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**THEMATIC
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I



**UNIVERSITY OF KRAGUJEVAC
FACULTY OF HOTEL MANAGEMENT
AND TOURISM IN VRNJAČKA BANJA**



BIG DATA - THE IMPACT ON HEALTH TOURISM AND SUSTAINABILITY

Marina Jovanović Milenković¹; Nataša Petrović²

Abstract

The healthcare industry has historically generated large amounts of data, driven by record keeping, compliance and regulatory requirements, and patient care. While most data is stored in a hard copy form, the current trend is towards rapid digitization of these large amounts of data. The combination of health and tourism is a relatively new type of tourism that records high rates of growth, and today the value of the health tourism market is over 100 billion dollars. The growth trend will continue in the future, and its sustainability is influenced by environmental factors. The potential of health tourism and sustainability is just in big data technologies. Big data will be a major challenge to health tourism and sustainability in the next decade.

Key Words: *healthcare, big data, health tourism, sustainability*
JEL classification: *I190*

Introduction

The health system and its development directions are the subject of the interests of numerous international organizations, agencies and other institutions, such as the World Health Organization, the World Bank, the International Committee of the Red Cross, and others. Health, or public health, deals with the general health of the community based on health analysis of the population (Milenković et al., 2012; Jovanović Milenković et al., 2016b). “Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host community” (World Tourism Organization UNWTO, 2018). It involves travel for all purposes,

¹Marina Jovanović Milenković, PhD., Assistant Professor, Faculty of Organizational Sciences, Jove Ilica 154, Belgrade, Serbia, marinaj@fon.bg.ac.rs

²Nataša Petrović, PhD, Full Professor, Faculty of Organizational Sciences, Jove Ilica 154, Belgrade, Serbia, petrovicn@fon.bg.ac.rs

including recreation and business. The combination of health and tourism is a relatively new type of tourism that records high rates of growth, and today the value of the health tourism market is over \$ 100 billion (Medical Tourism Magazine, 2014-2015).

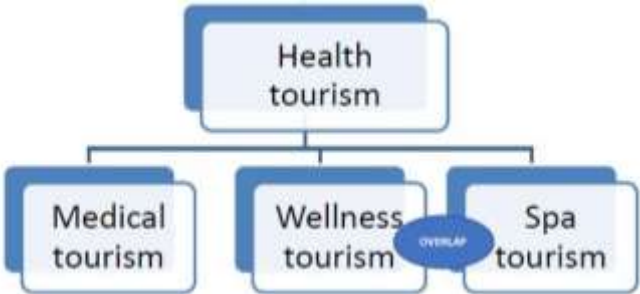
Considering the importance of health tourism and the sustainability of each country, the state implements a number of measures in planning and managing this system in order to ensure stable financing and a quality health care system. The environmental sustainability has a task “... to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations” (EPA, 2018). Further on, “big data is playing a transformative role in the sectors: tourism, sustainability and healthcare” (Keeso, 2014).

Health tourism

In the book *Tourism*, Dragutin Alfier points to the connection between health and tourism: “... health in fact is one of the oldest, lasting and strongest motives for tourism, and that tourism in all its forms always carries out a health function” (Alfier, 1994). In determining health tourism it is necessary to start from the individual’s psychological and physical abilities, needs and aspirations for the recovery of health, in other words goals that can be achieved by enjoying healing water through specific activities and treatments that meet the tourist demand.

Health tourism represents a sector under general tourism and includes wellness, spa and medical tourism (Figure 1).

Figure 1: *Structure of Health tourism*



Source: Mainil et al., 2017

Medical tourism includes people travelling in order to have access to medical treatment. People who travel for wellness want to maintain or improve their health and well-being. Spa tourism involves healing, relaxing or beautifying the body that is in its nature preventative and/or curative (Mainil et al., 2017).

Meler talks about healthcare hardware and healthcare software, where healthcare software is presented with the necessary infrastructure (specialized hospitals, health centers, specialized institutes ...). “Healthcare software is presented to the natural conditions of a specific destination, i.e. climate, thermo mineral and other natural healing factors of the tourist destination” (Meler, 2000). On the Figure 2 we can see types of health tourism.

