabling better management of natural resources and energy, as well as a reduction in greenhouse gas emissions. ICT can also promote innovation and creativity, thus enabling the development of new, more sustainable economic models. Finally, ICT can contribute to the realization of a more inclusive and equitable society, by providing education and training opportunities, as well as enabling better communication and greater citizen participation.

## 3. Impact of information and communication technologies (ICT) on sustainable tourism

The impact of Information and Communication Technologies (ICT) has not always been easy to detect. Indeed, the famous Nobel Prize winner in economics R. Solow in a statement to the « New York Times Book Review » in 1987, known for his Solow paradox: « We see computers everywhere, except in productivity statistics »[5].

However, ICT enables individuals, businesses and organizations to communicate, collaborate, share information and work remotely efficiently and quickly. ICT also has a considerable impact on the economy, society and the environment, and has become a key element of sustainable tourism.

### 3.1 Economic impact of ICT on sustainable tourism

Information and communication technologies (ICT) can have a significant impact on sustainable tourism by contributing to economic growth while reducing environmental impact. Here are the economic impacts of ICT on sustainable tourism:

- **Increased productivity**: ICT can improve efficiency and productivity in tourism businesses, which can boost economic growth. Tourism businesses can use ICT to automate tasks, reduce costs and promote the national destination on a large scale, optimize inventory management and improve the quality of products and services offered to tourists.
- **Job creation**: ICT can also create new jobs and stimulate entrepreneurship in the field of tourism, particularly in sectors related to information and communication technologies and to crowd out small businesses, which can lead to a loss of economic diversity and a reduction in competition.
- **Social impact of ICT on sustainable tourism**: ICT (Information and Communication Technologies) can have a significant social impact on sustainable tourism. Here are some examples:

- **Access to information**: ICT has revolutionized the way we access information. Through the internet, people can obtain information about environmental and social issues, which can help them make more informed decisions and adopt more sustainable behaviors.
- **Communication**: ICT allows people to communicate more easily and quickly, which can promote collaboration and the sharing of ideas. For example, social media can be used to mobilize citizens around environmental and social causes.

- **Energy savings**: ICT can help reduce energy consumption. For example, telecommuting allows people to work from home rather than having to travel, thereby reducing greenhouse gas emissions related to travel.
- **Resource savings:** ICT can also help save resources by enabling the more efficient management of waste, water, energy and raw materials.
- **Education**: ICT can be used to spread education and awareness about sustainability. For example, e-learning programs can teach people how to adopt more sustainable behaviors and how to help protect the environment.

### 3.2 Environmental impact of ICT on sustainable tourism:

Information and communication technologies (ICT) can have both positive and negative effects on sustainable tourism and the environment. Here are the main ways in which ICT has an environmental impact:

- **Greenhouse gas emissions**: ICT can help reduce greenhouse gas emissions through more efficient technologies, but it can also increase emissions due to the increasing energy consumption of IT equipment and data centers.
- **Energy consumption**: ICT can be very energy intensive, particularly data centers which require significant amounts of electricity to operate. However, using more efficient technologies and implementing energy efficiency practices can help reduce energy consumption.
- **Electronic waste management**: ICTs can contribute to the production of electronic waste, which is often poorly managed and can have adverse effects on the environment and health. Manufacturers and consumers must work together to reduce the amount of e-waste and ensure it is recycled appropriately.
- **Depletion of natural resources**: ICTs require natural resources to produce, such as rare metals and minerals, which may be depleted or extracted unsustainably. Businesses must ensure their sourcing practices are sustainable and minimize their environmental impact.

### 3.3 Impact of ICT on economic globalization and development:

As a complex and interconnected system, economic globalization is strongly influenced by the use of information and communication technologies (ICT). The impact of ICT on economic globalization can be seen through different prisms, including access to information, communication, productivity and efficiency, and the creation of new market opportunities.

On the one hand, ICT has enabled greater accessibility to information and faster and easier communication between economic actors around the world. Businesses can now access real-time data on market trends, regulations, exchange

rates, and more, allowing them to make more informed decisions and quickly adapt to changes. ICT has also facilitated cross-border trade, reducing costs and increasing the efficiency of transactions.

On the other hand, the use of ICT can also have negative consequences on sustainable tourism. «In fact, these negative effects are generated in particular by the increase in personal data consumption and the number of users on a global scale.»[6]. Economic globalization has often been accompanied by unsustainable business practices, such as excessive exploitation of natural resources, waste generation, air and water pollution, and destruction of biodiversity. ICTs have also led to an increase in energy consumption and the production of electronic waste.

A study conducted by the International Energy Agency (IEA) in 2021, [7]found that the increasing use of electronic devices and online services has led to an increase in energy consumption and emissions of greenhouse gases in the electricity sector. The IEA has called for more efficient use of energy and increased use of renewable energy to reduce the environmental impact of ICT.

In 2019, the Organization for Economic Co-operation and Development (OECD) estimated that the production of e-waste would reach 52.2 million tonnes by 2021. This waste poses a threat to the environment and human health, as they contain toxic substances such as lead, mercury and cadmium.

