

Waste Treatment

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Waste Treatment Management for Shores and Ocean Cleanness in Pari Island, Indonesia

Gestión de tratamiento de residuos para la limpieza de las costas y el océano en la isla de Pari, Indonesia

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ABSTRACT

The problem of waste due to domestic and tourism activities in Pari Island is a problem that has not been resolved until now. This study aims to discover how to improve waste treatment management by the community and how to improve waste treatment management by the government in Pari Island Kepulauan Seribu, North Jakarta. Research results show that participation by local communities might involve separating waste at the household level, but the role of the government to provide facilities and infrastructure for transporting waste from the island to the mainland is still very low.

Keywords: Ecotourism, environment, Pari Island, waste management.

RESUMEN

El problema de los desechos debido a las actividades domésticas y turísticas en la isla de Pari es un problema que no se ha resuelto hasta ahora. Este estudio tiene como objetivo descubrir cómo mejorar la gestión del tratamiento de residuos por parte de la comunidad y cómo mejorar la gestión del tratamiento de residuos por parte del gobierno en la isla de Pari Kepulauan Seribu, en el norte de Yakarta. Los resultados de la investigación muestran que la participación de las comunidades locales podría implicar la separación de los desechos a nivel de los hogares, pero el papel del gobierno para proporcionar instalaciones e infraestructura para transportar los desechos desde la isla hasta el continente aún es muy bajo.

Palabras clave: Ecoturismo, gestión de residuos, Isla Pari, medio ambiente.

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INTRODUCTION

The growth of marine ecotourism throughout the Indonesian archipelago has become a new phenomenon. The development of marine ecotourism contributes significantly to high-economic growth. Pari Island is a part of chain islands Kepulauan Seribu which is located in the north of Jakarta. Pari Island is 35 km from Jakarta with geographical position between 106°34'- 106°38' BT and 5°50'- 5°52' LS. Pari Island is an ecotourism area with beaches, ocean, water sport, as well as flora and fauna observation. Pari Island area is 41.32 hectares and divided into a tourist area, oceanography research area, and mangrove conservation area. The most significant income of the citizens on Pari Island is tourism, according to Central Agency on Statistics and Ministry of Maritime and Fishery of Indonesia.

However, this growth has a significant impact on the local community's ecology, society, and culture. Ecotourism development contributes a lot to the economy and gives more job opportunities for local communities. Tourist activities should also be followed by environmental awareness in order to avoid environmental damage caused by tourism. Problems arise when the tourist and community do not have environmental awareness. The growing number of tourists and the island position as a catchment area for marine currents carrying plastic pollution from the mainland is significantly impacting the surrounding marine environment. During the rainy season, up to 40,000 tons of garbage comprising 17,000 tons of domestic waste, 1,600 tons of waste from tourists, and 21,000 tons of waste originating from the mainland end up in the waters around the islands, much of our plastic waste (Handoko: 2011, Sekito et al.: 2013).

Consequently, problems like ocean/shore littering and coral reefs damage are arising. Every 20 minutes, the equivalent of a 10-ton truckload of plastic is dumped into the waters around Indonesia. Experts say without any improvement in waste management, the amount of plastic waste could increase tenfold by 2025. Increasing waste processing by up to 50 percent in the 20 worst offending countries could reportedly reduce ocean waste by 41 percent within ten years. Improvements in waste processing in the ten worst offending countries could reportedly reduce plastic waste dumped in the ocean each year by up to 6.4 tons by 2025. Globally, if this problem goes unchecked, there will be more plastic in the oceans than fish by 2050.

The problem of waste due to domestic and tourism activities is a problem that has not been resolved until now. Waste management has been regulated by the Law of The Republic of Indonesia Number 18 the year 2008. However, there are still many obstacles in implementation primarily related to coordination, cost, and infrastructure. The lack of public awareness of waste management, especially in the island and coastal area, adds to the long list of issues that need to be addressed immediately. The threat of waste in the marine environment becomes essential because it has a risk of impact towards humans (Halden: 2010, pp.179-194; Cole et al.: 2011, pp.2588-2597; Farrell & Nelson: 2013, pp.1-3) caused there is an interaction between the sea and humans (Fleming et al.: 2014, pp.16-19) and through the transfer mechanism from food sources such as fish and mollusks where the number has increased from year to the year 1985 to 1995 (Willoughby et al.: 1997, pp.469-478). Also, marine waste such as plastic affects the number of biotas (Uneputtu & Evans: 1997, pp.652-655), which is included in the IUCN red list or not (Gall & Thompson: 2015, pp.170-179) and suspected as an agent against coral reef disease (Harrison et al.: 2011, pp.12-20; Xiao et al.: 2017).

