MANAGEMENT OF ELECTRONIC MEDICAL WASTE DISPOSAL AND ITS IMPACT ON THE SUSTAINABILITY OF THE TOURISM DESTINATION

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Abstract

Purpose - The management of electronic medical waste (e-waste) represents a significant challenge and an opportunity for sustainability in the health tourism industry. As large companies in tourist destinations increasingly use electronic devices for medical purposes, the disposal of these items becomes crucial for the health of the environment and the sustainable development of the destination. This paper examines the impact of healthcare e-waste disposal in destinations and discusses strategies for effective management to improve sustainability.
Findings-Research - This study is based on a mixed methods design that includes a quantitative analysis of e-waste generation and qualitative case studies at major healthcare providers in leading tourism destinations. The paper evaluates different strategies for e-waste management, including Design for Environment (DfE) principles, the use of environmentally friendly materials, energy efficient practices, data security measures, recycling and reuse, and more. A multi-perspective approach will be used to discuss the challenges and opportunities of e-waste management that promotes sustainable tourism development.
Design/methodology/approach - This study examines the management of electronic medical waste (e-waste) and its impact on sustainability in tourism destinations. With the increasing integration of technology into the healthcare services offered there, the proper disposal and recycling of e-waste is proving critical to maintaining environmental health and ensuring sustainable development of the tourism economy. This study aims to identify effective e-waste management strategies that can be implemented by large companies operating in tourism destinations and analyse their impact on the environmental sustainability and overall attractiveness of these places for tourists.
Findings/ Originality of the research - This study not only represents an intersection between the healthcare industry's management practices regarding the disposal of average-life devices by hospitals and sustainability in tourism, but also provides insights for policy makers, healthcare managers and tourism stakeholders regarding effective e-waste management approaches. The study highlights the role that sustainable e-waste management can play as a key differentiator for destinations, while ensuring the health and safety of tourists and the wellbeing of the host community. The argument of this study is therefore that the current management of e- waste in healthcare facilities needs an alternative approach to improve their attractiveness and sustainability.
Keywords medical e-waste, e-waste, impact of health tourism on the destination, hospital e-waste.

Review
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INTRODUCTION

In recent years, the behavior and expectations of travelers in the tourism industry have changed significantly. Factors that have contributed to this growth include cost efficiency, speed and access to specialized services. However, in terms of environmental management, the sustainability of medical tourism is closely linked to the management of e-waste (electronic waste). Tourists are increasingly looking not only for adventure and relaxation, but also for experiences that contribute to their overall well-being. This is confirmed in an article by Abdallah (Abdallah & Al-Hashmi, 2023), in which he states that tourists' preferences have evolved towards trying to get the most out of their vacation, i.e. having a good time on the one hand and feeling better emotionally and physically on the other (Quintela, Costa, & Correia, 2016). Reed and Dawood (2009) have divided health tourism into two main categories. The first is medical tourism, which includes dental treatments, cosmetic surgery, elective surgery, and fertility treatments, but can also include a broader range of medical treatments (Lunt, et al., 2011). The second category is wellness tourism, which has been defined by the Global Wellness Institute (GWI) as "travel associated with the goal of maintaining or enhancing personal well-being"," which includes recreation, disease prevention and management, and lifestyle enhancement (Yeung & Johnston, 2018).

At a time when everything in life is being taken over by technology, the healthcare systems that cut through the booming tourism business have not been spared. The use of electronic devices in medical care, from diagnostic tools to wearable health monitors, has greatly improved patient care and operational efficiency. However, there is a less-discussed challenge associated with this digital revolution: the creation of e-waste, or electronic medical waste. In over 3 billion different literature articles, papers and studies on "medical tourism" (Medical Tourism Literature - Google Search, n.d.), only over 280 million articles appear when typing the words "medical e-waste management" into the search engine (Medical E-waste Management - Google Search, n.d.). Based on the study of the selected available literature and many years of experience in dealing with the problem of e-waste in medical business practice, this article examines the problem of the growing amount of e-waste generated by

the increasing use of various electronic devices in medicine. The aim was to assess the impact on the healthcare and tourism industries and the need for sustainable management practices.

