Revista **Turismo** & Desenvolvimento | n.º **31** | 2019 | [**47** - 59]
e-ISSN 2182-1453

An **Interpretation Model** for Turtle Conservation: A **Case Study** of Sukamade Coastal Area, Meru Betiri National Park, Indonesia

PANCA OKTAWIRANI * [panca.fisip@unej.ac.id]

TENG-YUAN HSIAO ** [tyhsiao@mail.nkuht.edu.tw]

NUR KHOLIQ *** [systematic2008@gmail.com]

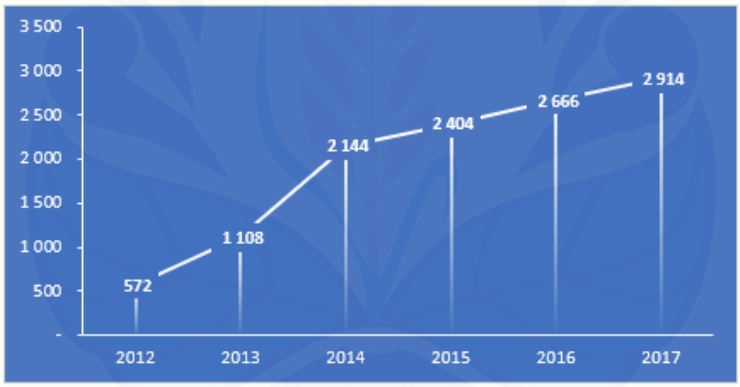
Abstract | Interpretation of ecosystems and behavior of turtles as part of conservation effort in national parks has been well established. The research purpose is to develop an interpretation model in Meru Betiri National Park where turtle watching is well known. This paper briefly reviews the concerns and outlines an interpretive program in Meru Betiri National Park by presenting a conceptual interpretive planning model that involves stakeholders (managers, visitors and community). This research was conducted in two phases: on-site interpretation evaluation and in-depth interview. Based on the results, an alternative model of interpretation consisting of three propositions was formulated and examined based on national park's institutional goals, visitors' feedback, and community participation.

Keywords | Interpretation model, turtle conservation, Sukamade, Meru Betiri National Park, Indonesia

* **PhD in Tourism Management** of National Kaohsiung University of Hospitality and Tourism, Taiwan. **Assistant Professor** of Tourism & Travel Business Department, University of Jember, Indonesia.
** **Full Professor** at Department of Leisure and Recreation Management, National Kaohsiung University of Hospitality and Tourism, Taiwan.
*** **Coordinator** of Planning, Collaboration, and Mapping of Meru Betiri National Park, Indonesia

1. Introduction

The Sukamade coastal area which is part of Meru Betiri National Park in East Java, Indonesia has become known for sea turtle landing and nesting, and considered as an ecotourism attraction (Haryati et al., 2016; Qomariah, 2009). The visitors' motivation is mostly dominated by viewing turtles' laying eggs, releasing of turtles and enjoying the beauty of nature, which have been the biggest attractions for visitors (Meru Betiri National Park, 2016; Qomariah, 2009). The turtle landing at Sukamade beach takes place throughout the year with peak seasons during November and December (Haryati et al., 2016). With such potentials, Sukamade Beach has become one of the most popular ecotourism destinations in East Java (Ministry of Tourism - Indonesia, 2016, (Nugroho, Pramukanto, Negara, Purnomowati, & Wulandari, 2016). The turtle landing at the Sukamade Beach takes place every night with numbers ranging from 1-12 turtles. Night visitors have a tremendous chance, almost 100 percent to witness nesting turtles every night at Sukamade Beach (Meru Betiri National Park, 2015). According to an Annual report of Meru Betiri National Park (2015), in 2011 the number of tourists has increased significantly from 1,616 tourists to 8,206. From that number, 2,404 people were foreign tourists. In 2017, international visitor numbers rose to 2,914 people (Figure 1).



Source: Meru Betiri NP, 2017

Figure 1 | Number of the foreign visitors in Sukamade Beach 2012-2017

Based on the last five years statistics' report, the average number of turtles that landed on Sukamade Beach increased from 1,828 heads per year while the number of nests was 1,042 per year (Meru Betiri National Park, 2016). It revealed two facts that occurred in the last five years (2011-2015) namely: (1) the increasing number of nesting turtle population, and (2) the rising number of visitors.