The problem of waste on Pari Island has an impact on decreasing the beauty of the tourism area and impacting the disruption of human health and the destruction of marine resources in the region. Toxic waste comes from household waste, tourism activities, and others. Toxic in the trash can harm human beings and marine ecology when interacting through groundwater infiltration. Toxic such as mercury can be accumulated and eaten by humans and animals when eating contaminated fish or seafood. Marine waste has an impact on the disruption of marine life and fish mortality, causing a decrease in fishermen's income, reduced functioning of coastal ecosystems, and the disruption of health.

Formulation of the problem

According to the background above, the research question is:

1. How to improve waste treatment for shore and ocean cleanness in Pari Island?
2. How to improve solid trash management for shore and ocean cleanness in Pari Island?

LITERATURE REVIEW

Waste Management on Small Islands as Tourism Site

Human interactions with the environment (human activities) have always resulted in waste production. Despite that, the production of wastes remains a significant source of concern as it has always been since the prehistoric period (Chandler et al.: 1997). In recent times, the rate and quantity of waste generation have been on the increase. Waste arises in many different forms, and its characterization can be expressed in several forms. Some common characteristics used in the classification of waste include the physical states, physical properties, reusable potentials, biodegradable potentials, source of production, and the degree of environmental impact (Amasuomo: 2016, pp.88). To prevent the adverse impact of waste, it needs to be managed to prevent contact with humans or their immediate environment. Demirbas (Demirbas: 2011, pp.1280-1287) describes waste management as a process by which wastes are gathered, transported, and processed before the disposal of any remaining residues. Waste management refers to the many methods and processes of dealing with waste at every stage from generation and collection through to final disposal.

One of the most significant contributors to waste is tourism. Nowadays, tourism is one of the most important industries worldwide and a driver for socio-economic development in many regions, particularly developing countries with unique cultural, historical, and natural resources. However, tourism has been recognized as high energy and water resource-demanding activity, simultaneously generating significant amounts of solid wastes from lodgings and recreational areas. According to the United Nations Environment Program (UNEP), on a global scale, the tourism industry is responsible for producing 35 million tons of solid waste annually.

Littering is also a particularly problematic issue in tourist areas, especially those on the coast, and can have extremely damaging effects on both the local landscape and the marine environment (Willmott & Graci: 2012; Ramírez et al.: 2018; Villalobos & Ramírez: 2018; Hernández et al.: 2018; Ramírez et al.: 2019), in their paper, presented the specific case of waste management in Gili Trawangan. This small island mainly serves as a tourism site, which are the characters of Pari Island. Solid waste is commonly produced by tourism. For the comparison, waste produced by tourism can count nearly twice the amount produced by the local community (Shamshiry et al.: 2011, pp.1-5). This is alarming since poor waste management can directly cause environmental and aesthetics pollution and may impact the experience of the local community's tourist and well-being. This problem is even more complicated when it comes to small island settings. Small islands are reportedly relying on imported products and not controlling the amount of waste produced; there is a little ability to reduce waste as the most significant option for waste management (Skordilis: 2004, pp.243-254; Chen et al.: 2005, pp.31-47; Diaz: 2007, pp.325-326). Thus, the negligence results in the waste volume overwhelm the islands' capacity (Deschenes & Chertow: 2004, pp.201-217; Chen et al.: 2005, pp.31-47).

Problems of waste management on small islands seem to be around the accessibility to waste facilities on the mainland, thus resulting in local community and tourists to choose the security options; open dumping on land and in water or open burning, with few, actually practicing recycle. Willmott & Graci (Willmott & Graci: 2012) later claim that the waste management in Gili Trawangan, despite its small island setting, is a success model whose standard is higher than the national one. Waste partnership and multi-stakeholder collaboration contribute to this success, providing Gili Trawangan with resources and finances required to acquire the sufficient waste management capacity of the whole island. Willmott & Graci (Willmott & Graci: 2012) also

conclude that the key to a successful small island waste management is to adopt "dynamic, location-based strategies," proven to be effective and efficient.

