Malaysian Journal of Sustainable Environment
Vol.11.No.2 (2024) 193-208
doi: 10.24191/myse.v12i1.1563

PUBLIC PERCEPTION REGARDING SUSTAINABILITY IN ARCHITECTURE: A QUALITATIVE STUDY OF CHALLENGES AND DEMANDS IN RESIDENTIAL BUILDINGS IN TEHRAN

Masoume Taraz*[1] & Roghayeh Taraz[2]
***Corresponding Author**
[1]Technology of Architecture, Tehran University, Iran
[2]MBA, Black Hill state University, South Dakota, USA

ms.taraz@yahoo.com & Artataraz@my.unt.edu
Received: 20 May 2024
Accepted: 12 July 2024
Published: 31 August 2024

ABSTRACT

Abstract In the rapidly urbanising world, the challenges of global warming, climate change, increased atmospheric pollutants, and the depletion of natural resources make the return to sustainability principles imperative for all. Since architecture is directly related to human life, the adoption of sustainable architectural principles requires serious effort. However, this necessitates awareness among all stakeholders involved in construction and housing such as designers, builders, policy makers, and users. This research investigates general awareness of sustainable architecture principles, focusing on residents of residential buildings in Tehran as the beneficiary of this industry. Using qualitative research methodology, purposive sampling was employed to select residents from various parts of the city. 12 residents of Tehran were asked to participate in an interview. Semi-structured interviews were conducted, recorded, and transcribed, with thematic analysis being the primary method of data analysis. The study identified five main themes from the interview results: understanding and principles of sustainable architecture, practical implementation and examples, personal impact and engagement, recognition and global perspective, and challenges and solutions. Despite existing challenges in the application of sustainability, participants in this research fundamentally prioritise sustainability and emphasise factors such as environmental preservation, resource

optimization, and resilience against natural disasters. The findings suggest a growing trend in global understanding and awareness of sustainable architecture but emphasise the need for further action and education. This article contributes valuable efforts towards increasing public awareness and promoting sustainable architectural projects in urban environments, providing strategies for enhancing awareness and improving sustainable architectural projects for professionals and researchers.

Keywords: *Sustainability, Sustainable development, Sustainable architecture, Public awareness*

INTRODUCTION

The world is becoming busier, more polluted, and more urbanised day by day, and we increasingly observe the urban lifestyle and urbanisation in it. During the twentieth century, the human population increased from 2 billion to 6 billion, which means a greater demand for housing, urban transportation, jobs, and interaction. Before this, most cities accommodated populations of fewer than one million people. However, the increasing growth of the twentieth century led to an increase in the number of cities accommodating populations of more than one million people. This signifies a significant increase in the utilisation of resources and the traffic of public and private transportation in cities, leading to an increase in the production of carbon dioxide and pollutants in urban areas. Also, the process of construction and demolition of existing buildings has become a challenge for urban environments due to the production of non-recyclable and polluting waste, which are the subject of some current research in various fields (Mahyuddin et al., 2024).

According to statistics published in 2010, human activities worldwide were producing 7×10^9 metric tons of carbon dioxide annually. This figure is remarkably significant. The industrial sector is responsible for producing 1.235×10^9 metric tons of carbon dioxide in the United States in 2007, and it is expected that this figure will increase to 1.667×10^9 metric tons by 2030. These concerns have prompted communities to take measures to address this issue. For example, factories have faced a new responsibility in the production of goods, which involves producing products

in an environmentally friendly manner. This necessitates engineers and manufacturers to be familiar with the concept of sustainability. Therefore, designing and producing environmentally friendly and sustainable products is vital (Ramani et al., 2010).