Figure 2: *Types of health tourism*

Types of Health Tourism				
Wellness			Medical	
Holistic	Leisure & Recreation	Medical Wellness	Medical	Medical
Spiritual	Beauty treatments	Therapeutic Recreation	Rehabilitation (Illness related)	Cosmetic surgery
Yoga & Meditation	Sport & Fitness	Rehabilitation (Lifestyle related)	Healing & Recuperation	Dentistry
New Age	Pampering	Occupational wellness		Operations
			Thalassotherapy	
			Nutritional & Detox programs	

Source: *Smith, Puczkó, 2009*

Because of the fact that the data usually gathered is unreliable and often fragmented, as well as the fact that health tourism’s definition and components vary, it is difficult to calculate the size and growth of it as a market. Within the European Union 28.56 million domestic and 5.1 million international travels were made in 2014 and the share of the market health tourism takes 4.3% - 5.8% of domestic arrivals and 1.1% of international arrivals. France, Italy, Sweden, Germany and Poland represent important destinations for health tourism when it comes to economy. Bulgaria, Germany, Spain, Finland and Ireland have a high

number of wellness and accommodation facilities, while most of health and wellness facilities can be found in Central and Eastern Europe and the Spanish and southern Baltic coasts. Large possible markets for health tourism are Germany, France and Sweden. When it comes to over-night trips, health tourism in the European Union takes up 233.7 million guest nights for domestic trips and 16.7 million international trips, with a total of 250.4 million (Mainil et al., 2017).

It is difficult to differentiate the size of the three markets of health tourism (that is medical, wellness and spa) in the European Union, because of the limited and fragmented data available and since the definitions of this tourism vary greatly depending on the sources and statistical bureaus. An Austrian study estimated the size of the market on the number of businesses/facilities per each market segment, but treated the invasive medical tourism separately. Wellness tourism was dominant in Austria in 2014 taking up 76% share of health tourism, spa tourism came second with 13% share, medical tourism took 9% share and minimally invasive/aesthetic medical tourism took 2% share (Donau-Universität Krems, 2014).

Sustainability

The concept of sustainability has now become widely accepted as a condition of survival and progress of the population. This concept is in close connection with sustainable development which is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). “A rising interest in sustainable development is a result of the perception of current actual conditions of the global human environment, which is largely unsatisfying and worrying, and demands urgent reaction of all members of the society, focused on long term environment protection and maintenance of biological stability” (Petrović, 2012; Savić et al., 2016a; Savić et al., 2016b).

The definition of the term ‘sustainability’ actually represents the study of how natural systems function, remain diverse and produce everything they need for the overall Planet ecology to remain in balance. It also acknowledges that human civilization takes resources to sustain our modern way of life. There are countless examples throughout human history where a civilization has damaged its own environment and seriously affected its own survival chances. Sustainability takes into

account how we might live in harmony with the natural world around us, protecting it from damage and destruction (Environmental Science, 2018; Meadowcroft, 2000).

It is evident that in this day and age, people consume a lot of natural resources each day. It is estimated that each year, humanity uses around 40% more resources than it can replenish, and this fact needs to change. Sustainable development and sustainability itself focus on the balance between competing two needs (Hopwood et al., 2005; Jovanovic Milenkovic et al., 2014):

1. The first is our need to move forward technologically and economically.

The second need is to protect the environments we live in.

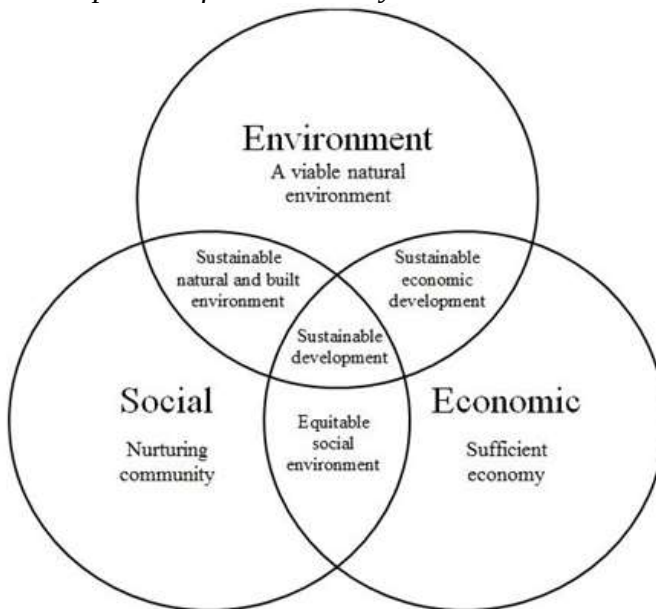
There are three pillars of sustainability (Summit, 2002; Waas et al., 2011):

- Economic Development - economic growth as an engine for long-term welfare creation to satisfy essential needs for jobs, income, food, energy, water, sanitation, social security, and consumption opportunities;
- Social Development - social justice to achieve an equal distribution of welfare, equal access to natural resources and equal opportunities between people (gender, social groups, etc.),
- Environmental Protection - environmental protection to conserve and enhance the resource base and to keep within the Earth's environmental limits for a long term perspective.

