CHALLENGES OF IMPLEMENTING NEW TECHNOLOGIES IN ECOTOURISM IN THE ERA OF THE 4TH INDUSTRIAL REVOLUTION

IZAZOVI PRIMJENE NOVIH TEHNOLOGIJA U EKOTURIZMU U DOBA 4. INDUSTRIJSKE REVOLUCIJE

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ABSTRACT

The wave of the Fourth Industrial Revolution affected all areas of the economy, including tourism. Technologies within the Fourth Industrial Revolution (artificial intelligence, Internet of Things, nanotechnology, virtual reality, augmented reality, blockchain technology, etc.), together with comprehensive digitalization, transform tourism in new ways, raise new challenges and create conditions for radical change in tourism. It is especially important to analyze the impacts of new technologies on sustainable or ecotourism as part of the need to respect the principles of sustainable development and corporate social responsibility through the harmonization of business with the natural and social environment. In this paper, we analyze the directions of the impact of new technologies of the Fourth Industrial Revolution on the transformation of ecotourism and the challenges of change and development faced by ecotourism.

KEYWORDS: Fourth industrial revolution, technologies, ecotourism, challenges, sustainable development.

SAŽETAK

Talas Četvrte industrijske revolucije pogodio je sva područja privrede, uključujući i turizam. Tehnologije u okviru Četvrte industrijske revolucije (veštačka inteligencija, Internet stvari, nanotehnologija, virtuelna stvarnost, proširena stvarnost, tehnologija blokčejna itd.), Zajedno sa sveobuhvatnom digitalizacijom, transformišu turizam na nove načine, postavljaju nove izazove i stvaraju uslove za radikalne promene u turizam. Posebno je važno analizirati uticaje novih tehnologija na održivi ili ekoturizam kao deo potrebe poštovanja principa održivog razvoja i društvene odgovornosti preduzeća kroz usklađivanje poslovanja sa prirodnim i društvenim okruženjem. U ovom radu analiziramo pravce uticaja novih tehnologija Četvrte industrijske revolucije na transformaciju ekoturizma i izazove promena i razvoja sa kojima se ekoturizam suočava.

KLJUČNE REČI: Četvrta industrijska revolucija, tehnologije, ekoturizam, izazovi, održivi razvoj.

INTRODUCTION

New technologies within the Fourth Industrial Revolution (4IR or Industry 4.0), primarily artificial intelligence, nanotechnology, virtual reality, augmentative reality, the Internet of Things and others, are experiencing incredible expansion and find application in various branches of the economy and society. Ecotourism or sustainable tourism, as a promising branch of tourism, is also attractive for 4IR technologies. These new technologies are widely used in various segments and areas of

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ecotourism.

In parallel with comprehensive digitalization, new 4IR technologies are transforming tourism in new ways, setting new challenges and creating conditions for radical change in the way, pace and structure of tourism services, increasing tourism potential and strengthening respect for sustainability and corporate social responsibility. The implementation of new 4IR technologies in ecotourism is also critical from the aspect of the necessity of matching business activities of ecotourism with the sustainable development goals (SDG), considered in the 2030 Agenda.

The tourism in protected areas is particularly appropriate for the application of 4IR technologies within ecotourism industry. In this paper, we will give an overview of the impact of the Fourth Industrial Revolution and analyze new technologies within it. Then we will define and analyze tourism in protected areas, give an analysis of selected case studies of the application of new technologies in ecotourism and finally we will present and explain our model of application of new technologies within tourism in protected areas.

1. DYNAMICS AND ACHIEVEMENTS OF THE FOURTH INDUSTRIAL REVOLUTION

The concept of the Fourth Industrial Revolution was coined by Klaus Schwab, owner and director of the World Economic Forum (WEF), in his critical book entitled The Fourth Industrial Revolution, where he distinguished it from the previous three industrial revolutions. According to Schwab, the Fourth Industrial Revolution means "the inexorable shift from simple digitization (the Third Industrial Revolution) to innovation based on combinations of technologies (the Fourth Industrial Revolution)" (World Economic Forum, 2021).

