

Empowering Tourism: Shared Power Banks for Sustainable Tourism Development in North America

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Abstract: This paper explores the transformative role of shared power banks in North American tourism. As electronic devices become indispensable for travelers and sustainable tourism gains momentum, shared power banks emerge as a solution to address charging needs while fostering local economies and enriching visitor experiences. The study analyzes the economic and cultural impact of shared power banks. These devices not only generate revenue through rentals and advertising but also promote local products and cultural attractions, enhancing the overall tourist experience. A user behavior survey conducted by us highlights attitudes toward shared power banks. While adoption is growing, users appreciate the convenience and stress reduction they offer, despite concerns about cleanliness and security. Successful case studies from tourist destinations worldwide, like Hangzhou West Lake Scenic Area and Gallerian shopping mall in Sweden, demonstrate the positive effect of shared power banks on engagement and prolonged stays. The paper envisions the future of shared power banks, leveraging intelligent integration, digital services, mobile apps, and emerging tech to enhance user experiences and responsible travel behavior. Collaborative initiatives among authorities, enterprises, and service providers are vital for sustainable tourism progress. In summary, shared power banks present an innovative solution to bolster North American tourism by providing convenience, boosting local economies, and embracing sustainability. These devices are poised to reshape tourist destinations significantly.

Keywords: shared power bank, sustainable tourism, user behavior, innovation, North America

1. Introduction

Nowadays, as innovation is gradually becoming a vital component of tourism development towards sustainability, the shared power bank, catering to the basic charging needs of travelers, is considered to be a possible solution to empower tourism. According to Fortune Business Insights, North America is expected to hold the major share of the global power bank market owing to the largest adoption of smartphones in the region [1]. In tourist destinations in North America, especially, since such devices are not as popular as in China, shared power banks are bound to positively impact tourism.

Our paper firstly analyzes some positive effects on the local economy as well as social culture influenced by implementing shared power banks and the reasons behind these influences. From our paper, shared power banks in tourist destinations in North America can not only help increase revenue for the local tourism industry but also improve tourists' experience and encourage interactions between tourists and communities.

Moreover, we have made up a survey to analyze the user behavior and preferences of shared power banks in tourist destinations in North America, and survey tourist attitudes towards shared power bank services to enhance the effectiveness and user satisfaction of charging services. Besides, we have studied successful cases such as Chinese tourist destinations like the West Lake equipped with shared power banks, a case study by Brick about placing a power bank station in a shopping mall, and so on. Based on the data analysis from our survey along with these accomplished cases, this paper then looks ahead to technological innovation and collaborative initiatives for sustainable tourism.

All in all, from now on and in the future, shared power banks in tourist destinations will be a symbol of the combination of convenience and eco-friendly travel experiences. Our paper precisely predicts this bright future, that is to say, advancing sustainable tourism is going to be empowered by shared power banks in North America.

2. Benefits for the Local Economy and Public Convenience

In this section, we delved into the multifaceted benefits of shared power banks in promoting the local economy and enhancing public convenience. This innovative technology not only generates diverse revenue streams for local businesses but also drives the promotion of cultural experiences, increased tourist engagement, and facilitated social interactions. Through shared power banks, we address practical needs while achieving economic growth and sociocultural support through technology-driven solutions, ultimately shaping a more vibrant and convenient community environment.

2.1. Economic and Sociocultural Impact of Shared Power Banks

2.1.1. Generating Revenue Streams for Local Business

- **Rental Income:** Shared power bank companies typically charge rent or a portion of profits to the power bank rental site. These sites are often situated in high-traffic areas like shopping malls and restaurants.
- **Advertising Revenue:** Shared power banks offer advertising display services to users and charge advertisers a fee. Users can promote merchants' goods or services through the displayed advertisements during power bank usage.
- **Member Service Income:** Companies can introduce membership services that offer benefits like faster charging, extended charging periods, and rewards. Members would need to pay a membership fee, providing an additional source of income.