The number of electronic devices in healthcare, such as diagnostic devices and wearables, has increased significantly, improving the quality of services for patients. However, this development also has a downside: it leads to an accumulation of electronic medical waste (EMW), which has a negative impact on human health and the environment due to the hazardous chemicals it contains. Furthermore, improper handling of such waste exacerbates these risks, including the possibility of data breaches. This article addresses the constituents of EMW, their health and environmental impacts, and the challenges associated with protecting against data leakage. The hypotheses of this article are as follows:

H1: In modern healthcare, the number of electronic devices is increasing significantly, which requires a more systematic approach to solving the problem of e-waste management.

H2: A better quality of e-waste management has a positive impact on the sustainable development of both health tourism and tourism in general.

1. ELECTRONIC MEDICAL WASTE AND TOURISM

Electronic medical waste or EMW is part of electrical and electronic waste (commonly known as WEEE or e-waste) (Waste From Electrical and Electronic Equipment (WEEE), n.d.). E-waste, also known as electronic medical waste, is a term that refers to discarded electronic equipment used in healthcare facilities in the tourism sector such as hospitals, clinics and laboratories. This group includes various devices such as monitors, scanners, diagnostic equipment and even personal health monitoring devices. When these devices are phased out or become obsolete due to rapid technological advancements, they become e-waste, posing potential environmental and health risks if handled improperly. Improper disposal of e-waste and its consequences can seriously damage a destination's reputation by degrading the environmental aspects of sustainable tourism.

In 2019 alone, global e-waste production amounted to an unimaginable 53.6 million tons, a testament to our increasing dependence on electronics. Yet only 17.4% of this was officially collected and recycled, indicating a huge gap in the management of e-waste (Home - E-Waste Monitor, 2024). This is all the more problematic as medical tourism has become a global phenomenon, with people from all parts of the world traveling to other parts of the world to receive medical healthcare.

Medical tourism destinations are under pressure to provide high quality healthcare while ensuring the safety and comfort of tourists. Both of these demands are particularly placed on the disposal of e-waste generated in healthcare facilities where a variety of electronic devices are used to diagnose and treat patients. Proper management is essential, as it not only protects the environment, but also the health of tourists and the people around them.

The disposal of e-waste by medical facilities in tourist areas requires the attention of several stakeholders. These include healthcare providers, waste management professionals, tour operators as well as policy makers and even tourists themselves, to name but a few. Each side has a part to play in ensuring that waste is disposed of sustainably, both from an environmental perspective and in line with best practice in public health services.

It also shows how the link between healthcare and tourism can act as a catalyst for innovative solutions through partnerships. These include investing in more efficient recycling technologies, developing new regulations to promote responsible e-waste management practices and educating travellers and service providers on sustainable behaviours. By tackling the e-waste challenge head on, they can not only maintain their reputation as environmental stewards, but also increase their appeal to people who value their wellbeing and seek medical services elsewhere.

2. ENVIRONMENTAL AND HEALTH IMPACTS

The amount of electronic medical waste is increasing faster worldwide than any other type of solid waste (Tackling Informality in E-waste Management: The Potential of Cooperative Enterprises, 2014). Some hazardous components in hazardous e-waste, such as lead, mercury, cadmium and brominated flame retardants, can contaminate soil and water and cause serious health problems for humans and animals. Another problem with the improper disposal of e-waste is that data breaches can occur due to the sensitive information that is often stored on these devices.

Electronic medical devices, ranging from monitors and scanners to smaller, portable technologies, are becoming increasingly common. They are characterized by a complex mix of valuable materials and harmful substances. The main elements found in e-waste that are hazardous, such as lead, mercury, cadmium and brominated refractories, contaminate not only the soil but also the water.