Three pillars of the sustainability “do not exclude each other, but even can accent each other” (UN, 2005; Savić et al., 2016b). Three pillars of sustainable development and sustainability are given in Figure 3.

It is evident that sustainability is not just the environment, it's also about health of people and the planet. When it comes to environment it must be noted that currently there are many environmental projects that promote living sustainably – both on local, national and global levels. Maintaining the health of the environment is crucial in ensuring that the future generations can go green and live healthy lives on a healthy planet. Our individual environmental projects can include carrying out our own environmental impact assessment to ensure we use energy and water efficiently and make sure our food, furniture and clothing is from sustainable sources (Environmental Science, 2018).

Figure 3: *Three pillars of Sustainability*



Source: *Pittsburg State University, 2014*

We can conclude that the connection between health tourism and the environment is high having in mind that health tourism depends on a clean environment, but has an impact on the environment (e.g. wellness and spa tourism depend to a large extent on clean water, clean air and attractive ecosystem).

Big data

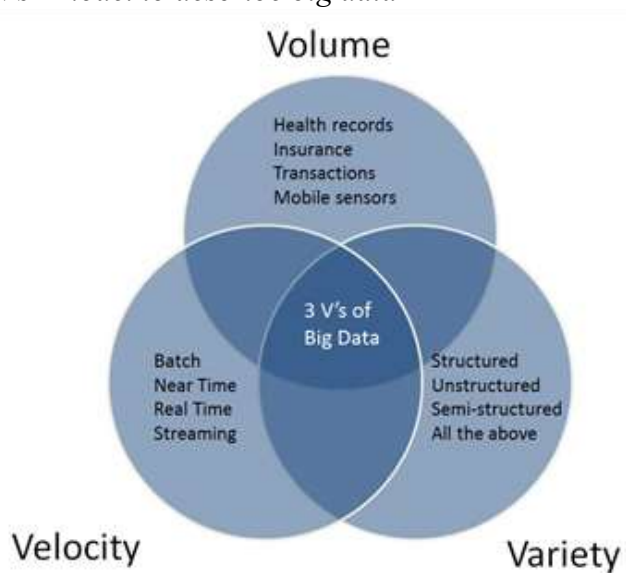
The massive amount of data that was collected at each step led to evolution of ways of storing, processing, manipulating and analyzing data. As large IT companies realized that the collection, purification, and analysis of these large amounts of data lead to valuable insights into how business endeavors can be improved, they were followed up. Today, almost every branch of industry, starting with banks, through large retail chains to health organizations use Big Data Technology to improve performance (Banjac et al., 2017). In 2010, Apache Hadoop defined big data as “datasets which could not be captured, managed, and processed by general computers within an acceptable scope.” On the basis of this definition, in May 2011, McKinsey & Company, a global consulting agency announced Big Data as the next frontier for innovation, competition, and productivity. Big data refer to such datasets that could

not be acquired, stored, and managed by classic database software (Chen et al., 2014). Doug Laney, an analyst of META (presently Gartner) defined challenges and opportunities brought about by increased data with a 3Vs model, i.e., the increase of Volume, Velocity, and Variety, in a research report (Laney, 2001). Gartner and many other enterprises, used the “3Vs” model to describe big data (Beyer, 2011). In the “3Vs” model (Jovanovic Milenkovic, 2016a) (Figure 4)

Volume means that with both generation and collection of data masses, the data scale is in turn becoming increasingly big:

- Velocity implies that the timeliness of big data, moreover, data collection and analysis, etc. must be rapidly and timely conducted, so as to utilize the commercial value of big data to the maximum.
- Variety indicates the various types of data, which can include semi-structured and unstructured data such as audio, video, webpage, and text, as well as traditional structured data (Chen et al., 2014).