In 2015, CO2 emissions from the ICT industry accounted for approximately 2% of all global greenhouse gas emissions (International Energy Agency, 2017).

In 2016, CO2 emissions from the ICT industry were equivalent to those of global civil aviation (Global e-Sustainability Initiative, 2017).

In 2017, approximately 44% of the world's population had access to the Internet, an increase of 10% from 2015 (International Telecommunications Union, 2017).

Between 2015 and 2018, the share of renewable energy in data center electricity consumption increased from 17% to 24% (The Green Grid, 2018).

In 2018, the total volume of electronic waste worldwide was estimated at 50 million tonnes, an increase of 20% compared to 2015 (Global E-waste Monitor, 2018).

It is important to note that the impacts of ICT on sustainable tourism are complex and may vary depending on the context and specific technologies. However, these statistics provide a general indication of the environmental and social impact of ICT.

However, ICT can also play a key role in promoting sustainable tourism. Clean and energy-efficient technologies, such as renewable energy and smart

buildings, can help reduce the environmental impact of economic production. ICT can also facilitate access to services.

**4. Responsible use of ICT in tourism**

The responsible use of information and communication technologies (ICT) is an increasingly important topic as dependence on digital technologies increases, and is essential to minimize their negative impacts on sustainable tourism and maximize their benefits «An obvious observation is obvious to us all: it is urgent to operationalize an alternative approach capable of guaranteeing the production, from their origin, of organic, fair, local, accessible, ethical, useful and constructive bytes, in sufficient quantity, but above all not more abundant than necessary. This prism already exists, it is that of sober and responsible digital design. In particular, it raises the question of the place of digital technology in society and guides us towards reasoned use of this tool in the service of humanity, and not the other way around.»[8], Here are some key actions for responsible use of ICT in tourism:

- Optimally exploit environmental resources which constitute a key element of tourism development, by preserving essential ecological processes and helping to safeguard natural resources and biodiversity.

- Respect the socio-cultural authenticity of host communities, preserve their built and living cultural assets and their traditional values and contribute to intercultural understanding and tolerance.

- Ensure viable long-term economic activity that provides all stakeholders with fairly distributed socio-economic benefits, including stable employment, profit opportunities and social services for host communities, and thus contributes to the reduction of poverty.

- Limit screen time: spending too much time on screens can have negative effects on physical and mental health. It is important to limit screen time, especially for children.

- Protect personal data: ICT collects and stores more and more personal data. It is important to protect personal information and limit the amount of information shared online.

- Avoid harmful behavior online: this can include cyberbullying, misinformation, spam and scams.

- Reduce digital footprints: excessive use of ICT can have a negative environmental impact. So we must reduce our digital footprint by turning off electronic devices when we are not using them and regularly deleting files and applications that we no longer need.

- Encourage responsible use among others: as an ICT user, you can encourage others to use these technologies responsibly. This can include conversations about online safety, reminders about using ICT, and setting a positive example of responsible ICT use.

- Use ICT to reduce environmental impact: ICT can be used to monitor and manage natural resources, reduce travel through teleworking and videoconferencing, and promote sustainable production and consumption practices.

- Recycle electronic waste: ICT generates electronic waste which can be toxic to the environment and human health. It is important to recycle them correctly to prevent them from ending up in landfills or being burned.

- Protect privacy and security: ICT users must be aware of the risks to their privacy and security. It is important to take steps to protect your personal data, such as using strong passwords and configuring privacy settings.

- Promote equitable access to ICTs: ICTs can have a positive impact on disadvantaged communities and individuals, but access must be equitable for all. It is important to promote access to affordable and quality technologies for all.

In short, responsible use of information and communication technologies can help minimize their negative impacts on sustainable tourism and maximize their benefits. It is important to take steps to reduce energy consumption, recycle e-waste, protect privacy and security, promote equitable access and use ICT to reduce environmental impact.

## 5. CONCLUSION :

In conclusion, ICT has a significant positive impact on sustainable tourism in Algeria. ICT can reduce energy consumption, sustainably manage natural resources, raise awareness and educate populations, improve the quality of life and reduce poverty and attract more international tourists. However, it is important to ensure that the use of ICT is itself sustainable and environmentally friendly, particularly in terms of electronic waste management and use of natural resources. ICTs must be considered as tools for sustainable tourism, and not as an end in themselves.

ICT is a powerful tool for sustainable tourism. They can be used to improve access to water and energy, improve transport efficiency and promote innovation and research. However, ICT can also have negative effects on sustainable tourism. It is therefore important to take these effects into account and find solutions to reduce the negative impacts of ICT on sustainable tourism.

Also, sustainable tourism is not a separate practice, nor a particular tourist market. It is an approach that can be adopted by any tourism actor by integrating the principles of sustainable development into its strategic management and/or the offer it offers. Sustainable tourism is also the individual responsibility of travelers: in their behavior, daily actions and choice of service providers and/or destinations according to sustainability criteria.

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