Waste Management Strategy

Management is a process or framework, which involves guidance or direction for a group of people towards organizational goals or tangible goals. This includes knowing what to do, determining how to do it, understanding how they should do it, and measuring the effectiveness of the efforts that have been made. Management is defined as a process because all managers, regardless of their specific skills or skills, must carry out certain activities that are interrelated to achieve the goals they want. The process consists of management activities, namely, planning, organizing, actuating, and controlling.

Skenderovic & Kalac & Becirovic (Skenderovic et al.: 2015, pp.2-10) provided a general discussion of waste management, whether solid waste, wastewater, dangerous waste, etc. Their study mentions that the waste management includes prevention of waste, re-use of waste, recycling, separation of recyclable materials, waste to energy, waste disposal methods, remediation of unregulated dump, and awareness of waste management.

The study explains recycling as one of the compelling waste management methods, which can also be applied to solid and domestic waste, the dominant type of waste produced in Pulau Pari. For instance, biodegradation of organic waste (of food, animal waste, etc.) is proven to be useful to transform waste into energy. Recycling is claimed to be energy-saving, providing environmental protection, creating jobs, and saving raw resources. The study's conclusion, waste management strategy presented by Skenderovic & Kalac & Becirovic (Skenderovic et al.: 2015, pp.2-10) is as follows:

1. Formal legal mechanisms introduction in the field of waste management,
2. Education and training program of personnel who manage waste,
3. Establishment of a national body responsible for the waste management personnel education and training.

To adopt the strategy, there are requirements such as sufficient research and development of recycling technologies, improvement of waste collection and sorting method, reduction of external costs of waste re-use, etc. Community-Based Solid Waste Management, known as CBSWM, is a waste management system that recognizes the community as an active role player in cleaning up their environment and earning income. The CBSWM approach is based on Kurt Lewin's principle, which states that people tend to change their behavior when they participate in problem-solving. CBSWM gives people control over the environment to maintain, improve, and participate in aesthetic value. Local communities' role is to practice sanitary behavior achieved by keeping households and surroundings clean and storing waste in a designated bin or container—also, resource recovery actions and participation in consultation and management. Waste management is regulated in Regional Regulation number 3 of 2013 states that supervise the implementation of waste management through monitoring, controlling, evaluating, and reporting. Supervision from the government is technical and individual supervision.

State of The Art

Pollution effect on the coral reef and marine population has been monitored over time by researchers (Baum et al.: 2015). The paper observes the coral cover, fish abundance, and benthic community in different areas of Thousand Islands (*Kepulauan Seribu*) of Jakarta. It also notes the factors that may cause the high and low number in each area. Assessment of effects on the coral reef and marine population is conducted by looking at the regional and localized stressors, using the statistical approach of sampling. This paper's writers suggest undergoing a re-evaluation of the organization of the Thousand Islands National Park, including the

regulations and boundaries. In this paper, Pari Island is an exceptional case since the coral reefs of the island show a substantial difference in the north and south parts of the island.

Comprehensive observation of the coral reef and marine population has been provided in the paper. However, the numbers are served without observing how each island manages its waste to prevent pollution. Sole focus on the paper is about local stressors which affected near-shore area and the regional stressors from the city waste nearby (Jakarta and other satellite cities on the shore), in order to understand the factors behind local stressors and answer the question on what contributes to the local pollution, our paper offer the more qualitative approach to observe the in-shore management of Pari Island as one of the well-known islands for tourism in Thousand Islands.

Noll et al. (Noll et al.: 2016) wrote a paper on waste management on the small island of Samothraki, Greece, with the same feature as Pari Island. In this paper, the problem arises from the lack of sufficient waste management on the island that may affect human health and environmental degradation. Waste is being collected on open dumps or incinerated without sufficient control and monitoring from the local authorities. The finding from the study on Samothraki suggests that illegal dumping, which includes construction waste, plastics, household electronics, and animal carcasses, is considered a big problem. Aesthetics and environmental cleanliness suffer a significant decline caused by the illegal open dumping site. The paper has presented a diagram that describes the qualitative waste flow but not yet explains how the authorities work and not yet observing the waste management regulation in creating ocean and shore cleanliness (Dominik: 2016, pp.33-35).