Sea turtles are part of two vital ecosystems - beaches, and marine systems. There are four to six types of turtle in the world that land on the Sukamade beach (Meru Betiri National Park, 1995). These types are Green Turtle (*Chelonia mydas*), Olive Ridley Turtle (*Lepidochelys olivaceae*), Hawksbill Turtle (*Eretmochelys imbricata*) and Leatherback Turtle (*Dermochelys coriaceae*) (Meru Betiri National Park, 1995). Conservation efforts are mandatory for Meru Betiri National Park which is implemented as an education program which combines visitor activities and benefits for local communities (Meru Betiri National Park, 2015).

Interpretive programs cover the biology, ecology, and behavior of marine species; best prac-

tice guidelines; and human threats to marine areas (Zeppel, 2008). Interpretation in protected areas can help reach conservation goals and inspire a new generation of knowledgeable and dedicated park supporters (Hvenegaard, 2017). There has not been any study that discusses the interpretation programs in Sukamade. This research is considered a pilot study in examining an interpretation model for Meru Betiri National Park as a protected area. Therefore, this research is expected to be the foundation and the basis for analysis in the interpretive program in the national park.The objectives of this study are 1) to assess an interpretative program in Sukamade; and 2) to develop an interpretation model in Meru Betiri National Park based on national park's institutional goals, visitors' feedback, and community participation.

2. Literature Review

2.1. Recent Research in Meru Betiri National Park

The previous research in Meru Betiri National Park has examined the climate change effects including beach disturbance on the coastal area, having an impact on the population of turtle eggs (Andriyono, 2015). Preservation of habitat from predators also pose challenges for the management institution. Threats naturally occurring in Sukamade are oceanographic's physical process, natural predators, changing conditions, climate and globalization (Andriyono, 2015; Haryati et al., 2016). Predators include Lizards (*Varanus salvator*), Sea Eagle (*Haliaeetus leucogaster*), Wild Boar (*Sus scrofa*), Weasel (*Paradoxurus Hermaphroditus*), Ants (order Hymenoptera) and Crabs (*Scylla sp.*) (Meru Betiri National Park, 1995). The temperature also plays an essential role in the determination of sex (Suastika & Suprapti, 2017; Suprapti et al, 2010). The high temperature will produce predominantly female hatchlings and vice versa. The Sukamade beach generated 75% of male hatchlings on nests under vegetation, 100% female hatchlings on open beaches, and 87.5% male hatchlings in the hatchery (Suprapti et.al, 2010). Current policy on sea turtle conservation and ecotourism activities in Sukamade expects to improve the sustainable management including mangrove restoration, sea turtle feed development, mapping of sea turtle distribution and migration, and also scientific information to support turtle conservation (Haryati et al., 2016).

2.2. Interpretation Model in National Park

The process of delivering information approaches to communication and educating visitors can be defined as interpretation (Roy Ballantyne, Packer, & Falk, 2011; "Environmental interpretation. A practical guide for people with big ideas and small budgets," 2003; G Moscardo, 1998; Gianna Moscardo, 2003; Gianna Moscardo, Ballantyne, & Hughes, 2007; Gianna Moscardo & Pearce, 1986; Gianna Moscardo, Woods, & Saltzer, 2004). Interpretation is a link or bridging the gap between visitors and existing natural resources (Hughes et al., 2013; Sharpe, 1982). The use of interpretation, especially in national parks increases the knowledge and understanding about nature, fostering a broader environmental awareness (Archer & Wearing, 2003; Hvenegaard, 2017; Kohl & Eubanks, 2008). The interpretation service in a national park does not only help visitors effectively achieve their recreation goals but also clarifies the park's preservation, conservation and education functions (Chen, Hwang, & Lee, 2006; G. Moscardo, 2009; Pearce & Moscardo, 2007). Interpretive information covers biology, ecology and behaviors of marine species, best practices and human threats to marine life (Zeppel & Muloin, 2008). An inter-

pretation will add value to the visitor's knowledge of the site, increasing the pro-environmental attitudes, enhancement of visitor experience, reduction of negative visitor impacts, managing of visitor numbers, minimization of the public incidents, and understanding of an agency's goals and objectives (Hendee & Dawson, 2009; Marion & Reid, 2007; Moscardo et al., 2004; Sharpe, 1982; Tubb, 2003). Moreover, attendance at interpretive events appears to increase the likelihood of visitors donating to the park (Stern et al., 2011b). However, how to interpret work within the vast area of national parks and with limited budget and staff is an important management issue.