2.1.2. Promotion of Local Products, Services, and Cultural Experiences

Implementing shared power banks can promote local products, services, and cultural experiences by integrating advertisements for nearby businesses, exclusive local offers, and information about cultural attractions within the power bank sharing app. Users accessing the power banks receive exposure to the community's offerings, fostering economic support for local enterprises and encouraging cultural exploration while enhancing the convenience of charging.

2.1.3. Fostering Interactions Between Tourists and Local Communities

Shared power banks, catering to the needs of tourists, offer a dynamic opportunity to stimulate consumption while fostering interaction between tourists and local communities. By catering to diverse needs, this approach enhances the overall experience of tourists while boosting local employment. Embracing shared power banks encourages the growth of the sharing economy within the community, leading to improved services and greater economic cooperation [2].

2.2. Enhancing Tourist Engagement and Connectivity

The effectiveness of shared power banks relies heavily on the influx of tourists to a particular destination. The number of tourists directly influences the utilization rate of shared power banks. In instances where tourist numbers are low, the surplus of charging units can lead to underutilization, potentially impacting the company's profitability. This scenario, despite the primary fees encompassing electricity usage and service charges, might incur additional costs for maintenance and repairs, outweighing the service fees collected.

2.2.1. Enabling Effortless Sharing of Travel Experiences

Shared power banks offer an invaluable remedy for tourists to maintain their devices' functionality throughout their journey. By providing accessible charging options at tourist destinations, travelers can conveniently charge their smartphones, cameras, and tablets, ensuring they capture and share their experiences without interruption. Notably, during holidays, smartphones serve as indispensable tools for photography, recording experiences, and sharing memories with friends. However, smartphones and watches experience increased power consumption due to their advanced features, impacting battery life. Shared power banks address this concern, allowing tourists to avoid missing out on significant moments due to low battery levels.

2.2.2. Utilizing Shared Power Banks as a Tool for Interactive Guided Tours

An innovative application of shared power banks lies in their potential to facilitate interactive guided tours. Certain power bank models incorporate positioning and data modules. The positioning module determines the user's location, enabling the provision of relevant audio information about the region. Furthermore, a connection between the charger and the shared power bank empowers remote control capabilities, prompting users to return the power banks. This setup not only enhances tourist engagement but also simplifies navigation within tourist destinations.

2.2.3. Promoting Connectivity among Tourists and Encouraging Social Interactions

The use of shared power banks can extend beyond charging devices; it can foster connectivity among tourists and encourage social interactions [3]. When tourists utilize these power banks, their positive experiences might prompt them to share their impressions with others, effectively amplifying the brand's reach and attracting new clientele. This interaction between tourists and the community not only benefits the power bank companies but also provides communities with an avenue to communicate their needs and preferences, ultimately contributing to the enhancement of power bank functionalities.

3. User Behavior and Preferences in Tourist Destinations

To gain a deeper comprehension of user behavior and preferences within tourist destinations across North America, an online survey was conducted. A total of 45 responses were collected from

participants residing in California, Massachusetts, New York, Ontario, and Texas. The full questionnaire is available in the appendix. The following sections will emphasize the pivotal findings from the survey.

3.1. Analyzing Charging Patterns and Preferences of Tourists

Based on the feedback obtained from the initial three questions, it is evident that nearly half of the respondents frequently encounter situations where their mobile devices run out of battery while they are traveling around destinations, and about one-third of people face this situation occasionally. This scenario arises due to the combination of low battery levels and the heightened usage demands of electronic devices. The second prominent factor contributing to this is the utilization of navigation or maps. In essence, while exploring tourist destinations, individuals frequently encounter urgent requirements for power banks to enhance their travel experiences.

Among the various types of devices that tourists commonly seek to charge, smartphones emerge as the primary priority. Pads and laptops share the second spot, with a substantial number of respondents expressing their interest in charging wearable devices or e-readers.

3.2. Surveying Tourist Attitudes Towards Shared Power Bank Services

To our surprise, shared power banks are not commonly observed in North America. As shown in Figure 1, the respondents who have encountered shared power banks in tourist destinations account for nearly half, among whom most have used the service at least once and have expressed satisfaction or neutral feelings about their experiences. Further exploration with some participants revealed that the main reasons for seeing shared power banks but not using them are concerns about cleanliness and doubts about the service's security. However, the reasons for the low usage of shared power banks in North America differ somewhat from these findings.