Sahwan (Sahwan: 2004, pp.12-16) presented the finding in his paper on the waste management of *Kepulauan Seribu*. The paper explained that waste around Kepulauan Seribu came from them both outside and inside the islands. The outside source is the estuary of 13 rivers of Jakarta met in Jakarta Bay. This paper's findings suggest that waste management inshore and on the island are not different from waste management in general. Thus the diagram of waste flow presented in the paper includes waste collection at the temporary dumping site (TPS) as well as final dumping site (TPA), 3R (reduce, re-use, recycle) method, composting plant, an incinerator. Our paper uses a different approach from this study; the writers believe that different indicators should be applied in Pari Island as a community-managed tourism site. Thus, the writers use Community Based Solid Waste Management (CBSWM) to produce our analysis.

METHODS

Research Design

This research uses qualitative design, which is used to explore and understand the social and humanitarian aspects of individuals or groups. Qualitative research is research that intends to understand phenomena about what is experienced by research subjects such as behavior, perception, motivation, actions, etc. holistically and using descriptions in the form of words and language, in a particular context which is natural and by utilizing various scientific methods (Meleong: 2012).

The approach of this research is a case study where the case study is an exploration of a system or a particular case from time to time, which involves resources that possess rich data and information related. The case study is selected since this research focuses only on waste management in Pari Island, Kepulauan Seribu. This research was conducted from January to May 2020. The location of the research was located in Pulau Pari. Pulau Pari is selected because of its waste management issue.

Research Instrument

The research instrument is done by interview, observation, and document study and the necessary data or information is obtained from a light source. Analysis of qualitative research data will take place along with other parts of qualitative research development: data collection and writing of findings.

Data Analysis Methods

The data collected at the data collection stage is then analyzed using the Miles and Huberman models. Data analysis, according to Miles and Huberman, is done continuously until reaching data saturation (Miles and Huberman: 1984, pp.20-30; Erwanto et al.: 2014, pp.1487). The data above analysis stages are applied in the research to answer the proposed research questions in the problem formulation.

RESULTS

Pari Island is one of the islands in Kepulauan Seribu, a tourist destination that implements ecotourism with beautiful beaches, water sports, flora and fauna observations, and tourist activities. Interestingly, Pari island is managed by the local communities who still uphold the local wisdom of the island. The local communities conduct provision of tour packages such as tour guides, homestays, catering, bicycle rental, souvenir sellers, providers of water sports, and snorkeling facilities. In short, local communities are an essential element of tourism activities on Pari Island. However, based on researchers' observations, waste management for marine and coastal cleanliness is far from ideal conditions. Garbage in Pari Islands is divided into three sources: the island's domestic waste, garbage brought by tourists, and trash brought by the waves from the ocean. Pari Island also receives shipments of rubbish from rivers in Jakarta, Tangerang, Bogor, and Bekasi, which have caused high amounts of waste in the marine waters of this region.

The less-than-ideal condition of waste management is caused by several factors, including low public awareness of waste management and maintaining environmental cleanliness, inadequate waste disposal facilities, and difficulty of accessibility to onshore waste facilities. This situation affects local communities and tourists choosing the most comfortable option, throwing waste in open disposal on land and water or burning the waste. So that the principle of 3R (Reuse, Reduce, Recycle) is not conducted at all in the management of this waste. Also, the collaboration between the local government and the community did not go well in this waste management. However, this collaboration has contributed significantly to the success of this waste management in the resources and finance needed to meet adequate waste management capacity throughout the island.

For this reason, waste management is not only the responsibility of the local community but also requires active contributions from various parties, including the local government and the private sector. This waste management is directly related to an increase in the number of tourists because it will be strongly associated with tourist comfort and the beauty of the tourism environment. This statement is supported by Mazilu (Mazilu: 2010) in his article, which states that tourism quality management is reaching the maximum level in meeting customer needs, community requirements, meeting aspects of consumer protection, and also the environment. Tourism quality management needs to consider customer requirements to attract more visitors. With proper waste management, it will indirectly increase the number of visitors who are directly related to community income from this ecotourism service.