There are many planning processes applied to interpretation. Several studies examined interpretation service incorporated into the park's management plan (Cho, 2005). Some of the models that have been developed include Communications Model for Interpretive Planning (Peart & Woods, 1976), Model of Interpretation (Cherem, 1977 in Veverka, 1998); Plan Ahead for Interpretation (Mullins, 1979); Interpretive Program and Services Planning (Army Corps of Engineers 1983); Interpretive Master Planning (Veverka, 1994); The Interpretive Planning Process Model (National Park Service, 2002); Interpretive Planning: the 5-M Model for Successful Project Planning (Brochu, 2003), and Interpretive Master Planning: Strategies for the New Millenium (2008).

Furthermore, Veverka (2008) discusses the development of the Master Plan Interpretation and general guidelines for developing interpretation plans using the interpretive planning model initiated by Peart and Woods (Figure 2). Veverka developed the basic elements of the interpretive as a model with 6 (six) basic elements that are taken into consideration in planning which consists of 1). Element "What- Resources, themes, and sub-themes in the interpretation, 2). Element "Why- Vision, Mission, Goals, and Goals to be achieved, 3). Elements "Who- Profile visitors, 4). "How / When / Where"Elements-Presentation of interpretation programs and services, 5). Elements of "I&O"(Implementation & Operational) - Requirement (time, resources, budget, personnel) to implement interpretation programs and services, 6). Elements of "So What- Guidance and control through monitoring and evaluation for improvement and development.

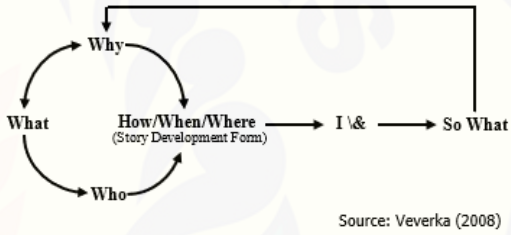
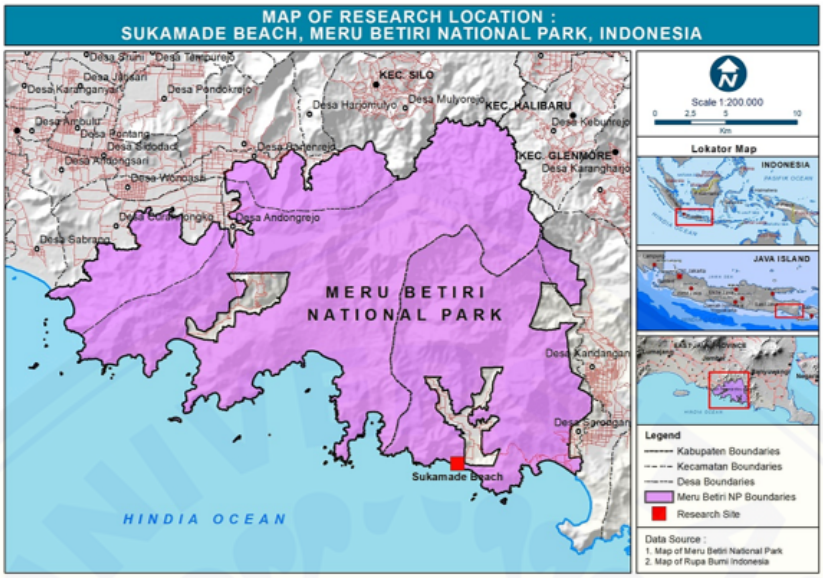


Figure 2 | Interpretive Master Planning)

3. Research Method

3.1. Instrument, Design and Data Collection

The research was conducted at Sukamade Beach, Meru Betiri National Park from July to December 2016. This study focused on investigating an interpretation management system in Meru Betiri National Park.



Source: Meru Betiri National Park, 2016

Figure 3 | Location of Research

This study used observation, based on semi-structured and in-depth interview in examining current interpretation program in Meru Betiri National Park. The interview questions were then pilot tested on two employees in order to increase the validity of questions before drafting the final version of the instrument. Through this process, the attributes are described from one to five values. The selection of characteristics was based on previous reseach undertaken at Meru Betiri National Park. The attributes are mission, goals, and objectives of the manager, demography of visitors, statistical data of turtle landing and nesting at Sukamade beach, current interpretive program, facility in Sukamade beach, visitor feedback and community participation. Although some follow-up and probing questions were asked, the researchers avoided leading the respondents. Data collected via observation are current interpretive programs (nesting turtles and releasing), basic facilities' information, visitor activities and guiding techniques at the Sukamade Coastal Area. The in-depth interview was conducted with the Head of Meru Betiri National Park, the management staff, rangers and visitors. The number of respondents in the interview was determined by 4 employees, 6 rangers, 1 guide, and 30 visitors. After the interview with the participants, authors agreed on data saturation and additional interviews would provide limited improvement in the variety of responses. Interviews took 40 to 60 minutes; they were electronically recorded and transcribed verbatim within the same day by two of the authors. Observations for each interview were also noted. The process of collecting data was explained in the framework below (Figure 4).