One of the industrial sectors responsible for producing a significant amount of carbon dioxide in the atmosphere is the construction industry. In 2009, the production of carbon dioxide in the construction sector worldwide was equivalent to 5.7×10^9 metric tons, meaning it accounted for 23% of the total carbon dioxide emissions produced by global economic activities (Huanget al., 2018). This indicates that the global community also needs to take measures to reduce this amount of carbon dioxide production in the construction sector and achieve an environmentally friendly approach in its activities. Indeed, this has led to the emergence of the concept of sustainability and environmental consideration in product design, as well as extensive research in this regard (Wu et al., 2019; Pons-Valladares et al., 2020). Carbon dioxide is indeed one of the predominant greenhouse gases that play a direct role in global warming (Labaran et al., 2021). Neglecting the continuous increase in carbon dioxide levels could indeed have irreversible consequences for humanity. For this reason, sustainability has become one of the hottest and most prevalent topics in research across all fields in recent years. The figure 1 is indicative that the search for keywords related to sustainability has shown increasing growth between the years 1950 and 2008 (Donovan, 2020). This demonstrates the importance of this issue for the global community. Indeed, this issue has also received attention in architecture. Architects are also striving to implement this concept in their designs (Ragheb et al., 2016).

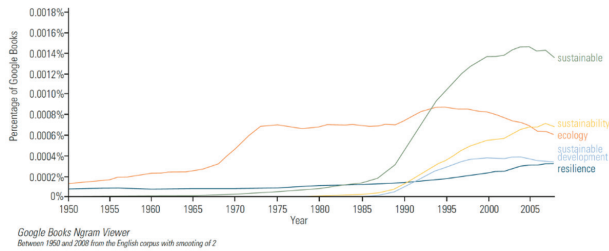

Figure 1. Frequency of Keywords Relating to Sustainability between 1950 and 2008

Source: Donovan, (2020)

Sustainability

Sustainability is the subject of various knowledge. Each of the fields of knowledge have dealt with this issue in turn and the definitions they have provided have expanded this concept. Table 1 shows some of the mentioned definitions of sustainability.

Table 1. Definition of Sustainability in Some Dictionaries

Dictionary	Definition of Sustainability
Longman Dictionary	Strong enough to continue existing or happening for a long time. Able to continue without causing damage to the environment.
Cambridge Dictionary	The quality of being able to continue over a period of time. The quality of causing little or no damage to the environment and therefore able to continue for a long time. The idea that goods and services should be produced in ways that do not use resources that cannot be replaced and that do not damage the environment.
Merriam-Webster dictionary	Relating to or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged.

Source: Author

Sustainability results in a deep concern about the impact of human activity on the environment (Bennetts et al., 2003). Environmental sustainability prohibits damaging effects on the environment by efficiently applying renewable sources, natural sources and preserving the water, soil, and air from pollution" (Ghaderi, 2016). Very soon, the mentioned concept found its place in all sectors of developed societies, and consequently in developing countries, as a pervasive trend which needed special attention. (Taraz et al.,2020).

A more comprehensive concept of sustainability on a global scale is the concept of sustainable development (Ruggerio, 2021). In fact, it can be said that the primary goal of paying attention to the concept of sustainability in all fields and domains is to achieve sustainable development. The accepted definition of sustainable development, as declared by Mrs. Gro Harlem Brundtland in the report "Our Common Future," published in 1987, is as follows:

"Sustainable development is development that meets the needs of the

present without compromising the ability of future generations to meet their own needs." (Daugelaite aet al.,2020)

Although there are several definitions of sustainability and sustainable development (Moore, 2017), the famous economist Herman Daly describes the principles of sustainable development for resource management based on two main principles: The withdrawal rate must equal the reproduction rate (sustainable performance), The waste emission rate must be equal to the natural absorption capacity of the ecosystems in which the waste is released.

Daly believes that the relationship between economy and ecology must depend on a stable balance. Attention to sustainability in architecture has also grown significantly. Dominique Gauzin-Muller's interpretation of sustainable architecture is a relatively comprehensive interpretation. She states that sustainable architecture is a balance between the discovery of bioclimatic principles, architectural traditions emerging from the context, and creative initiatives that reduce the use of resources. This definition includes several key concepts: the importance of climate in design, the precious heritage of the past in construction techniques, close connection with the site, technological innovations, reducing resource consumption and protecting the ecosystem. Over the centuries, using its internal self-control mechanisms, nature has been able to develop itself as a system that works without wasting resources and without polluting based on cycles. This situation continued through several geological periods until the modern period began. Humans are also an important but not vital part of the biodiversity of the system. While a biosphere without humans is possible and exists in geological periods, humans without a biosphere are unimaginable. Unlike balanced biological systems, industrial society considers the natural environment as a reservoir from which it can extract everything it needs for life and growth and can leave the residues and wastes of this process in it. Humanization of the realm has compromised its performance because the balance of resource and energy consumption has been disrupted and the system is unable to absorb this amount of intervention (Thiebat, 2019).