The Fourth Industrial Revolution (4IR) was launched on the scientific and technological breakthrough and development of new technologies that make up the 4IR technology platform. What are these new technologies and what are their characteristics?

According to the World Economic Forum's Global Risk Report 2017, twelve emerging technologies are listed within 4IR (World Economic Forum, 2017). They are: a) 3D printing; b) Advanced materials and nanomaterials; c) AI and robotics; d) Biotechnologies; e) Energy capture, storage and transmission; f) Blockchain and distributed ledger; g) Geoengineering; h) Internet of Things; i) Neurotechnologies; j) New computing technologies; k) Space technologies and l) Virtual and augmented Realities

According to the BCG classification, nine key technologies represent the basic building blocks of 4IR, and they are: a) Big Data and analytics; b) autonomous robots; c) simulation; d) horizontal and vertical system integration; e) Internet of Things; f) cybersecurity; g) Cloud technology; h) additive industrial production and i) augmentative reality (BCG, 2020).

The Fourth Industrial Revolution, on the wave of these key technologies, covers all domains, aspects and areas of the economy and society. Their influence is comprehensive and radical. Gerd Leonhard (Leonhard, 2016, p. 6) singled out three essential features that characterize 4IR technologies. They are exponential, combinatorial and recursive. The first feature means that these technologies have an exponential growth and such a pace of their growth leads to a real technological explosion, which makes it impossible for people, who behave linearly, to perceive the effects and consequences of such an explosion. In addition, the 4IR technologies are interconnected and complementary, creating complex fusions and acting disruptively on every segment of the economy and society. Finally, the third feature indicates that these technologies have the ability to independently and continuously improve and upgrade on their own.

2. DEFINING ECOTURISM AND THE IMPORTANCE OF TOURISM IN PROTECTED AREAS

Ecotourism as a kind of sustainable tourism is a promising branch of tourism. Ecotourism is the tourism based on the concept and basic principles of sustainability and sustainable development. It is a completely new approach to tourism. In an age of promoting and investing in a green economy and sustainable development, the importance and attractiveness of ecotourism is growing.

According to the International Union for Conservation of Nations (IUCN), ecotourism is "environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features—both past and present) that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations" (Ceballos-Lascuráin, 1996).

According to The International Ecotourism Society (TIES), ecotourism is defined as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education" (TIES, 2015).

When talking about ecotourism, the question arises of the distinction between the terms ecotourism and sustainable tourism. The EUROPARC, ECEAT manual offers strong explanation of the differences between sustainable and ecotourism. According to the manual, the sustainable tourism "is not a 'type' of tourism or a 'niche' market, as it is often believed, but rather a way of organising any type of tourism development. It is a (moral) obligation undertaken by all tourism stakeholders towards each other, their local community and to future generations." In contrast, ecotourism "is a 'type' of sustainable tourism", and it means "sustainable tourism in (protected) nature areas. It should include visitor interpretation and should involve or benefit local communities" (EUROPARC FEDERATION, ECEAT International, 2012).

In our paper (Bartula & Radun, 2020), we concluded that sustainable tourism "can be applied to all types of tourism, hence it is sort of a wider term then the concept of ecotourism. On the other hand, ecotourism is more concerned with the conservation of natural areas and natural resources and with the welfare of the local people, involving the proper knowledge and education of both the staff and the guests. It comprises knowledge of the natural resources as well as the knowledge of the culture and practice of the local communities and people living within the natural environment."

From these concise and clear-cut clarifications, we can conclude that ecotourism comprises four key elements:

- Preservation of the environment;
- Maintaining people's well-being;
- Orientation towards the well-being of the local population and
- Encouraging interpretation and education, which includes learning about the environment, ecosystems and biodiversity, as well as learning the customs and traditions of the local population, which ecotourism activities face.