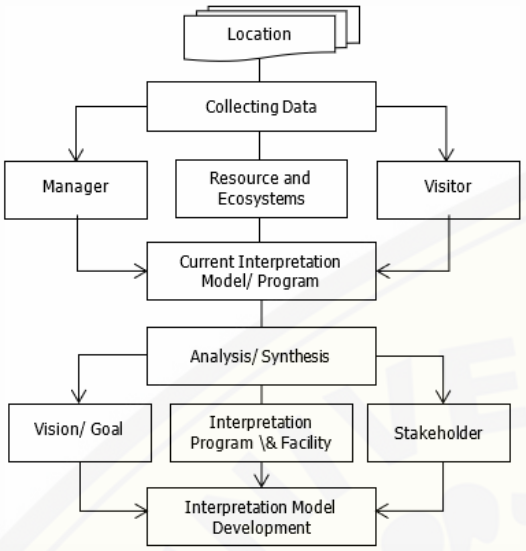


Figure 4 | Research Design

4. Results & Discussion

4.1. The Results of In-Depth Interview

Meru Betiri National Park is subdivided into ten resorts (Meru Betiri National Park, 2016). The vision of Meru Betiri National Park is to become an education center for biodiversity in Indonesia. There are two critical aspects in the management of Meru Betiri National Park: preserve natural resources and ecosystem and educational programs. The vision is motivated by the importance of foundation to achieve sustainable development ecosystem and environmental education to young generations as generation exchange. The national park has established three missions for attaining the vision: 1) protect and preserve the area along with the potentials of biological natural resources and its ecosystem; 2) utilize biodiversity and ecosystem potential in sustainable behavior, and 3) increase the supporting components of educational tourism.

Based on interviews with employees, ecotourism and environmental education programs provided for preserving the diversity of plants and animals, protecting life support systems and sustainable use of biodiversity. The conservation activities towards the sea turtles, such as egg patrol, hatchery, and hatchling release are becoming the non-consumptive uses for sea turtles. The eggs usually hatch in about two months. Each hatchery holes marked by information board about the species, date when eggs are taken and the number of eggs. Succeeded hatched eggs and the mortality were recorded. The management also maintains the cleanliness of the hatchery (incubator). Hatchlings should be incubated for 7-20 days before releasing. The data about turtle eggs and hatchling release are provided from the 1970s until now (Meru Betiri National Park, 2016).

There is a particular technical management unit known as Turtle Conservation Management Unit with the following tasks:

1. Protection of turtles and their habitat
2. Turtle preservation through semi-natural breeding
3. Rehabilitation of nesting site habitat, care, and release of turtle harvest results from hunting actors
4. Development of science through research (Turtle Research Center)
5. Development of nature tourism and conservation education

4.2. Results of Observation

4.2.1. Turtle Nesting

Turtles are excellent navigators. They often migrate at distances of hundreds or even thousand kilometers between feeding areas and egg-laying. Turtles spend their time at sea, but their mothers occasionally return to land to lay their eggs. Sea turtles lay eggs in a 2-4 years cycle, coming to the beach 3-4 times to lay hundreds of eggs in a single

Table 1 | The Result of interviews with listed attributes and response by visitors

Attributes	Responses
Interpretive Program 1. Turtle nesting	❑ There needs to be much more information on all aspects ❑ The passion of the rangers in taking care of the turtles is so good. ❑ I'd like to know more about turtle nesting. ❑ It would be good to learn more about turtles. ❑ I wanted more general information about turtles. ❑ Salute to the ranger on duty in Sukamade Beach.
2. Releasing Activity - Baby Turtles	❑ Releasing the baby turtles in the morning was one of the most wonderful experiences ❑ An excellent experience to know more about turtles. ❑ The turtle thing was fabulous. ❑ It was a great experience to witness natural selection by releasing baby turtles. Emotional moments ❑ Great adventure and fantastic ❑ Released baby turtles the next morning, so fantastic.
3. Facilities (rooms, toilets, meals)	❑ The facility is very basic. ❑ The amenities and sleeping conditions at Wisma Pantai were very basic. ❑ Facility, bed, toilets should be renovated. ❑ There needs to be much more information on all aspects of the turtle, national park and resource. ❑ Signs are required, also information board.