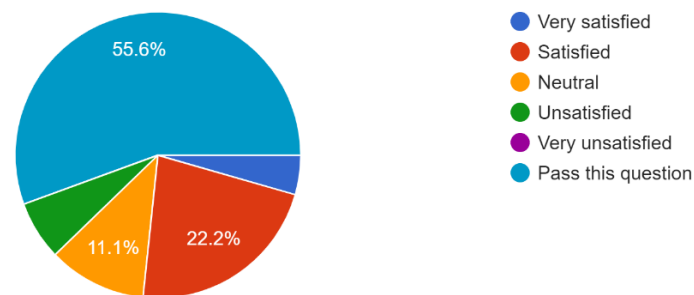


Figure 1: The level of satisfaction from our respondents who have ever used one.

Primarily, while many people do worry about privacy and data security, the most significant factor is the limited availability of charging stations. This is compounded by the fact that many people in North America own private cars, allowing tourists to charge their devices or personal power banks in their vehicles. Moreover, in major cities like New York and Boston, you can easily find wireless phone chargers on tables at Starbucks. These factors together contribute to the relatively low use of shared power banks by tourists in North America.

Nevertheless, a significant portion of the respondents recognize the benefits of using shared power banks in tourist areas. The most notable advantages are increased convenience while traveling and reduced stress caused by worries about battery life. Consequently, introducing shared power banks stands out as a promising approach to enhancing the tourist experience in North America.

3.3. Adapting Shared Power Bank Station Designs to Cater to Diverse Tourist Needs

From our survey, we've identified three main factors influencing tourists' decisions to use shared power banks: convenient locations, charging speed, and service pricing, as shown in Figure 2. While more than half of the respondents are hesitant to pay extra for faster charging, many are more likely to use shared power bank services if they offer different charging cable options for devices or provide discounts for multiple uses. Moreover, it's believed that shared power bank services would be most beneficial in places like airports, train stations, and urban areas, as shown in Figure 3. These findings underscore the significance of these factors in shaping the adoption and success of shared power bank services in North America's tourist destinations.

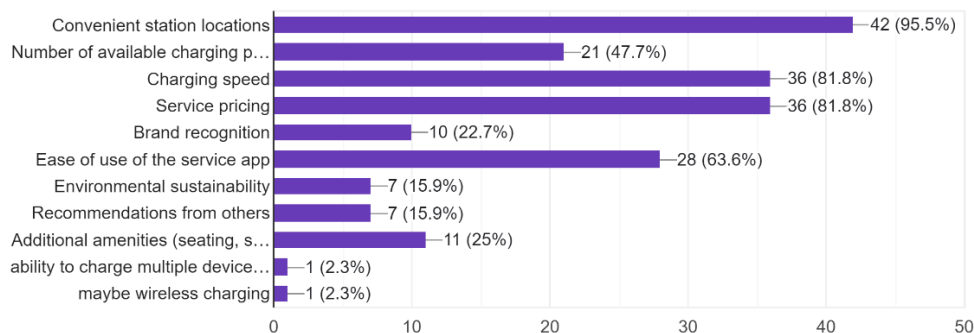


Figure 2: The factors that influence users' decision to use shared power bank services.

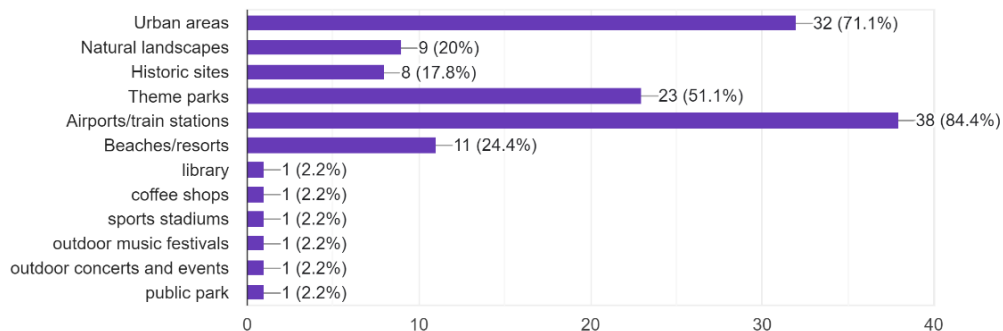


Figure 3: The places that would benefit the most from shared power bank services.