It is important to point out that ecotourism establishes the connection of tourism, as an economic branch, with the principles of sustainability and sustainable development, and through that with the 17 sustainable development goals (SDG) together with 169 specific targets, which were promoted in Agenda 2030 for Sustainable Development (United Nations, 2015), adopted by the United Nations in 2015. Ecotourism, as a part of sustainable tourism, is particularly connected with SDGs 8, 12, 14 and 15 (UNWTO, 2020). Ecotourism contributes to decent work and economic growth, as is defined in Goal 8, especially in developing countries. Target 8.9 is particularly relevant, as it states, "by 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and

products". The importance of ecotourism is also supported by Goal 12 (responsible consumption and production), where target 12.b. aims to "develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products". In the SDG 14 (life below water), particularly in target 14.7., it is stated: "by 2030 increase the economic benefits to SIDS and LDCs from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism". And, finally, the Goal 15 (life on land) is relevant, where it is emphasized that "sustainable tourism can play a major role, not only in conserving and preserving biodiversity, but also in respecting terrestrial ecosystems, owing to its efforts towards the reduction of waste and consumption, the conservation of native flora and fauna, and its awareness-raising activities".

When speaking of ecotourism, the most suitable application of ecotourism is tourism in protected areas since this kind of ecotourism has unique characteristics that make it a potentially positive force for conservation. According to Dudley (2008, p. 8), protected area is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values".

The main purpose of ecotourism is to preserve the biodiversity and sustain the integrity of the natural environment as well as the welfare of the local people dealing with it and/or living therein (Bartula & Radun, 2020). Bearing this in mind, the ecotourism activities come to its full expression only in protected areas, by contributing to both socio-economic development and nature protection and preservation.

Ecotourism generates a great deal of benefits that could be divided into three main groups: environmental, economic and social/ community (Leung et al., 2018).

The main environmental benefits of ecotourism are the following: public education on conservation issues and needs; greater appreciation of natural values and resources through experiences, education and interpretation, and awareness of the value of natural resources and protection of resources that otherwise have little or no perceived value to residents, or are considered a cost rather than a benefit.

Among economic benefits, the most important are the following: the increase of the jobs and income for local residents, diversification of the local economy and financial support to protected areas through payment of tourism fees and charges.

The social benefits of ecotourism are reflected in encouraging the development and conservation of local culture, crafts and the arts, and, particularly, encouraging local people to value and take pride in their local culture and protected areas as well as to learn the languages and cultures of others.

According to the World Database on Protected Areas – WDPA (Protected Planet, 2021) there are 258,133 designated protected areas in the world, which is significant potential for ecotourism development at global scale. Most areas are on land, and collectively protect around 15 % of the earth's land surface (UNEP-WCMC, IUCN and NGS, 2018) which represents substantial potential for ecotourism at global scale. IUCN defines six categories of protection among which National Parks, Natural Monuments, Habitat/Species Management Area, Protected Landscape/Seascape and Managed Resource Protected Area have sustainable tourism as management objective (Dudley, 2018).

Although ecotourism is a type of tourism closely referring to nature as well as local economy, culture and community, it can generate a vast range of negative impacts if not properly managed, as presented in tables 1 and 2.

Table 1. Potential negative environmental and ecological effects of tourism activities

Area of impact	**Examples of potential consequences**
Air	Air and noise pollution from vehicles
Sound	Noise pollution from vehicles can affect breeding success of birds
Water	– Minerals, nutrients, sewage, solid waste, petrol and toxins added to the environment – Increased water consumption
Geology and soil	Physical and chemical changes in soil
Habitats	– Fragmentation of natural habitat (e.g. wetlands) – Competition between native and invasive plant species – Destruction of habitats and clearing of lands – Eutrophication and sedimentation
Wildlife	Changes in species composition, reproduction and behaviour

Source: Adapted from Leung et al., 2018

Table 2. Potential negative impacts on protected area host communities: Social, cultural and economic

Area of impact	**Examples of potential consequences**
Social and cultural	
Traditions	– Commodification of ceremonies, causing changes in arts, crafts, dress, festivals for display – Disruption of traditional patterns and timing of cultural and religious ceremonies – Deterioration of workmanship of crafts as increased volumes are made for tourists
Crime and Stability	Destabilisation of communities, leading to increased crime
Economic	
Employment	Seasonal job losses during low seasons
Local business development	*Seasonality of business* may cause difficulties for enterprises during low seasons
Diversification	– Dependency on tourism, making the economy vulnerable, with service and product providers at risk if there is a downturn in visitation – Unequal distribution of benefits, as when they are accrued by a small, elite group