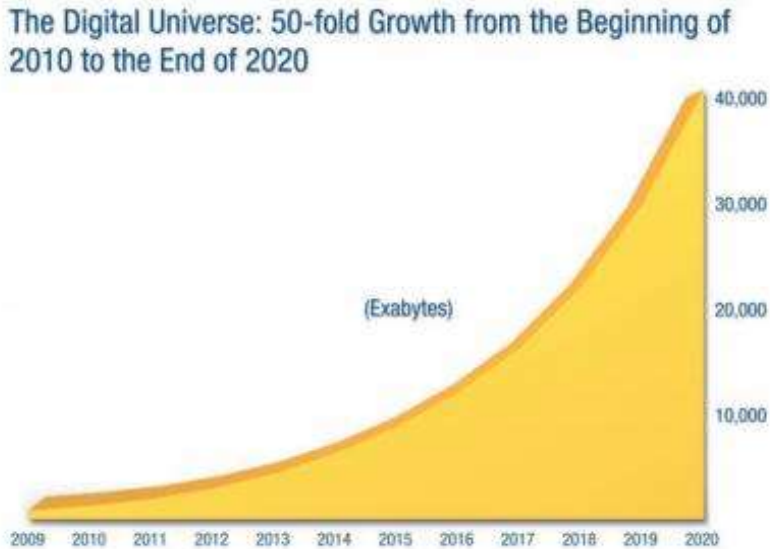
Figure 4: “3Vs” model to describe big data



Source: Austin & Kusumoto, 2016

IDC (International Data Corporation), one of the world's leading providers of market information, advisory services and events for IT, telecommunications and the market for consumer technology, predicts that the world's data will be duplicated every two years and will reach 44 zeta bits in 2020 (1,021 bytes) (Gantz & Reinsel, 2012) (Figure 5).

Figure 5: *Increase in the amount of data 2009-2020*



Source: *Gantz & Reinsel, 2012*

The fact that Facebook has more users than the country of China has people is fascinating. By 2015, its users posted around 250 billion photographs and post an additional 350 million every day. In 2016, users on YouTube posted 300 hours of videos YouTube Company Statistics, 2017), an average of 58 million tweets were posted daily on Twitter (Twitter Company Statistics, 2017), while Facebook generates 4 petabytes (1015 bytes) of new data per day, and its users 4 million likes every minute (Marketing: 47 Facebook Statistics, 2017). However, over 80 percent of the data collected are unstructured data, which means they can not be analyzed in their current form. These are usually videos, photos, audio files, text documents, and many other types of business documents. Semi-structured data make up about 10 percent of the data collected. Finally, structured data constitutes only 5 to 10 percent of the data collected.

Big data - the impact on health tourism and sustainability

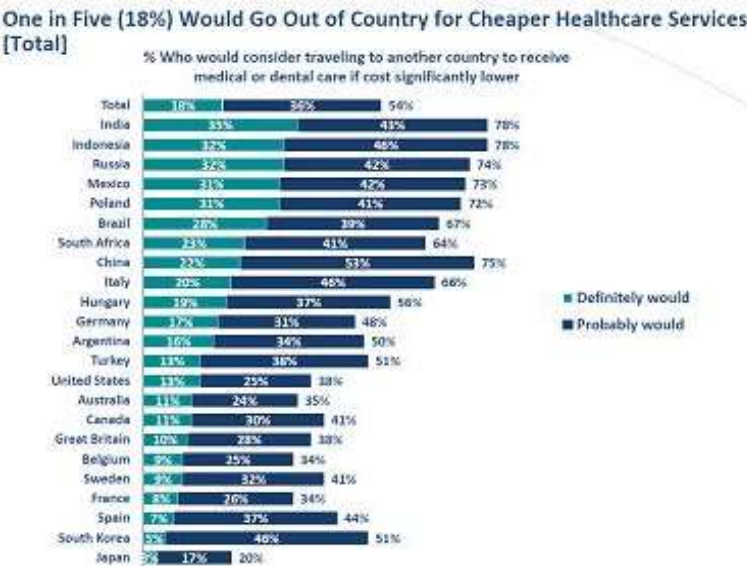
Health tourism, sustainability and big data are concepts that are mutually dependent. More precisely, everything around us today is affected by big data. The phenomenon took shape earlier in this decade and there are now growing numbers of compelling ways in which big data analytics is applied to solve real-world problems. The correlation between health

tourism and sustainability comes from interweaving a large number of data. Big data's potential impact on sustainability hinges on three facts:

- Sustainability of both the business world and the natural world;
- The business world is very complicated, with many interactions between consumers, companies, suppliers and markets;
- The natural world is even more complicated, with lots of interactions between people and resources and ecosystems and climate.