2.1. Soil and Water Contamination

The journey of EMW often begins with its disposal. In many cases, e-waste from healthcare facilities is not properly segregated and can become mixed with general waste. This can include everything from obsolete medical equipment to electronic recording systems. Even when e-waste is collected separately, inadequate handling and processing can lead to environmental contamination.

A common destination for improperly disposed e-waste is landfills. When e-waste is disposed of in landfills, it does not simply lie idle, but begins to decompose or is crushed under the weight of other waste. This is where the first significant risk of contamination arises. Over time, these hazardous substances can seep from the e-waste into the surrounding soil. This leaching process is accelerated by rainfall or the landfill's own leachate management system, which is designed to absorb the liquid that seeps through the waste pile. Once in the soil, these toxins can damage plant life, disrupt soil microorganisms, reduce agricultural productivity and enter the food chain.
Contaminated soils also pose a direct risk to human health as people come into contact with them or consume plants that have ingested these toxins.

2.1.1. Contamination of Groundwater and Surface Water

The contaminants don't stop at the soil. They can also run off into the groundwater or enter surface waters such as rivers, lakes and oceans through runoff. Groundwater contamination is of particular concern as it is a common source of drinking water. Similarly, toxins entering rivers and lakes can affect aquatic life and any animals or humans that rely on these water sources.

Once hazardous substances from e-waste enter natural water systems, they can be taken up by aquatic organisms, starting a process known as bioaccumulation. When larger animals eat smaller ones, these toxins concentrate higher up the food chain, a process known as biomagnification. This means that even trace amounts of toxic substances can greatly accumulate in the largest predators, including humans.

The end result is that both wildlife and humans can be exposed to significant levels of toxic substances through the consumption of contaminated water or organisms. This exposure can lead to a range of health problems, including neurological damage, kidney disease and cancer, depending on the specific contaminants and the level of exposure.

2.2. Human Health Risks

According to Grant's study (Grant et al., 2013), the consequences of "exposure to e-waste include changes in thyroid function, changes in cellular expression and function, negative effects on newborns, changes in temperament and behaviour, and decreased lung function. Boys aged 8-9 years who lived in a town where e-waste was recycled had lower forced vital capacity than boys who lived in a control town. Significant negative correlations were also found between blood chromium concentration and forced vital capacity in children aged 11 and 13 years. Most studies found that exposure to e-waste was associated with an increase in spontaneous abortions, stillbirths and premature births, as well as lower birth weight and birth length. People living in cities where e-waste is recycled or who work in e-waste recycling were shown to have greater DNA damage than people living in control cities." Below are some of the developmental, cognitive, neurological and carcinogenic health effects of e-waste.

Developmental effects: Exposure to certain chemicals in medical e-waste, such as lead and mercury, can have profound effects on development, particularly in fetuses and young children. These substances can interfere with normal development, resulting in:

- Decreased cognitive function and lower IQ.
- Delayed or impaired growth and development.
- Behavioural problems, including ADHD (attention-deficit/hyperactivity disorder).
- Impaired motor skills and learning difficulties.
- Lead is also known to cross the placental barrier and affect the developing nervous system of fetuses, which can lead to lower birth weight and growth.

Neurological effects: Neurological effects are among the most worrisome consequences of exposure to hazardous substances in e-waste. Metals such as mercury, lead and cadmium, as well as certain organic compounds found in e-waste, are neurotoxic and can damage the nervous system, leading to:

- Cognitive deficits and memory impairment.
- lowed nerve conduction velocity.
- Neuromuscular weakness.
- Increased risk of neurodegenerative diseases such as Alzheimer's and Parkinson's later in life.

Carcinogenic effects: Some components of medical e-waste are classified as carcinogenic or potentially carcinogenic. For example:

- Certain types of brominated flame retardants (BFRs) used in electronic devices have been linked to thyroid cancer because they can disrupt thyroid hormone homeostasis.
- Cadmium exposure has been linked to an increased risk of lung cancer and possibly prostate and kidney cancer.
- Polychlorinated biphenyls (PCBs), while no longer commonly used, are still found in older appliances and are associated with an increased risk of several cancer, including melanoma, liver cancer and gallbladder cancer.