RESEARCH OBJECTIVES

The construction process in the field of architecture can be divided into three

parts: First, idea generation in which the design team is formed, and the initial design of the project is done by the architect and designer- The second is the construction process, in which the project manager and contractors have the main role- The third phase is the provision of building services, in which the users and the building manager, as well as the community, play the main role. Thanks to the repair and maintenance processes that happen to the building over time, the physical and service life of the buildings increases. For this reason, designers should anticipate that it will decrease during the service life of the building and plan to fix this defect. For this purpose, European legislative authorities have devised strategies and plans to strengthen energy optimization and sustainability in the life cycle of buildings. On the other hand, in the process of construction and life of a building, each of the beneficiaries have needs from their own point of view. Employers should keep an eye on the economic situation while building users think about the economic and environmental effect of the building. Local officials should also have a response to the growing awareness of local communities in relation to sustainability. This is where codes and laws are created to meet all these needs as much as possible (Thiebat, 2019).

Users of buildings are the main consumers of these products, and architects base their designs on their needs in architectural design. However, this responsiveness to needs brings two principles into architectural design: Designing based on the current needs of the consumer and creating new needs or modifying consumer needs through appropriate design. Sometimes, the current needs of individuals are not needs that require a suitable response. Therefore, the architect strives to inform users of the existence of these needs through the design and encourages them to eagerly utilise the outcome of his work. This is a familiar strategy in marketing and business (Taraz et al.,2016). There is also extensive research in the field of consumer behaviour aimed at understanding their needs and aligning them with the production of products (Valmohammadi et al.,2023). This phenomenon also occurs in architecture. Users, with an understanding of the concept of sustainable architecture, can compel designers to implement principles related to sustainability in their products (buildings and structures) and thereby contribute to providing a solution to the issue of global warming.

The aim of this research is to assess the level of public familiarity with concepts related to sustainable architecture and then, by identifying

the existing obstacles in this path, help the scholars to provide solutions. The general objectives of this research can be summarised in four main axes as shown in Table 2.

Table 2. Research Objectives and Questions

Research Objectives	Research Questions
Assessing public awareness	This research focuses on examining the level of individuals' awareness of the concepts and importance of sustainable architecture. Do people have awareness about what sustainable architecture is? Do they recognize key concepts such as energy efficiency and resource conservation?
Current experiences	What are people's experiences and opinions about existing sustainable buildings? Have individuals had the experience of living in sustainable buildings? What notable points from their experience regarding these buildings are worth considering?
Decision-making factors	Examining the factors that influence the decision to purchase or use sustainable buildings: What factors are important for individuals in choosing a sustainable building? Do environmental factors such as environmental impacts and energy play a significant role in their decisions?
Social and economic capabilities	Studying the impacts of sustainable architecture on the social and economic aspects of society: What impact does sustainable architecture have on the local economy and community? Can sustainable buildings strengthen local communities?

Source: Author

METHODOLOGY

This research employed qualitative methodology. This research provides valuable insights into how familiar residents of a city are with the concept of sustainability in architecture. There are various methods for conducting qualitative research and gathering data: studying resources, interviews, observations, content analysis, and so on (Busetto et al., 2020). However, one of the most common comprehensive methods of data collection in qualitative research related to business, management, marketing, or other social science studies is interviewing (Merriam et al., 2015). The purpose of conducting interviews is to examine the experiences, opinions, ideas, beliefs, or motivations of individuals regarding an object, phenomenon, or topic. In this way, interviews often provide insights or a deeper understanding of phenomena or social issues. Therefore, the interview method is suitable

for researchers who have less familiarity with the issue or topic, and when the topics are sensitive and participants prefer to express their opinions or beliefs verbally (Islam et al., 2022).

The research team conducted interviews with 12 residents of housing built in various parts of the city of Tehran, selected through purposive sampling based on their residence in buildings located in Tehran. All the participants in this research have lived in more than 3 houses in Tehran.In terms of educational level, 50% of the participants had a master's degree, 34% a bachelor's degree, and 16% a doctoral degree.