3.4. A Brief Conclusion

In the previous sections, we obtained the current views, attitudes, and usage preferences of North Americans towards shared power banks in tourist destinations through the release of survey questionnaires. In this questionnaire, we set various questions and obtained a wide range of results, from which we can learn that the audience of power banks in North America is still not very wide. However, once local users have access to shared power banks, most of them will give high praise, as using such devices can indeed eliminate many potential problems during the tour. This illustrates the great development potential of setting up power bank stations in tourist destinations. We believe that through promotion, the popularity and influence of shared power banks in tourist destinations in North America will continue to increase.

4. Case Studies of Successful Shared Power Bank Implementation in Tourism

According to China Shared Power Bank Industry Research Report by iResearch, in 2023, with the comprehensive unsealing of all places, residents' consumption motivation and consumer confidence

will be steadily restored. It is expected that the related industries of shared power banks will usher in a full recovery, and the catering and travel industry, which was previously the biggest impact of the epidemic, will also achieve significant growth, thus forming a good industry for shared power banks. With the iterative upgrading of the business model of the tourism industry, its offline consumption scenarios are also expanding, from the traditional basic consumption scenario to the derivative scenario, which brings more diversified demand scenarios for the use of shared power banks [4]. Additionally, since tourist destinations and theme parks are where tourists gather, tourists usually need to recharge their batteries during the trip. Placing power bank equipment in these places can meet the charging needs of tourists, provide convenient services, and also obtain a higher usage rate and income for power banks. Let's look at some successful cases to analyze the relationship between shared power banks and tourism.

4.1. Case 1. Hangzhou West Lake Scenic Area, Zhejiang, China

Our paper takes the shared power banks in Hangzhou's West Lake scenic area as an example. Early this year, Hangzhou West Lake Scenic Area through the Internet auction of the scenic toilet supporting shared power banks business contract management rights, triggered a hot discussion on the Internet. This innovative practice of shared power banks in tourist destinations can provide a benchmark and experience for related industries in North America: By integrating shared power bank service into public toilets in tourist destinations, tourists can easily charge, thereby improving the travel experience.

Given the prevalence of electronic devices, the need for tourists to have access to charging facilities has become a standard expectation in modern tourism. The West Lake Scenic Area, through the development of relevant applications based on digital innovation, and given that the toilet where the shared power banks are located is one of the places everywhere in the scenic area, makes it possible for visitors to find nearby charging stations at any time. The application of this digital innovation technology in the traditional tourism industry has not only improved the convenience of tourists but also injected new vitality into the operation of tourist destinations.

In addition, the West Lake Scenic Area has learned a good lesson from the past, did not take too high pricing, but through market research to develop the most appropriate rental price, both to meet the needs of tourists, also to ensure economic feasibility, to truly realize the shared power banks to enable tourism.

4.2. Case 2. Gallerian, Stockholm, Sweden

Let's focus on a Swedish case, where shared power banks are placed in one of the largest shopping malls in central Stockholm.

In 2020, Brick installed a large 48-slot power bank station at Gallerian, in which there are different restaurants, cafés, stores, and a climbing gym. Placing shared power banks in shopping malls has proved effective according to Brick. Statistics up to the end of November 2022 show that the average stay of Brick users in the Gallerian extends to 85 minutes, well above the average time of 18 minutes for all visitors. The results suggest that the shared power bank provides tourists with a longer and more sustainable shopping experience, as they do not need to worry about their mobile being out of power anymore.