Source: Adapted from Leung et al., 2018

Protected areas have a great potential for development of ecotourism. An increasing environmental awareness among tourists along with the growing interest for preserving natural environment, particularly for sustaining biodiversity, stresses the importance of the tourism in protected areas. It is important to emphasize that tourists appreciate the natural environment within the protected areas more if it is more preserved. According to S. Nikolić (Nikolić 2006, p. 110): "If certain natural environments have richer and more complex ecosystems and landscapes of greater recreational opportunities, more attractive and rare natural objects and phenomena, so the more important are the ecotourism destinations. And it is precisely landscapes and natural

objects of such features and importance that are valued and proposed for protection as natural resources. That means that there are no significant differences between the ecological and tourist features of a protected and ecologically preserved nature."

3. USING 4IR TECHNOLOGIES FOR MANAGING PROTECTED AREAS

3.1. Key features of 4IR technologies for managing protected areas and assessing protected areas management effectiveness

The tremendous comprehensiveness, transformative power and radicality of the technological wave of 4IR indicate huge opportunities for the potential use of new technologies in tourism in protected areas.

The protected areas are especially suitable for the application of new technologies due to their special properties. The protected areas in each country enjoy special treatment, full legal protection at the national level, and economic support and stimulation. Therefore, it is clearly and strictly defined by legal regulations which part of the country should be proclaimed as protected, under which conditions may it be protected and within which boundaries.

The main benefit of using 4IR technologies in the protected areas should be in improving protected areas management effectiveness (known as PAME). The key features of new technologies regarding managing protected areas are their ability to monitor, control and connectivity, which is really necessary for enabling long-term preservation of ecosystems within the boundaries of a protected area. The set of 4IR implemented in the protected areas should provide wide range of methodologies and effects in terms of tracking, measurement, analyzing and control, such as automation of management of natural resources, monitor and control biodiversity, monitor and track movement of wildlife or tourists within the protected areas, protect the key points of the areas, etc. Within the scope of the process of managing protected areas, applying 4IR technologies may include monitoring and measurement of ecotourism indicators. According to Drumm et al. (2004) there are five groups of ecotourism indicators: environmental, economic, socio-cultural, experiential, and managerial, all of which can be also applied to the tourism in protected areas.

Environmental indicators reflect the tourism activities and their impacts on the environment, which indicate whether the tourist activities exceeded the limits of carrying capacity of the tourist destination and the effectiveness of the measurements that the managers took to protect (Li, 2004).

Economic indicators show impact of ecotourism at local community welfare, measuring number of ecotourism entrepreneurs in neighbouring communities, local community's annual income from tourism/total income, local population participating in tourism business etc.

Socio-cultural indicators generate wide range of data that reflect the impact of ecotourism at local population and its traditional way of life, while experiential indicators are connected to the visitors' both positive and negative behaviours within the ecotourism destination.

Managerial indicators show the existence of ecotourism infrastructure and quality of infrastructure maintenance within the destination such as for example number and length of trails or amount of time spent on infrastructure maintenance.

The following questions should be asked when identifying indicators:

i. Does the indicator tell us what we want to know? What question are we trying to answer?

ii. Does the indicator relate directly to an important resource, social or economic condition?

iii. Can the indicator be measured easily and relatively inexpensively?

iv. Can the indicator alert managers to a deteriorating condition before it reaches an unacceptable level?

v. Can the indicator be measured without

affecting the quality of the visitors' experience?
vi. Will the indicator provide information that is worth time and cost needed to obtain it?
vii. Who will carry out the necessary monitoring?

According to a global study exploring management effectiveness across 8,000 protected areas throughout the world (Leverington et al., 2010), about 40% of all protected areas were shown to be managed poorly, and 37% were managed only on the basic level. Only 23% were found to be managed sufficiently strong ("sound management").
Considering the findings of this study, a new approach to improving PAME is needed, one that should be more systemic, sensitive, interconnected, continuous, easy-to-use and controllable. Due to a lot of their superior features, various 4IR technologies can be used for the purpose of improvement of PAME: Artificial Intelligence (AI), Internet of Things (IoT), Cloud computing, GIS and GPS technology, robotics, biotechnology, nanotechnology, Virtual Reality (VR), Augmented Reality (AR), geoengineering, etc.
Since 1990s, numerous methods have been developed and applied to assess PAME. Most methodologies are based on IUCN WCPA framework for PAME (Hockings et al., 2006). This framework (Fig. 1) includes six key elements of the process of PAME assessment: context, planning, inputs, process, outputs and outcomes.