These substances can enter the human body through direct contact with electronic waste, through the ingestion of contaminated food or water or through the inhalation of dust and vapours from the recycling process of electronic waste.

Table 1: **The effects of E-Waste on Human Health**

Chemical	Uses in Electronics	Health effects
Lead	Glass and PC cathode ray tubes as radiation shield	Damage to nervous system, circulatory system & kidneys; serious effects on brain development
Aluminium	Conductivity	Skin rashes, asthma, linked to Alzheimer's Disease
Nickel	Magnetics	Chronic bronchitis, impaired lung functions
Beryllium	Thermal conductivity	Lung damage, chronic beryllium disease
Chromium	Decorative, hardener (steel)	Damage to liver, kidneys, increased possibility of lung cancer, asthma
Cadmium	Battery, Blue green phosphor emitter	Kidney disease, bone fragility
Mercury	Batteries, switches	Chronic brain, kidney, lung and fetal damage

(Shantaram et al., 2014)

3. DATA SECURITY CONSIDERATIONS

Healthcare facilities must prioritize data security when disposing of electronic devices. Data should be erased or devices destroyed to protect patient identity and comply with privacy regulations such as the Health Insurance Portability and Accountability Act (HIPAA). Means that can be used to prevent data breaches include purging the data by removing it from the device or destroying the device itself (Perolina, 2023). HIPAA and inventory and asset management are briefly described below:

HIPPA: In the US, medical facilities must comply with HIPAA. HIPPA is a federal law that mandates the creation of national standards to protect sensitive patient health information from being disclosed without the patient's consent or knowledge. However, if an international company processes or transmits PHI of U.S. citizens, it is considered a business associate of a covered entity and is therefore subject to HIPAA regulations. This applies to companies of any size, whether it is a small startup or a large multinational corporation (Greevy, 2023).

INVENTORY AND ASSET MANAGEMENT: Accurate inventory management systems can help streamline the processes for obsolescence of electronic devices. This would mean tracking their disposal and keeping detailed records. A solid inventory system allows healthcare facilities to comply with government regulations, track data destruction and plan for future technological advancements.

4. THE CHALLENGE OF SUSTAINABLE MANAGEMENT

E-waste can be classified according to its physical and chemical constituents (Mohammed, 2023) and the contaminants of e-waste can be categorized into three types (Halim & Suharyanti, 2019). Primary pollutants are the hazardous components of e-waste, such as heavy metals and halogenated compounds. Secondary pollutants are by-products or residues resulting from improper recycling processes, including dioxins, polyaromatic hydrocarbons (PAHs) and polyhalogenated aromatic hydrocarbons (PHAHs). Tertiary emissions or contaminants are compounds used for recycling that must be handled properly to avoid environmental and health problems, e.g. aqua regia, residues of nitric acid, hydrochloric acid, cyanide, thiourea and bromide in the leaching process of metal recycling. (Khanna et al., 2014).

Due to the hazardous nature of safe disposal and recycling, some people argue that handling electronic medical waste is the most difficult part. For example, e-waste cannot be landfilled or incinerated like other waste because it releases toxic

substances. Also, the rapid technological advancement in the healthcare sector leads to rapid obsolescence of devices, which increases the amount of e-waste.

In order to effectively manage electronic medical waste (EMW), appropriate measures must be taken to ensure that environmentally friendly disposal methods and recycling and reuse initiatives are adopted. However, this goal is not always easy to achieve or put into practice. The issues involved include:

Regulatory hurdles: Different regulations in different countries and regions can make standardized management of e-waste difficult.

Economic hurdles: The costs associated with recycling and safely disposing of e-waste can be prohibitive for many healthcare providers, especially in resource-poor areas.

Lack of awareness: Both healthcare providers and patients may be unaware of the environmental and health risks of improperly disposed medical e-waste.