Brick's shared power bank is placed in shopping malls and other tourist destinations in the form of power bank stations. The operational and technical support required for the station during this period has been minimal, averaging less than one hour per month [5]. Sandra, Marketing Director at Gallerian, pointed out that Brick's solution of placing shared power banks in the mall has significantly enhanced the shopping experience and improved the image of the shopping mall. She emphasized

that the convenience of shared power banks, which frees customers and tourists from the hassle of bringing their chargers, allows them to fully enjoy their shopping time at Gallerian.

4.3. Case 3. ChargerGoGo, the No.1 Brand of Shared Power Bank Enterprise in the US

In addition to China and Europe, there are also precedents in the United States for shared power banks in tourist destinations, such as the famous company ChargerGoGo.

This year, ChargerGoGo made an attempt at a strategic partnership with major event organizers Danny Wimmer Presents and Life Is Beautiful.[6] This year, ChargerGoGo made its first attempt at a strategic partnership with festival organizers Danny Wimmer Presents and Life Is Beautiful. In these music festivals, ChargerGoGo implemented many shared power banks for the first time to promote convenience for attendees, and this action strengthened its brand influence in North America and bridged the gap between technology and entertainment.

Furthermore, to further meet the charging needs of tourists, ChargerGoGo has developed a strategic layout in Shanghai Plaza, Las Vegas [6]. As a central location with a dense flow of residents and tourists, the square provides ChargerGoGo with good customer groups and industrial prospects and also reshapes the way of integrating technology with daily life by putting a shared power bank in the square.

4.4. What We Can Extract from the Cases Above

All of these successful cases highlight the potential of shared power banks in tourist destinations. The placement of shared power banks in places with large flows of people such as tourist destinations, shopping centers, and city plazas can not only provide convenience for the charging needs of tourists but also extend the stay time of tourists, to enhance the overall attractiveness of these places. As the tourism industry undergoes ongoing advancements in the digital economy and technological innovation, the utilization of shared power banks will progressively emerge as the primary means to offer convenience, enhance customer satisfaction, and drive the sustainable growth of the tourism sector.

5. Technological Innovation for Future Development

5.1. Integration of Intelligent Functions and Digital Services in Shared Power Bank

In the critical period of transformation and upgrading and structural adjustment of the tourism industry, the integration of cloud computing, big data, artificial intelligence, and other technologies has promoted the digital upgrading of traditional charging stations, which has injected a strong impetus to the development of the tourism industry. With the support of big data analysis technology, the system will dynamically adjust the number of power banks in a specific cabinet according to the localized use, supplemented by the charging digital management system, to help the operation service work more “intelligent” [7]. Operators can also gain precise insights into shifts in data, enabling the optimization of service processes such as operational maintenance and shared power bank distribution. This ensures a seamless client experience.

Moreover, artificial intelligence, a pivotal component of the digital economy, can offer enhanced support and empowerment to charging stations. In the event of charging station equipment malfunction, the extensive data cloud platform will automatically initiate an early warning. This will promptly generate a work order for critically faulty equipment and promptly alert the on-site operations and maintenance personnel for immediate investigation.

5.2. The Potential of Mobile Applications to Locate Power Banks and Plan Formation

As a new type of charging equipment, mobile application positioning power bank has been widely used and promoted in cities of some countries in recent years. With the widespread adoption of mobile Internet, there is an increasing desire for mobile devices. The emergence of mobile application-oriented charging stations, coupled with advancements in technology and rising living standards, has created a promising market with substantial growth potential. This development trend is not only evident but also poised to maintain a high growth rate in the foreseeable future. Take China as an example, in 2017, China's shared power banks' point coverage was only 300,000, by 2021, China's shared power banks were 8 million, 2021, an increase of 52% year-on-year in 2020 [8].

The power bank will not only be a charging device but also develop into a smart device that can achieve a variety of functions, such as positioning, navigation, interaction, etc. Technology upgrades will be the trend of the future, such as more efficient charging technology and smarter charging management systems. The innovation model will not only be a single rental model, but also more innovative models will appear in the future, such as free use, charging, and other ancillary services.