Similarly to past research, the interviews were based on open-ended, semi-structures interview questions (Islam et al., 2022) to explore Sustainability in architecture. All interviews were recorded to ensure accurate transcription, and each interview lasted approximately 60 minutes each (Edmondson et al., 2007). Thematic analysis was employed as the data analysis method, enabling the identification of patterns, key words, and concepts derived from the interviews (Smith et al., 2011).

Two coders were involved in the data analysis process, and the analysis process involved generating initial codes, memos, refining themes, and defining and naming them. Given the limited research on sustainability in architecture, an exploratory qualitative research approach was chosen (Norman et al., 2019). Exploratory studies are suitable for topics with little existing research or theoretical frameworks. Interviews with business informants are commonly used in exploratory research (Bewley, 2002). An inductive research strategy, starting with data collection, followed by analysis and development of generalisations, was employed. The grounded theory approach proposed by Strauss and Corbin (Strauss et al., 1998) was used for coding and analysis. Content analysis played a crucial role in identifying recurring themes and issues requiring further exploration (Drisko et al., 2016).

Before starting the interview, interviewees were fully acquainted with the purpose, method, duration, as well as their rights and obligations in the interview. The interviewer assured the interviewees that their identity and personal data would remain confidential and would only be used for research purposes. All interviewees freely provided their opinions and experiences

about the questions posed during the interview which are listed in table 3.

Table 3. Interview Questions

Row	Questions
1	Please introduce yourself and state your level of education and age.
2	Please discuss your experience and perspective on sustainable architecture.
3	Are you familiar with the concepts and objectives of sustainable architecture as a resident or user of buildings?
4	What is your understanding of sustainable architecture? What does this concept mean to you?
5	Have sustainable architecture concepts been utilised in the buildings where you live or work? If yes, please share your experiences in this regard.
6	In your opinion, what factors are important in the design and construction of a sustainable building?
7	Do you believe that society values sustainable architecture concepts? Why or why not?
8	Have you had any experience living in a sustainable building? If yes, please describe this experience and explain its effects on you.
9	What are the problems and challenges in the implementation of sustainable architecture? In your opinion, how can these obstacles be overcome?
10	Do you believe that increasing public awareness of sustainable architecture concepts can help improve the quality of buildings and the environment?
11	Ultimately, are you influential in decisions to purchase or use sustainable buildings? If yes, what factors influence these decisions?

Source: Author

RESULTS AND DISCUSSION

In this study, we employed data analysis techniques and applied an analytical framework derived from existing literature. This section of the research focuses on examining the themes identified from the collected data. These themes illustrate how people, despite encountering challenges, consistently understand and prioritise sustainability. Five primary themes that emerged from the data analysis encompass understanding and principles of sustainable architecture, practical implementation and examples, personal impact and engagement, recognition and global perspective, challenges, and solutions.

Figure 2. Frequency of Words in Participants' Responses
Source: Author

Understanding and awareness of the principles of sustainable architecture are vital for defining sustainable architecture. Therefore, understanding the principles and objectives of sustainability is considered essential factors in sustainable architecture. Also, the primary goal of this type of architecture is environmental preservation. For example, some interviewees admitted:

"I've never heard of the concept of sustainable architecture before."

"A style of architecture in which the buildings are designed to harmonise with the environment from all aspects."

Based on the interviewees opinion, efficiency in materials and energy usage, emphasis on recycling and reducing reliance on primary resources, resilience against natural disasters, utilisation of renewable resources, flexibility and adaptability to changing needs, self-sufficiency and waste reduction, consideration of culture and regional conditions, control of energy and resource consumption, and background research and innovation are the most fundamental elements that should be considered in the practical implementation of sustainable architecture. For example, some interviewees admitted:

"Utilising sunlight and other clean energy sources indicates an approach that considers the environment and seeks to reduce negative impacts on it."

"The use of double-glazed windows, precise daylighting design, and the use of durable materials aim to reduce energy consumption and natural resource use."

"Referring to the importance of previous research and investigations in the design and construction of buildings to optimise resource utilisation and increase efficiency."