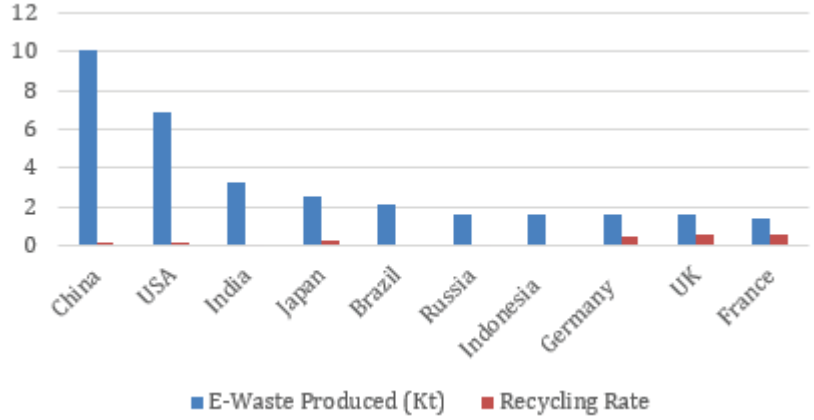
But how is e-waste disposed of in the countries that produce the most? The management of e-waste varies from country to country, with some of the major producing countries implementing recycling programs and laws to reduce environmental impact. The effectiveness and enforcement of these measures varies widely (geeksforgeeks, 2024):

Table 2: **The top 10 Electronic Waste Producing Countries in the World**

Rank	Country	E-Waste Produced (Kt)	Recycling Rate
1	China	10,129	16%
2	USA	6,918	15%
3	India	3,230	1%
4	Japan	2,569	22%
5	Brazil	2,143	0%
6	Russia	1,631	6%
7	Indonesia	1,618	n/a
8	Germany	1,607	52%
9	UK	1,598	57%
10	France	1,362	56%

(geeksforgeeks, 2024)

Graph 1: **The top 10 Electronic Waste Producing Countries in the World**



(geeksforgeeks, 2024)

4.1. Opportunities for Sustainable Practices

There are major opportunities to improve sustainability practices in electronic medical waste management (EMWM), such as:

Innovative recycling technologies: improvements in recycling technologies used in EMWM can help recover valuable materials, reducing the demand for raw materials while minimizing the environmental footprint. Investing in newer, safer technologies for the disposal of e-waste can minimize environmental contamination.

Regulatory incentives: Governments can play a crucial role by providing incentives for the adoption of sustainable e-waste management practices, such as tax breaks or grants for recycling programs.

Public-private partnerships: Collaboration between healthcare providers, waste management companies and environmental organizations can lead to innovative solutions for e-waste management and recycling.

Education and awareness campaigns: Raising awareness among healthcare providers and the public about the importance of managing medical e-waste can encourage responsible disposal and recycling behaviour.

The most effective solution to the growing e-waste problem is to recycle raw materials from discarded electronic devices. Most electronic devices contain a range of materials, including metals, that can be reused for future purposes. Dismantling and providing reuse options conserves intact natural resources and avoids air and water pollution from hazardous debris (Shantaram et al., 2014).

4.1.1. Mitigation Steps

Several steps can be taken to reduce the impact of medical e-waste on soil and water:

Improve waste separation: ensure that e-waste is properly separated from other types of waste at the point of generation.

Recycling and reprocessing: Promote reuse, recycling, recovery of valuable materials and the management of hazardous substances contained in electronic waste.

Strict regulation and enforcement: Implementation and enforcement of regulations governing the disposal, treatment and recycling of e-waste.

5. DESIGN FOR ENVIRONMENT (DFE)

Design for Environment (DfE) is a forward-looking approach to the manufacture of electronic devices that aims to reduce the environmental impact throughout the product's life cycle, especially at the end of its life. When environmental concerns are integrated into product design, waste volumes can be significantly reduced and recycling facilitated, while hazardous materials can be minimized in their use. This method not only benefits the environment, but also meets the increasing consumer demand for sustainable products. Below are some examples and practices that show how DfE is applied in the manufacture of electronic devices:

MODULAR DESIGN – Example for modular design of electronic devices is Fairphone, which is environmentally friendly and sustainable. Fairphone is also easy to disassemble and repair. Therefore, customers do not have to buy a new phone every time the Fairphone breaks, but can have the camera, screen or battery replaced separately without having to throw away other parts. In this way, Fairphone ensures that the lifespan of its product is much longer and the e-waste is reduced at the same time (Fairphone | the Phone That Cares for People and Planet, 2024).