The increment of journeys for health purposes encouraged countries to invest in their healthcare infrastructure (Figure 6). In Figure 6 we can see who considers traveling to another country to receive medical or dental care if the cost was significantly lower. It is no longer rare that leading hospitals are advertised on the international market, directly or through agencies that create special programs that combine medical services and tourist experiences. When defining medical tourists, different methodological interpretations of this problem arise. It's mostly about people who travel to another country looking for medical treatment or health care. The following chart shows a survey of which percentage of the population would travel for the purpose of cheaper health care services.

Figure 6: *Who could consider traveling to another country to receive medical or dental care if the cost were significantly lower*



Source: Ipsos, 2012

Of course, ICT technologies have greatly facilitated the finding of health care that offers the desired value for money outside the place of residence. There is an increasing number of medical services prices, that is, portals specializing in medical tourism, which allow the exchange of offers and contacts between clients and service providers. The ultimate goal is to connect patients with reliable doctors - specialists.

The connection of big data, health tourism and sustainability implies much potential. Data gathering is becoming advanced and it is our ability to analyze and understand the abundant amounts of it. Better computational strength and enhanced connectivity are driving the information revolution. According to an estimate by IBM, by 2020 there will be 300 times more information than we had in 2005. There are, of course, huge opportunities that arise from proper use of these data and sustainability is one of them. Examples that can provide insight into the enormous potential are:

- Energy consumption related to street light in Oslo decreased by 62% with smart solutions (Echelon, 2014).
- The General Hospital in the State of Massachusetts has introduced QPID (Queriable Patient Inference Dossier). It is a system that allows doctors to oversee key information about patients when receiving and treating them. This system also provides operational risk for each patient, which allows each patient to get the best possible treatment and care (Bresnick, 2014).
- Paul Rogers, GE's chief development officer expressed his thoughts in the IGEL conference about the potential of Big Data to optimize performance in the business world. According to the facts presented by him, a "meager 1% improvement in efficiency in five major industrial sectors including healthcare, aviation, rail, power and oil and gas can save \$276 billion in the next 15 years." This amount is a reflection of the kind of profit that companies involved can earn while causing a lesser impact on the environment (The Wharton School, 2015).
- The analysis of blogs and traveler reviews represents a relatively new research method for tourism scholars. Tourist behavioral patterns and behaviors can be observed, recorded, and analyzed (Girardin et al., 2008) through these data. Landmarks, travel routes, and places frequently used by tourists can be identified. Research using data uploaded by tourists on social media is at different geographic levels. At a global level, Hawelka et al. (2014) used Twitter data to explore international tourist travel behavior (Hawelka et al., 2014).

- According to the nearly one billion tweets in 2012, these researchers investigated the mobility of tourists in different countries, characteristics of tourist flows, radii of rotation, diversity of destinations, and balance of capital inflows and outflows (Shao et al., 2017)
- “Big data’s potential impact on sustainability rests on its power to present a clear picture of the complete impact their operations are having on the natural world” (DATAFLOQ, 2018). Earlier this information was disbursed across different formats, locations and sites. However, now businesses are trying to make out the end-to-end impact of their operations throughout the value chain. This includes things that are outside their direct control, including raw material sourcing, employee travels, product disposal, and likewise.
- Other ways in which big data is helping environment sustainability is by helping us to understand the demand for energy and food as the world population increases and at the same time, climate change reduces these resources by every passing year.