The problem of ineffective waste management on Pari Island is closely related to the lack of awareness of the local community regarding waste management knowledge and the difficulty of accessibility to onshore waste facilities. Quoting from Sinthumule, N.I & Mkumbuzi, S.H. (Sinthumule & Mkumbuzi: 2019), knowledge is a significant barrier that can result in reduced participation and poor waste separation. This means that communities with better information have more significant opportunities to participate in waste management than those who do not. It seems that the role of local communities in managing waste on Pari Island is hugely important.

In producing suggestions on waste management for shore and ocean cleanliness on Pari Island, researchers used the concept of Community-Based Solid Waste Management known as CBSWM. CBSWM is a waste management system that recognizes the community as an active role player in cleaning up their

environment and earning income. The CBSWM approach is based on Kurt Lewin's principle, which states that people tend to change their behavior when they participate in problem-solving.

According to the CBSWM concept, there are five indicators of community-based waste management's success:

a) Giving people control over their environment to participate, maintain, and improve its aesthetic value. The local community on Pari Island did not yet have the awareness to preserve the environment through waste management. For this reason, collaboration is needed between the local government and environmental NGOs to provide concrete socialization related to the habit of preserving the environment with the knowledge of waste management with economic value when the community has the awareness to participate in increasing the aesthetic value of Pari Island which then affects economically for local communities' income because the aesthetic environment will increase tourist visits.

b) Local communities are to practice sanitary behavior achieved by keeping households and surroundings clean and storing waste in a designated bin/container.

However, the difficulty of accessing onshore waste facilities and the lack of trash bins for household waste pose challenges for the maintenance of an environment free of waste on Pari Island. In addition to education about waste management needed by the local community, waste disposal facilities, and garbage transportation to be transferred to the mainland are issues that need to be seriously addressed by the local government.

c) Participation by local communities might involve separating waste at the household level.

Socialization about waste separation has been carried out by environmental NGOs, but programs with no sustainability have made the community not accustomed to this waste separation. However, some people already have an awareness to separate wastes such as organic and inorganic waste. Even so, the local community does not yet have 3R knowledge about waste management to become economically valuable goods.

d) Incentives need to be given to community members to improve waste management habits. In CBSWM, the local community is expected to attend meetings, elect representatives who manage the waste collection, and to give feedback and queries to the local authority. Regarding waste management and incentive activities, it has not been conducted either from the local government, the local community, or the private sector. This is a useful input for increasing public awareness and knowledge about waste management, which has many benefits for the local community.

e) Local communities are not the only role players in CBSWM projects; instead, CBOs and local authorities are also relevant stakeholders. There are local authorities that are viewed as initiators and facilitators. This primarily promotes cooperation, collaboration, and working together as partners in waste management between communities, local authorities, and the private sector. Collaboration between the local community, local government, and the private sector have not been conducted very well on Pari Island. However, of course, waste management will only work well if these three stakeholders collaborate to increase ecotourism's economic value. This condition could happen if there is an initiation from both the private and government sectors with the aim that the community will have knowledge and facilities to support waste management.

From the five indicators above, only one indicator that is implemented in Pari Island, namely participation by local communities, might involve separating waste at the household level. At the same time, the other four indicators have not been carried out by stakeholders involved in Pari Island. Therefore, in closing, the researcher would like to suggest four CBSWM indicators implemented by stakeholders on Pari Island including (1) giving people control over their environment to participate, maintaining and improving its aesthetic value, (2) local communities is to practice sanitary behavior achieved by keeping households and surroundings clean and storing waste, designated bin/container, (3) Incentives need to be given to community members to improve waste management habits, (4) Local communities are not the only role players in CBSWM projects; instead, CBOs and local authorities are also relevant stakeholders. In essence, to improve waste management

on Pari Island requires good collaboration between the stakeholders involved such as the local community, local government and the private sector in providing the provision of facilities, knowledge, skills, teaching, and training related to waste management to maintain the cleanliness of shore and ocean of the island. It is hoped that ongoing assistance for the local communities will raise awareness of waste management problems.