Fig. 1: The Framework for assessing management effectiveness of protected areas

Source: Hockings et al., 2006.

The framework is based on the understanding that the management of the protected areas follows a cyclical process that continuously goes through six stages or elements.

- Context: The management process of the IUCN WCPA framework begins with understanding the context of the protected area, which means identifying and understanding its values, the threats and opportunities that it faces, its stakeholders, management and political environment.
- Planning: This stage means establishing vision, goals, objectives and strategies to conserve values and reduce threats.
- Inputs: Management allocates inputs (resources) of staff, money and equipment to work towards the objectives.
- Processes: Management in this stage implements actions according to accepted processes.
- Outputs: In this stage, management achieves certain activities and targets, produces certain goods and services, which should usually be outlined in management plans and work plans.
- Outcomes: Finally, as a result of the management process, certain outcomes proceed, by achieving defined goals and objectives.

It is important to make difference between outcomes and outputs. As it stated in the document, "outcomes reflect whether the long-term objectives are met (e.g. are plant and animal populations stable, are ecological systems functioning properly, are cultural values being maintained?). The distinction is important because it is possible to have a protected area that meets all its output targets but continues to degrade (suggesting the management strategies or activities need to be changed), or to have a badly managed protected area that nonetheless maintains its broader values" (Hockings et al., 2006).

3.2. Case study: Implementing 4IR technologies in Pendjari National Park, Benin, Africa

We will present and analyze implementing 4IR technologies in Pendjari National Park, situated in Benin, West Africa.

The Program on African Protected Areas & Conservation (PAPACO) of the International Union for the Conservation of Nature (IUCN) published two reports on using Internet of Things and other new technologies for effective management of the protected areas. The reports were produced based on a mission in Benin (Africa), with the focus on the Pendjari National Park (PNP).

The First Report published by the IUCN, titled "The Internet of Things for PNP: A Phased Innovative Technology Investment Strategy to Improve Management Effectiveness" (PAPACO, 2016), explains how the Internet of Things (IoT) ntechnology can "transform the management effectiveness of protected areas in Africa and elsewhere in conserving nature" (PAPACO, 2016). The IUCN PAPACO report showed that IoT investments improved PAME and helped in solving a number of main challenges faced by protected areas, precisely, to:

- "Better evaluate the impact of conservation programmes through automated ecological monitoring;
- More quickly identify and control threats to biodiversity;
- Redirect resources from low value-added manual data collection and untargeted patrolling activity, to focus on understanding and dealing with threats in real-time;
- Facilitate communications and collaboration between the various park stakeholders." (PAPACO, 2016).

Six major management challenges were identified in PNP, where technology could help (PAPACO, 2016):

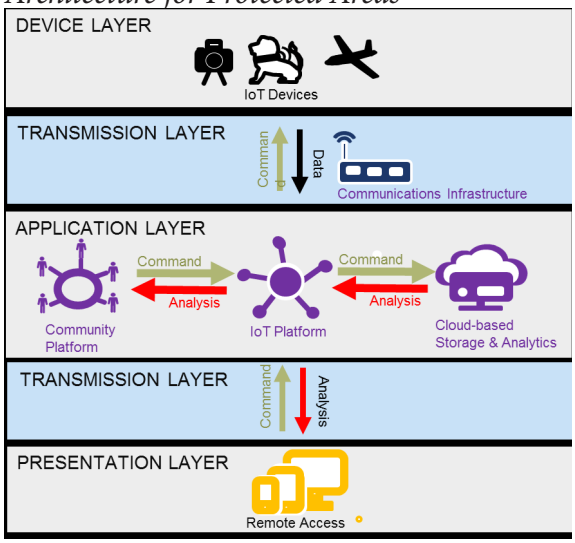
- Collection of ecological data to establish trends, threats and causality to

support the planning of conservation programmes.
- Surveillance of the park to identify threats from poaching, logging, and transhumance.
- Security of staff and tourists in the park.
- Threats to livestock and crops of local communities bordering the park.
- The experience of tourists planning and during their visit.
- Communications, collaboration and governance between the stakeholder groups.