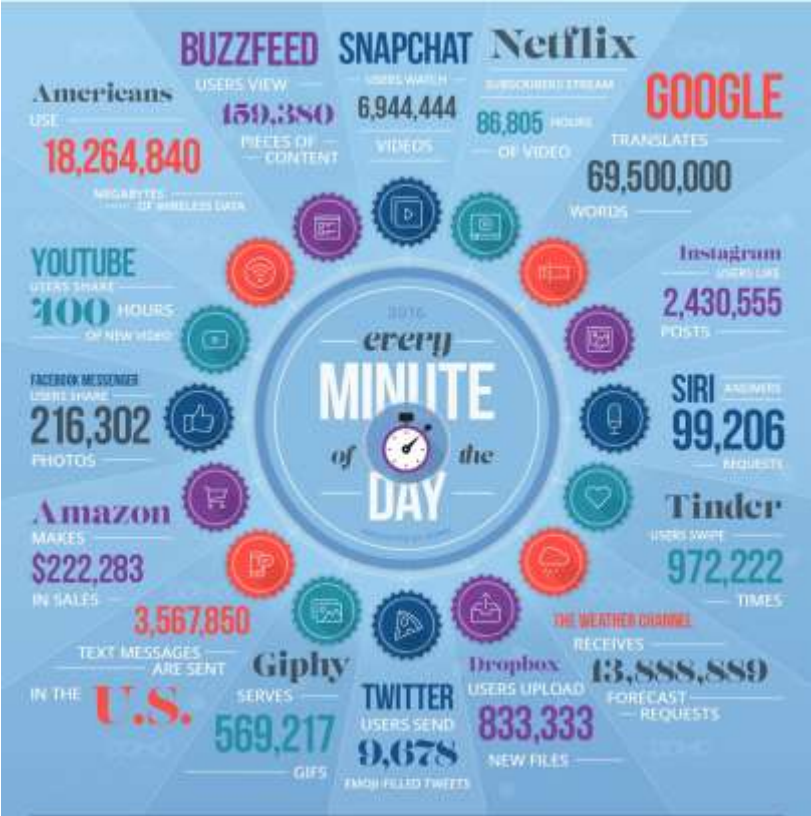
Big data has the power to transform how large businesses – the ones with biggest environmental impacts, but access to large amounts of information as well – can take action on sustainable development and sustainability. Also, strive for data collection can also incentivize smaller suppliers in being more responsible in their own businesses, creating a domino effect. Big data can also be integrated into government policies in ensuring a better environmental regulation. Governments can today implement the newest sensor technology and adopt real-time reporting of environmental quality data. This data can be used to monitor the emissions of large utility facilities and, if required, put some regulatory framework in place to regularize the emissions. Firms are given complete freedom to experiment and chose the best possible means of achieving the required result.

Keeping a complete track of how various business operations have an impact on the natural world gives way to new and innovative ways for bringing sustainability in an organization’s structure also. In the business world, big data is actively helping create a change, cut costs and boost long-term profitability in a resource-constrained world. That’s the real objective that every corporate should be aiming towards.

Josh James, the founder and general manager of the software company Domo, which provides Business Intelligence and Data Visualization

services in 2016, gave his review of the amount of data collected over one minute on the Internet, which can serve as a clear example of the 3V characteristic Big Data (James, 2016) (Figure 7).

Figure 7: *How much data is generated every minute*



Source: *James, 2016*

Conclusion

In this paper we pointed out the connection between health tourism, sustainability and big data. In determining health tourism it is necessary to start from the individual's psychological and physical abilities, needs and aspirations for the recovery of health, in other words goals that can be achieved by enjoying healing water through specific activities and treatments that meet the tourist demand.

Further on, "it has been widely recognized that sustainable development and public health are intricately connected" (Adshead et al., 2006; Dooris,

& Baybutt, 2009). The reasons for this lie in these facts (Seke et al., 2013):

- Achieving sustainability depends on a health of population.
- Health represents precondition and outcome of sustainability.
- Health is closely interrelated with sustainability.
- Both health and sustainability emphasize the need for long term thinking and integrating environmental, social, and economic factors into decision making.

In addition “statements have been made that call for a reinvigorated effort to address matters of environmental sustainability in light of the new forms of analytics and insight that big data could generate” (Keeso, 2014). The connection of big data, health tourism and sustainability implies much potential. Earlier this information was disbursed across different formats, locations and sites.

However, now businesses are trying to make the end-to-end impact of their operations throughout the value chain. This includes things that are outside their direct control, including raw material sourcing, employee travels, product disposal, and likewise. Other ways in which Big Data is helping environment sustainability is by helping us to understand the demand for energy and food as the world population increases and at the same time, climate change reduces these resources by every passing year.

Having in mind that “tourism has a major impact on natural and built environments and on the wellbeing and culture of host populations, and these effects can be positive or negative” (Ministry of Tourism and Environment of Montenegro, 2007), as well as a growing belief that tourism can play a significant role in sustainable development, The World Tourism Organization, in its capacity as Specialized Agency of the United Nations, encourages all countries to ensure that their policies and actions for the development and management of tourism fully embrace the principles of sustainability. In this context, UNWTO has increasingly been putting the concern for sustainability in the center of its activities, undertaking research and capacity building activities on different aspects regarding tourism policies, and its development, management, regulation, and similar issues of public concern. The paper shows that health tourism and sustainability project more and more data to be collected and analyzed in order to better manage the health care of the population.

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