USE OF ECO-FRIENDLY MATERIALS - Another practical application where DfE can come into play is the choice of inexpensive materials. A good example is the use of recyclable or biodegradable content in the development of electronic devices to reduce the impact on nature. An excellent example is the Ecomouse, which is made from recycled plastic and bamboo. Its components can be easily separated for recycling, while the bamboo housing is biodegradable and therefore has a limited environmental impact (RECYCLED ABS AND BAMBOO MOUSE, n.d.).

ENERGY EFFICIENCY - DfE means that energy efficiency is taken into account as part of the basic characteristics of electronic devices. Environmentally friendly devices require less power and thus minimize the negative impact of energy production on our planet. LED monitors, for example, consume significantly less power than conventional LCD screens. The result is lower carbon dioxide emissions combined with lower electricity costs for consumers.

REDUCTION OF HAZARDOUS SUBSTANCES - The removal or reduction of hazardous chemicals in these appliances is another important aspect of DfE. An example of this is the switch from lead solders to conductive circuits, which are considered safer when it comes to disposing of electronic waste. These products are no longer toxic for recycling and disposal when they are stripped of toxic metals such as lead, protecting the environment and humanity.

SOFTWARE SOLUTIONS FOR LONGER LIFESPAN - DfE includes software strategies that can extend the service life of electronic devices. For example, a simple firmware upgrade on smart TVs can improve performance and add streaming capabilities, delaying the need to purchase a new model. Firmware updates can also improve the operating efficiency of this type of device. In this case, firmware upgrades on smart TVs would add functionality and additional streaming features and new models would not need to be launched.

CONCLUSION

The World Tourism Organisation defines sustainable tourism as "tourism that fully considers its current and future economic, social and environmental impacts, taking into account the needs of visitors, the industry, the environment and host communities" (Sustainable Tourism | Department of Economic and Social Affairs, n.d.).

Sustainable medical tourism is a conscious and sustainable human activity in which a medical tourist/mobile patient aims to receive broadly defined health care outside their permanent residence (at home or abroad), consisting mainly of maintaining (improving) the health and/or aesthetic appearance of their own body, often combined with recreation and the consumption of tourist packages (Sustainable Tourism | Department of Economic and Social Affairs, n.d.).

Medical tourism destinations have facilities equipped with all kinds of modern medical equipment and gadgets. They use various electronic devices, from sophisticated testing machines to patient monitoring devices. Nevertheless, this phase generates e-waste consisting of worn-out, obsolete or discarded equipment. There are legal, logistical and financial challenges that companies face when disposing of e-waste. The challenges of managing e-waste are even greater when it is related to medical tourism, as reputation and environmental safety are critical in such areas.

In this paper, the critical link between the management of e- waste in medical tourism destinations and the outlook was examined in detail. The findings make it clear that the improper handling of e-waste, which typically contains lead, mercury and cadmium among other hazardous chemicals, poses a significant environmental and health risk. This can contaminate ecosystems by leaching into the soil and waterways, with catastrophic effects on human health.

Inappropriate handling of medical electronic waste used in medical tourism can destroy a country's image. Inadequate management of medical e-waste also significantly lowers the marketability and viability of tourism destinations, making them less attractive and competitive, leading to a decrease in the number of patients seeking treatment. If e-waste management is not seen as a strategic necessity for a health tourism destination, the number of tourists who consider sustainability alongside quality of healthcare when deciding where to seek treatment decreases. The combination that exists between managing e- waste for medical tourism today and future needs is not only complicated but also full of potential solutions. Given the rapid growth of medical tourism today, the need for sustainable approaches to managing the e- waste generated by the sector cannot be overstated. Such practices protect the health of the environment and at the same time contribute to the reputation of the respective countries, which promotes sustainability in this sector. From this point of view, the disposal of e-waste is more than just an environmental issue. Rather, it becomes a strategic issue that determines the success or failure of global business ventures in the field of medical tourism.