5.3. Leverage Emerging Technologies to Enhance Travel Experience

The perfect combination of strong scientific innovation and hardware production capabilities, that is, the new product model provides diversified value for sustainable charging infrastructure. Emerging technologies improve the quality from both hardware and software aspects, such as the technical improvement of charging cabinets and power banks in the hardware direction, and the software direction involves billing, finding, and returning. For instance, serving as an intelligent terminal application catering to various consumption scenarios, the sustainable charging infrastructure employs radio charging technology. This technology harnesses solar or wind power to generate electricity, thereby not only diminishing reliance on fossil fuels but also mitigating environmental pollution.

On the other hand, by combining the original shared power bank products with multi-terminal devices, through the modular product assembly method, the original power bank cabinet can freely carry intelligent terminal devices such as mask machines, advertising machines, and AED defibrillators, which provides support and guarantee for the various needs of tourism.

6. Sustainable Tourism Cooperation Initiative

6.1. Cooperation Between Tourism Authorities, Enterprises, and Paid Service Providers

The core concept of supply chain management is the integration of enterprises. In the tourism industry, since the tourism bureau, enterprises, and fee service providers all produce service-oriented products and can provide products and services directly to tourists, the partnership between them is a cooperative relationship of sharing information, sharing risks, and sharing profits in a certain period.

On the premise of giving full play to their core competitiveness, all nodes can achieve a continuous reduction of the total cost of the supply chain system, continuous improvement of product quality, further acceleration of market influence, and further improvement of customer satisfaction through synchronous cooperative operation, so that all links of the supply chain can benefit from the realization of the overall goal of the system. It embodies the systematic thought of resource integration and optimal utilization. For example, the tourism bureau can not only rely on the collection of reception services and advertising fees for revenue, but also should regularly organize activities according to the characteristics of the season and tourism products, and strengthen the communication, exchange, and income generation between enterprises and fee service providers to enhance the benefit of visitors.

6.2. Create Incentive Programs to Encourage Responsible Travel Behavior

Encouraging both businesses and customers to engage in agreements for the utilization of mobile app-based charging stations is aimed at motivating the adoption of these products. The options extended include cashback, bonus points, coupons, and service upgrades [9]. The primary objective revolves around delivering substantial advantages to users, thereby fostering a preference for mobile app-based charging stations and subsequently elevating their contentment and loyalty levels.

The program is subject to continual enhancements to align with the evolving needs of users. As an illustration, upon acquiring a charging system, users can experience a phase of complimentary service upgrades, encompassing faster charging and extended usage intervals. This contributes to an enriched travel experience. Moreover, rewards are also extended to users who adhere to product return timelines and uphold quality standards.

6.3. Establish Standards and Guidelines for Sustainable Charging Infrastructure

The government should formulate industry production standards, standardize the production process of the sustainable charging infrastructure industry, and set up relevant departments to supervise the research and development, production, sales, and other aspects of the sustainable charging infrastructure industry to form a unified supervision and management system.

At the same time, improve the infrastructure construction of the test circulation link to promote the long-term and stable development of the industry. Significantly enhancing product quality necessitates production enterprises to meticulously adhere to industry production standards. This entails ensuring unwavering product quality stability while concurrently amplifying endeavors in innovation and research. By consistently introducing novel products, enterprises can not only broaden their market share but also actively contribute to the pivotal trajectory of future industry advancement [10].

7. Conclusion

In the previous sections, we analyzed the frequent occurrence and use of shared power banks in tourist destinations nowadays and analyzed their role in economic life, social life, and social capital income. It can be said that shared power banks promote the linkage of various industries increase socio-economic dividends, and strengthen the participation and connectivity of tourists in tourist destinations. It can be confirmed that the existence of shared power banks can enhance the travel experience of tourists and play an extremely special role in tourism itself and providing convenient services. It is gratifying that, combined with on-site investigations of tourist destinations in China and other places, we can find that the application of shared power banks is widespread and successful. At the same time, tourists' acceptance and recognition of shared power banks are also on the rise, even though they still account for a small minority of the audience.