For some interviewees individual lifestyle and active participation in sustainability are crucially important topics. For example, one of the interviewees stated that:

"The concept of sustainable architecture should expand to environmental, social, cultural, and economic aspects. Sustainable architecture should be considered not only as a preventive measure against damages but also as a restorative factor."

Another group of interviewees expressed that it seems that awareness and understanding in the field of sustainable architecture are increasing. This global awareness and observed increase in sustainable architecture indicate a fundamental shift in the attitudes and behaviours of global communities towards advancing sustainable architecture. For example, one interviewee admitted that:

"Construction processes and reducing environmental impacts require government attention through setting standards and utilising optimal methods and approaches in sustainable construction and architecture. These perspectives indicate that sustainable architecture remains a global challenge that requires collaboration and attention from society."

Awareness of the increasing challenges in the field of sustainable architecture is achieved through examining and expanding the concept of sustainable architecture and the factors that influence decision-making. Indeed, with the increase in awareness and study in the field of sustainable architecture, related thoughts and concepts are also developing and expanding. Furthermore, various factors influence decision-making related to sustainable architecture, and they require careful examination and ongoing pursuit to find effective solutions in the field of sustainable architecture.

CONCLUSION

In this research, 12 people were interviewed, all of whom had a bachelor's degree or higher and had a history of living in more than 2 houses in

Tehran. Based on these interviews, the participants emphasised the role of people to choose a more sustainable lifestyle. They cited examples such as the separation of wet and dry waste at the source and the possibility of composting waste produced from food and fruits as an incentive to create commitment to the concept of sustainability at the household level. They also stated that this effort, although small, will make this culture a social responsibility in the society.

The results of the interviews showed that the participants are well familiar with the concept of climate change and have understood its destructive effects to some extent. The importance of paying attention to natural resources, especially trees and forests, in reducing the pollution of cities and preventing landslides in mountainous areas, excessive extraction of underground water tables that cause land subsidence were the points that the participants expressed concern about. In the field of architecture, they emphasised the use of less natural resources and the use of renewable resources.

Another point that all the participants in the interview agreed on was investing in education, research and policy making to spread familiarity with the concept of sustainability in society, as well as the application of these concepts in the field of architecture and other fields related to human life. They expect the education system to introduce the future generation to the importance of this issue and encourage policymakers to enact protective laws in this regard. In addition, the issue of the global importance of the concept of sustainability was not hidden from the interviewees and they emphasised that Iranian architects should apply and implement this concept in the design and construction of the built environment, side by side with other countries of the world. Because paying attention to sustainability is a trans-regional concept.

The participants criticised the excessive use of resources and emphasised the importance of careful and planned use of natural resources. They emphasised the need to create infrastructure for recycling industrial and non-industrial wastes caused by human behaviour. They suggested that instead of using resources and raw materials, designers should use recycled materials in their designs. In this way, architects can reduce the environmental footprint of their projects and play a role in preserving

natural resources. In addition, the use of recycling in projects reduces the dependence on natural resources, which leads to lower costs and more economical projects. In addition, it reduces the number of pollutants produced by construction, thereby reducing the environmental impact of buildings.

The interviewees emphasised the importance of increasing awareness and increasing knowledge among architects, builders, policy makers in the construction sector and the public. From their point of view, increasing awareness causes people's demand to have sustainable housing to increase and this increase in demand causes builders to have a high motivation to build more sustainable buildings. Also, policy makers can speed up the implementation of sustainability principles by adopting incentive policies, and ultimately the result will be the construction of buildings with less environmental pollution.

On the other hand, this research showed that people are only aware of a limited example of the application of sustainability and do not know a comprehensive definition and an accurate example of the application of these principles in architecture.

Ultimately, sustainability has been universally recognized as a comprehensive concept directly linked to environmental preservation and resource conservation, accepted as a global necessity and requirement. By promoting awareness and educating individuals, we can ensure the sustainable future of humanity on this planet.

FUNDING

There is no funding for this research.

AUTHOR CONTRIBUTIONS

All authors contributed to the design of the research and the questionnaire. All authors have read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Bennetts, H., Radford, A., & Williamson, T. (2003). *Understanding sustainable architecture*. Taylor & Francis.