However, the disposal of e-waste is very complex due to legal regulations and logistical constraints. In some regions, there is no adequate infrastructure for handling waste, while in other regions the legal framework for disposal is not strong enough and control methods are not applicable to clinical e-waste from around the world. Therefore, there are certain legal measures that have been introduced to solve this problem.

However, these challenges also present opportunities for new sustainability initiatives that can be transformative. By using innovative technologies and practices to reduce and recycle e-waste, and through collaboration between tourism businesses, e-waste processors and environmental organizations, these destinations could significantly increase their sustainability performance. In addition, the DfE approach to manufacturing environmentally friendly electronic devices is a comprehensive program that incorporates every aspect of production. For example, modular design, the use of environmentally friendly materials, energy efficiency, the reduction of hazardous substances and software solutions to extend product life are important DfE principles that manufacturers can apply to promote sustainable development worldwide. In addition to the practical applications that these practices offer, it is worth noting how important it is for the electronics industry, particularly from a health perspective, to ensure that all of its processing is environmentally friendly.

There can be no doubt that effective management strategies for medical tourism are required to ensure that these destinations remain viable or not in the long run. It needs a collective commitment from various stakeholders such as healthcare providers, manufacturers, policy makers and even visitors to adhere to good environmental practices for the growth of sustainable medical tourism.

Based on the facts and assertions presented in this paper, analysis of global trends, available literature and current research, it can be concluded that health tourism is playing an increasingly important role in tourism. As modern medicine and health tourism increasingly rely on the use of sophisticated electronic devices, the problem of electronic waste management is becoming more and more important in the sustainable development of both health tourism and tourism in general. Solving this problem requires a systematic approach and the adoption of new policies and strategies at all levels of government and tourism development policy makers. The above conclusions prove the validity of the hypotheses (H1 and H2) in the introduction of this paper.

REFERENCES

Electronic waste (e-waste). (2023, October 18). https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste)

Fairphone | The phone that cares for people and planet. (2024, March 15). Fairphone. https://www.fairphone.com/en/

G. (2024, March 14). Top 10 Electronic Waste Producing Countries in the World. GeeksforGeeks. https://www.geeksforgeeks.org/top-10-electronic-waste-producing-countries-in-the-world/

Greevy, H. (2023, March 22). Do international companies have to abide by HIPAA? https://www.paubox.com/blog/do-international-companies-have-to-abide-by-hipaa

Halim, L., & Suharyanti, Y. (2019, December 7). E-Waste: Current Research and Future Perspective on Developing Countries. International Journal of Industrial Engineering and Engineering Management. https://doi.org/10.24002/ijieem.v1i2.3214

Home - E-Waste Monitor. (2024, February 8). E-Waste Monitor. https://ewastemonitor.info/

Khanna, R., Cayumil, R., Mukherjee, P. S., & Sahajwalla, V. (2014, January 1). A Novel Recycling Approach for Transforming Waste Printed Circuit Boards into a Material Resource. Procedia Environmental Sciences. https://doi.org/10.1016/j.proenv.2014.09.006

Lunt, N., Smith, R., Exworthy, M., Green, S.T., Horsfall, D., Mannion, R. (2011). Medical Tourism: Treatments, Markets and Health System Implications: A scoping review, Paris: OECD. DOI: 10.1016/B978-0-12-375678-7.00615-5

Mohammed, S. I. (2023, November 2). E-Waste Management in Different Countries: Strategies, Impacts, and Determinants. IntechOpen eBooks. https://doi.org/10.5772/intechopen.106644