In order to perform all these tasks, the appropriate IoT architecture should be constructed, one which could fulfill the defined goals and targets of well-designed protected area management system. Hence, it was proposed in the report that the most possible elegancy and simplicity of the IoT approach must be ensured.

The IoT architecture implemented in PNP has five layers (Fig. 2):
- Physical layer, consisted of physical devices that should be placed remotely in the field: sensors, cameras, drones, etc.).
- First transmission layer, a kind of communications infrastructure, which can capture the data from the devices and transmits it to an application layer. In the absence of adequate public network, it should be necessary to install some kind of private communications network. This network may include: VHF radio; private mobile network such as LTE/4G, able to provide high speed DATA services for IoT devices and mobile handsets; satellite network operators (such as Iridium and Globalstar), to provide internet connectivity and voice communications; some other technical devices and networks, and some Google/ Facebooks solutions for providing internet connectivity using drones and satellites.
- Application layer, which consists of IoT platform, community platform and Cloud-based process of storage and analytics. This platform enables receiving and storing the data from the devices in the field and is able to process, inspect, filter, analyze, transform, and model with the purpose of discovering useful information, suggesting conclusions, and supporting decision-making. This segment include various kinds of applications using Big Data, AI and other 4IR technologies.
- Second Transmission layer.
- Presentation layer, which includes a large number of potential users of the information provided by IoT infrastructure in the protected area, such as: park managers, rangers, ecologists working for the park agency, NGOs, or universities, members of the local communities, and others who may have interest or have to be alerted if there are some kind of threats to the protected area. All these users should use various tools or devices to access the relevant information, such as smartphones, PC computers, laptops and tablets.

Fig. 2: Key Components of Internet of Things Architecture for Protected Areas



Source: Hockings et al., 2006.

As it can be seen from the presented case study, the protected areas are quite appropriate for implementation of various 4IR technologies for the purpose of improvement of the managing protected areas and enabling

determined and continuous tracking, monitoring, analyzing and controlling the protected areas, in the process of assessing PAME.

4. CONCLUSION

Using 4IR technologies in ecotourism, and particulary in the tourism in protected areas, may lead to huge effects. In this paper we analyzed the potential of the protected areas as a field suitable for using 4IR techologies. We analyzed the great benefits of using new technologies for the purpose of improvement of the management process of the protected areas as well as improving protected areas management effectiveness (PAME).

We suggested that the 4IR technologies implemented in the protected areas should provide wide range of methodologies and effects in terms of tracking, measurement, analyzing and control.

Considering the ways and directions of using 4IR technologies for achieving systemic and continuous management of the protected areas, we presented case of implementation of IoT and accompanying technologies in Pendjari National Park (PNP) in Benin, Africa. The IoT architecture for managing protected areas that was developed and implemented in PNP may be used as a model of implementation of 4IR technologies in other protected areas, elsewhere in the world. The set of technologies that make up the appropriate technological (IoT) platform can be installed relatively simply and in a reasonably short time. Finally, building of such designed management system can radically improve protected areas management, for the purpose of preserving ecosystem and biodiversity and making protected areas and ecotourism sustainable, both for the benefit of the natural environment within the protected areas and the well-being of the local population.

LITERATURE

[1] Bartula, M. & Radun, V. (2020). Visitor management planning as a tool for sustainable tourism in protected areas in Serbia, in 5th International Scientific Conference "Tourism in function of development of the Republic of Serbia", 3-5 September, 2020, Vrnjačka Banja, Serbia, Thematic Proceedings I, University of Kragujevac, Faculty of Hotel Management and Tourism in Vrnjačka Banja, Vrnjačka Banja, 2020.