In addition, shared power banks have indeed won the preference of many users, especially trail users who first use this kind of device during their travels. Today's era is due to convenience, reliability, and stability. Also, surprisingly enough, the combination of shared power banks with digital services, mobile apps, and emerging technologies has led to improvements in user planning and travel experience. We believe that, after a certain degree of promotion and promotion, Shared Power Bank will truly unleash its potential and promote the progress and leap of a series of industries, including itself. It will also provide more convenient services to more users in more places outside of tourist destinations. The user end will also accept this product more and make it a norm in social life. The above phenomena are worth looking forward to.

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Appendix

Questionnaire: A Survey about User Behavior and Preferences of Shared Power Banks in Tourist Destinations in North America

1. How often does your mobile devices out of power while at tourist destinations? (Choose single)
☐ Rarely ☐ Occasionally ☐ Frequently ☐ Always
2. What situations prompt you to seek charging options? (Choose multiple)
☐ Low battery ☐ Waiting for friends/family
☐ Taking photos/videos ☐ Using navigation/maps
☐ Keeping social media updated ☐ Checking emails ☐ Other: _____
3. What type of device(s) do you most frequently need to charge? (Choose multiple)
☐ Smartphone ☐ Pad ☐ Laptop ☐ E-reader
☐ Wearable devices ☐ Other: _____
4. Have you seen shared power bank services in tourist destinations in the past? (Choose single)
☐ Yes ☐ No
5. Have you used shared power bank services in tourist destinations in the past? (Choose single)
☐ Yes ☐ No
6. If you have used shared power bank services, please indicate your level of satisfaction with your experience: (Choose single) Or you can choose “Pass this question”.

- ☐ Very satisfied ☐ Satisfied ☐ Neutral ☐ Unsatisfied
☐ Very unsatisfied ☐ Pass this question

7. If you have not used shared power bank services, what factors have discouraged you from using them? (Choose multiple) Or you can choose “Pass this question”.

- ☐ Lack of trust in the service’s security ☐ Concerns about hygiene and cleanliness
☐ Unfamiliarity with how it works ☐ Prefer using personal power banks
☐ Pass this question ☐ Other: _____

8. Please rank the following factors in order of importance when considering the use of shared power bank services (1 = Most Important, 5 = Least Important):

- ☐ Convenient station locations ☐ Charging speed
☐ Service pricing ☐ Brand recognition ☐ Environmental sustainability

9. How do you perceive the impact of shared power bank services on your tourist experience? (Choose multiple)

- ☐ Enhanced convenience for tour planning ☐ Increased exploration time
☐ Improved safety and security ☐ Reduced stress due to battery anxiety
☐ Enhanced sharing of experiences on social media ☐ Other: _____

10. Why do you think Americans are less likely to use shared power banks? (Choose multiple)

- ☐ High ownership of personal power banks ☐ Concerns about privacy and data security
☐ Limited availability of charging stations ☐ Lack of awareness about shared power banks
☐ Cultural preferences for personal charging solutions ☐ Other: _____

11. What factors influence your decision to use shared power bank services? (Choose multiple)

- ☐ Convenient station locations ☐ Number of available charging ports
☐ Charging speed ☐ Service pricing
☐ Device compatibility ☐ Ease of use of the service app
☐ Environmental sustainability ☐ Recommendations from others
☐ Additional amenities ☐ Other: _____

12. Are you more likely to use shared power bank services if they offer various charging cable options for different devices? (Choose single)

- ☐ Yes ☐ No ☐ Maybe

13. Would you be willing to pay a premium for access to faster-charging shared power bank services? (Choose single)

- ☐ Yes ☐ No ☐ Maybe

14. Which types of tourist destinations do you believe would benefit the most from shared power bank services? (Choose multiple)

- ☐ Urban areas ☐ Natural landscapes ☐ Historic sites ☐ Theme parks
☐ Airports/train stations ☐ Beaches/resorts ☐ Other: _____

15. How would you feel about a loyalty program that offers discounts or incentives for using shared power bank services multiple times? (Choose single)

- ☐ Very positive ☐ Positive ☐ Neutral ☐ Negative