Multi-stakeholder coordination is a must for the effective implementation of proper waste management on Pari Island. Coordination between local government, community, and tourism industry must go hand in hand. The main objective of implementing multi-stakeholder coordination is to promote a better decision-making process. Meanwhile, the essence of this approach is to ensure that dialogue and consensus build the views of those who have influence or are influenced by specific policies, projects, or decision-making agreed by the parties involved. Decision making will be based on the considerations of relevant parties who have a comprehensive view, relevant resources, expertise, and knowledge.

The principles of multi-stakeholder diplomacy are careful considerations in the use of diplomacy to achieve national interests, including:

- a. Principles of collaboration; multi-stakeholder diplomacy practices are carried out in collaboration with ministries related to domestic stakeholders (parliaments, academics, business institutions, media, society).
- b. Principles of consultation; conduct periodic consultations between stakeholders
- c. The principle of dialogue; related ministries hold dialogues with domestic stakeholders both formally and informally.
- d. The principle of inclusion, government involvement, academics, and business institutions in the official delegation of the meeting
- e. The principle of multidimensional support; there is financial, material, and institutional support to various stakeholders in their involvement in the activities carried out.

DISCUSSION

The use of multi-stakeholder coordination principles can build transparency because of the involvement of various actors involved. Input produced in the form of consensus can provide another perspective on the implementation of the achievement of objectives to achieve a comprehensive and profitable policy formulation.

The government's role is to make regulation about waste management, regulated in Law of the Republic of Indonesia Number 18 of 2008 and was strengthened by the Special Regulation of the Capital City of Jakarta Number 3 of 2013. The government also plays a vital role in managing waste management on Pari Island.

In the Jakarta Regional Regulation, No 3 of 2013 written, transportation of household waste and residues directly to the TPST and TPA is the Regional Government's responsibility. It can be cooperating with business entities in the field of cleaning. The prohibitive cost of transporting rubbish from the Pari Island to the mainland and the behavior of tourists who are not friendly to the environment is also the reason for the difficulty in stemming from the garbage that comes through the river to the sea. The integrated waste management system between the islands and the mainland has also become an obstacle for local government.

Public awareness to sort waste has been carried out at several points in the Pari Island region. However, people have difficulty selling waste that has been disaggregated and brought to the mainland or waste collectors. This should be a concern for the local government to facilitate this need. So that waste management related to waste recycling that has been done by the community can be increasingly developed.

Currently, the steps taken by the local government to overcome the waste problem are collaboration, education, and action. Solid steps shortly, to tackle the waste, the Provincial Government will use the 4P concept (public, private, people, partnership) and want to involve civil society to work together (Kehati: 2020). By implementing multi-stakeholders' cooperation in waste management, it is hoped that the Pari island area's cleanliness will be maintained.

CONCLUSION

Ecotourism is the dominant sector in Pari Island's community economy. Proper waste management is essential to maintain and even expanding, ecotourism's role in the economy. Visitors seek a pristine environment, not one with garbage floating in the sea and trapped on the reefs. Wastes in the ocean is a serious problem. There are many pollutants and many more dangers than ever imagined. Start managing it by reducing, recycling, and re-using plastic products. The clean environment is essential for developing ecotourism.

Pari Island must be set up integrated waste management that carried out by all the stakeholders. According to this research, the only implemented CBSWM indicator in Pari Island is participation by local communities might involve separating waste at the household level. Therefore, the researcher suggests four CBSWM indicators implemented by stakeholders on Pari Island including (1) giving people control over their environment to participate, maintaining and improving its aesthetic value, (2) local communities is to practice sanitary behavior achieved by keeping households and surroundings clean and storing waste, designated bin/container, (3) Incentives need to be given to community members to improve waste management habits, (4) Local communities are not the only role players in CBSWM projects; instead, CBOs and local authorities are also relevant stakeholders to implement. Thus, in order to succeed in the waste management program, collaboration from multi-stakeholders are needed.

Multi-stakeholder coordination is a must for the effective implementation of proper waste management on Pari Island. It is expanding recycling by households and small businesses, especially in the tourism sector, where recycling can generate employment—piloting bulk stores that avoid plastic packaging, which is especially important on small islands where the first step is to reduce the volume of plastics waste that must be managed. Improved coordination among SWM stakeholders in the region will enable the development of effective SWM plans and regulations. The environment and ocean cleanness of Pari Island is the key to investment for Pari Island to attracting tourists and investors.

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