Perolina, N. J. (2023, June 7). Managing Electronic Waste in Healthcare: Proper Disposal and Data Security. MedPro Disposal. https://www.medprodisposal.com/managing-electronic-waste-in-healthcare-proper-disposal-and-data-security/

Quintela, J., Costa, C., Correia, AG (2016). Health, wellness and medical tourism: A conceptual approach. Enlightening Tourism: A Pathmaking Journal, 1–18. RECYCLED ABS AND BAMBOO MOUSE. (n.d.). Bourne International. https://www.bourne-intl.co.uk/recycled-abs-and-bamboo-mouse

Reed, C.M., Dawood, R. (2009). The Health-seeking Traveler. JS Keystone, PE Kozarsky, D. O. Freedman, H. D. Nothdurft, B. A. Connor, Travel Medicine (Second Edition): 343–349. New York: Mosby.

Shantaram, M., Shafy, S., & Fatimah, R. (2014, April 1). A concern of E-waste in the hospital setting and its ways of disposal. ResearchGate. https://www.researchgate.net/publication/261595471_A_concern_of_E-waste_in_the_hospital_setting_and_its_ways_of_disposal

Sustainable tourism | Department of Economic and Social Affairs. (n.d.). https://sdgs.un.org/topics/sustainable-tourism

Sustainable tourism | Department of Economic and Social Affairs. (n.d.). https://sdgs.un.org/topics/sustainable-tourism

Tackling informality in e-waste management: The potential of cooperative enterprises. (2014, October 21). , https://www.ilo.org/sector/Resources/publications/WCMS_315228/lang--en/index.htm

Taheri, S., & Asadizanjani, N. (2022, February 16). An Overview of Medical Electronic Hardware Security and Emerging Solutions. Electronics. https://doi.org/10.3390/electronics11040610

Waste from Electrical and Electronic Equipment (WEEE). (n.d.). Environment. https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en

Yeung, O., Johnston, K. (2018). Global Wellness Tourism Economy. Miami: Global Wellness Institute.

medical tourism literature - Google Search. (n.d.). https://www.google.com/search?q=medical+tourism+literature+&sca_esv=832bfc491017b489&sca_upv=1&rlz=1C1GCEA_enRS1044RS1044&sxsrf=ADLYWIIIVtTnuYHMA29J3uEunr_ofb-TdQ%3A1716575245299&ei=DdxQZrvcEfWD9u8P0aeg0AU&udm=&ved=0ahUKEwj7lueN9aaGAxX1gf0HHdETCFoQ4dUDCBA&uact=5&oq=medical+tourism+literature+&gs_lp=Egxnd3Mtd2l6LXNlcnAiG21lZGljYWwgdG91cmlzbSBsaXRlcmF0dXJlIDIGEAAYFhgeMggQABiABBiiBDIIEAAYgAQYogQyCBAAGIAEGKIEMggQABiABBiiBEiZCVCKB1iKB3ACeAGQAQCYAYYBoAGGAaoBAzAuMbgBA8gBAPgBAZgCA6ACjgHCAgoQABiwAxjWBBhHmAMAiAYBkAYCkgcDMi4xoAeJAw&sclient=gws-wiz-serp

medical e-waste management - Google Search. (n.d.). https://www.google.com/search?q=medical+e-waste+management&sca_esv=832bfc491017b489&sca_upv=1&rlz=1C1GCEA_enRS1044RS1044&sxsrf=ADLYWIKo8rClfVLc8X2WQQ0j09B3M6veWg%3A1716575447633&ei=19xQZv2XJvA9u8Pj4uqwAs&udm=&ved=0ahUKEwi936Tu9aaGAxV1gP0HHY-FCrgQ4dUDCBA&uact=5&oq=medical+e-waste+management&gs_lp=Egxnd3Mtd2l6LXNlcnAiGm1lZGljYWwgZS13YXN0ZSBtYW5hZ2VtZW50MgUQIRigAUiAI1AAWKAhcAB4AZABAZgBzQKgAewkqgEIMC4yM
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