[2] BCG. (2020). Embracing Industry 4.0 and Rediscovering Growth, Nine Technologies Transforming Industrial Production. Retrieved March 29, 2012, from https://www.bcg.com/capabilities/operations/embracing-industry-4.0-rediscovering-growth (September 26, 2020)

[3] Ceballos-Lascuráin, H. (1996). Tourism, ecotourism, and protected areas: the state of nature-based tourism around the world and guidelines for its development. Gland: IUCN. DOI: https://doi.org/10.2305/IUCN.CH.1996.7.en

[4] Drumm, A., et al. (2004). Chapter 5: Visitor impact monitoring and management. In: Ibidem, Volume II: The business of ecotourism development and management. Ecotourism development: A Manual for Conservation Planners and Managers. Arlington, Virginia: The Nature Conservancy.

[5] Dudley, N. (Editor) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. x + 86pp. WITH Stolton, S., P. Shadie and N. Dudley (2013). IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21, Gland, Switzerland: IUCN.

[6] EUROPARC FEDERATION, ECEAT International. (2012). Practical, profitable, protected, A starter guide

to developing sustainable tourism in protected areas. Retrieved April 11, 2021, http://www.eceat.org/images/Practical,%20profitable,%20protected%204%20MB.pdf

[7] Hockings, M., Stolton, S., Leverington, F., Dudley, N. & Courrau, J. (2006). Evaluating Effectiveness: A Framework for Assessing Management Effectiveness of Protected Areas. 2nd edition. IUCN, Gland, Switzerland and Cambridge, UK.

[8] Leverington, F., Costa, K. L., Pavese, H., Lisle, A., & Hockings, M. (2010). A Global analysis of pa management effectiveness. Environmental Management, November 2010, 46 (5), 685-98. DOI:10.1007/s00267-010-9564-5

[9] Leonhard, G. (2016). Technology vs. Humanity, The Coming Clash Between Man and Machine. London: Fast Future Publishing Ltd.

[10] Li, W. (2004). Environmental management indicators for ecotourism in China's nature reserves: A case study in Tianmushan Nature Reserve. Tourism Management, 25, 559–564.

[11] Leung, Yu-Fai, Spenceley, Anna, Hvenegaard, Glen, & Buckley, Ralf (eds.) (2018). Tourism and visitor management in protected areas: Guidelines for sustainability. Best Practice Protected Area Guidelines Series No. 27, Gland, Switzerland: IUCN. xii + 120 pp

[12] Nikolić, S. (2006). Turizam u zaštićenim prirodnim dobrima Srbije. Beograd: Zavod za zaštitu prirode Srbije.

[13] PAPACO. (2016). The Internet of Things for Protected Areas: The Application of Innovative Technologies to Improve Management Effectiveness, First report of IUCN Mission to PNP, Retrieved April 10, 2021, from https://papaco.org/wp-content/uploads/2016/11/Innovative-Technologies-for-Protected-Areas-a-global-review.pdf

[14] Protected Planet (2021). The World Database on Protected Areas (WDPA). Retrieved April 2, 2021, from https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA Accessed in April 2021

[15] Smart Parks. (2021). Applications. Retrieved April 14, 2021, from https://www.smartparks.org/applications/

[16] TIES. (2015). The Definition. Retrieved April 15, 2021, from https://ecotourism.org/what-is-ecotourism/

[17] United Nations. (2015). Transforming our world: the 2030 Agenda for Sustainable Development, A/RES/70/1. Retrieved April 12, 2021, from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

[18] UNEP-WCMC, IUCN and NGS (2018). Protected Planet Report 2018. UNEP-WCMC, IUCN and NGS: Cambridge UK; Gland, Switzerland; and Washington, D.C., USA.

[19] UNWTO. (2020). Tourism in 2030 Agenda. Retrieved April 13, 2021, from https://www.unwto.org/tourism-in-2030-agenda

[20] World Economic Forum. (2021). The Fourth Industrial Revolution, by Klaus Schwab. Retrieved April 16, 2021, from https://www.weforum.org/pages/the-fourth-industrial-revolution-by-klaus-schwab

[21] World Economic Forum. (2017). The Global Risks Report 2017, 12th Edition. Retrieved April 13, 2021, from http://www3.weforum.org/docs/GRR17_Report_web.pdff