Bewley, T. (2002). Interviews as a valid empirical tool in economics. *The Journal of Socioeconomics, 31*(4), 343-353.

Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and practice, 2*(1), 14.

Cambridge Dictionary, Retrieved 2024, https://dictionary.cambridge.org/

Daugelaite, A., & Grazuleviciute-Vileniske, I. (2020). Aesthetics of sustainability and architecture: An overview. *Architecture and Urban Planning, 16*(1), 48-55.

Donovan, E. (2020, November). Explaining sustainable architecture. In *IOP Conference Series: Earth and Environmental Science, 588*(3), p. 032086). IOP Publishing.

Drisko, J. W., & Maschi, T. (2016). *Content analysis.* Oxford University Press, USA.

Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of management review, 32*(4), 1246-1264.

Ghaderi, S. (2016). *Integration of Sustainability in Architecture Education: EMU as Case Study* (master's thesis, Eastern Mediterranean University (EMU)-Doğu Akdeniz Üniversitesi (DAÜ)).

Huang, L., Krigsvoll, G., Johansen, F., Liu, Y., & Zhang, X. (2018). Carbon emission of the global construction sector. *Renewable and Sustainable Energy Reviews*, 81, 1906-1916.

Islam, M. A., & Aldaihani, F. M. F. (2022). Justification for adopting qualitative research method, research approaches, sampling strategy, sample size, interview method, saturation, and data analysis. *Journal of International Business and Management, 5*(1), 01-11.

Labaran, Y. H., Mathur, V. S., & FAROUQ, M. M. (2021). The carbon footprint of the construction industry: A review of direct and indirect emission. *Journal of Sustainable Construction Materials and Technologies, 6*(3), 101-115.

Mahyuddin, M. N.., Azahari, Q. K.., Abd Rashid, M. N. ., & Ismail, S. . (2024). Demolished Waste into an Innovative Resource for Sand Replacement in Concrete (The DWARF Technique) *Malaysian Journal of Sustainable Environment, 11*(1), 301–322.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.

Moore, J. E., Mascarenhas, A., Bain, J., & Straus, S. E. (2017). Developing a comprehensive definition of sustainability. *Implementation Science,* 12, 1-8.

Norman, B., & Jan, P. (2019). *Designing social research: The logic of anticipation*.

Pons-Valladares, O., & Nikolic, J. (2020). Sustainable design, construction, refurbishment and restoration of architecture: A review. *Sustainability, 12*(22), 9741.

Ragheb, A., El-Shimy, H., & Ragheb, G. (2016). Green architecture: A concept of sustainability. *Procedia-Social and Behavioral Sciences,* 216, 778-787.

Ramani, K., Ramanujan, D., Bernstein, W. Z., Zhao, F., Sutherland, J.,

Handwerker, C. & Thurston, D. (2010). *Integrated sustainable life cycle design: a review.*

Ruggerio, C. A. (2021). Sustainability and sustainable development: A review of principles and definitions. *Science of the Total Environment,* 786, 147481.

Smith, J., & Firth, J. (2011). Qualitative data analysis: the framework approach. *Nurse researcher, 18*(2).

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques.*

Taraz, M., Haghi, F., Mansouri, Z., & hossein Ghasempourabadi, M. (2020). Recycled-bottle arch as a prototype to practise sustainability through PBL. *Malaysian Journal of Sustainable Environment, 7*(1), 133-150.

Taraz,R. ,Mehdikhani,R. (2016). The Relationship Between Consumer Personality Traits and Decision-Making Styles in the Home Appliance Market. *International Conference on Economic, Management, Psychology.*

The Longman Dictionary, Retrieved 2024, https://www.ldoceonline.com/

T*he Merriam-Webster Dictionary,* Retrieved 2024, https://www.merriam-webster.com/

Thiebat, F. (2019). *Life Cycle Design.* Springer Nature, Cham.

Valmohammadi, C., Taraz, R., & Mehdikhani, R. (2023). The effects of brand community identification on consumer behaviour in online brand communities. *Journal of Internet Commerce, 22*(1), 74-96.

Wu, W., Sun, P., & Zhou, H. (2019, December). The case study of carbon emission in the building construction process. *In IOP Conference Series: Earth and Environmental Science, 371*(2). IOP Publishing.