season having an interval of 14-30 days. Sea turtles will initially observe the coastal area from the surface of the sea, to determine the safety of their eggs, from tidal waves or predators. Sea turtles land and digs a body size hole in the sand with the hind flippers and a hole to lay the eggs with the back flippers to convinced with the area's safety. After the eggs are laid, sea turtles will cover the hole and camouflage it before turning to the sea.

Green Turtles are the most frequent turtles landing in Sukamade. A turtle can grow to a length of about 1.2 meters and can weigh up to 100 kgs., that can lay more than 100 eggs per landing. Olive Ridley Turtle is considered the smallest turtle among the existing turtles, with its tail smaller than a green turtle. The size is only 60 cm and weighs about 45 kgs. Hawksbill turtle has a sharp, pointed beak with a rather large jaw like the eagle's beak. The fourth type of turtle is the Leatherback turtle, considered the largest turtle species in the world. The turtle can grow up to three meters and weigh up to 200 kgs. Based on the ranger's statement at Sukamade, apart from witnessing the turtle nesting as an attraction, visitors get information and knowledge related to the types of sea turtles that land on the Sukamade beach.

Figure 5 | Turtle laying eggs

Turtle watching begins at around 8 pm – 10 pm. The guide brings the visitors to the beach where all must then turn off all lights and remain silent. When the Rangers spot an egg-laying turtle, all the visitors must follow the rangers to the part of the beach where the turtle has been located (see Figure 5). Visitors are not allowed to turn on their torch or anything with lights. On reaching the site, visitors are told not to stand in front of the turtle (only behind or at her side). Photos and flashlight photography are not allowed, except the one from the ranger.

4.2.2. Releasing Turtles

All visitors are invited to witness the releasing of hatched baby turtles (*tukik*) from the hatcheries into the sea, the next morning from 6 am. The beach for laying eggs and releasing is only 7-minute away by foot from the guesthouse. Every person has one bucket which contains 6-7 baby turtles. Before the release, the guide explains about the percentage rate of baby turtles that can live in the ocean. The success rate of living to adulthood is meager, and experts say that only about 1-2% of the total eggs produced. The guide also explains the predators like sea eagles that catch baby turtles before making it to the sea (Figure 6). Visitors can touch the turtles before the release. Turtles should immediately crawl and swim out to the sea to avoid predators. Some *tukik* swirling like confused returned to the beach and the others directly to the ocean. The guide explains this condition meaning the turtles are familiarizing to grab the location where they are released and will come back to the same place in the future to lay eggs.

Figure 6 | A guide instructing the visitors

4.2.3. Turtle Hatchery

The number of visits is a potential for Meru Betiri employees to convey information and education about turtle conservation. Therefore, after the release of *tukik*, the guide invited all visitors to proceed to the hatchery area (Figure 7). He explained the process of collecting eggs from the beach. Eggs are collected by rangers to protect them from predators, both humans, and animals. These are then incubated for safety in the park hatchery, and hatchlings are released to the ocean from the beach where eggs were laid. The semi-natural hatchery was designated to reduce the risk of hatching failure, having the hatchlings in its natural hatchery and prevent predators such as wild pigs, rats, lizards and sea eagles from devouring them.

Figure 7 | Hatchery Area

5. Conclusion and Suggestions

The national park is confronted with the growing number of visitors and implementing a conservation approach with more accountability and beneficial to the community is required. Furthermore, integrating interpretation into conservation programs can result in active visitor participation in conservation (Koel & Eubanks, 2008). Interpretive program in Meru Betiri National Park, specifically Sukamade has been running but not in optimal phase as there's no specific interpretive planning; minimum directional signage, displays and exhibits; and lack of evaluation and visitors' participation.

According to the framework of Veverka (2008), in terms of 'What' element which consists of resources, interpretation significance, and significant themes in interpretation at the study site, Meru Betiri National Park has to collaborate with visitors and community in resolving key issues at Sukamade Coastal Area.

In the 'Why' element which consists of the vision statement, mission, goals, and objectives, the management needs improvisation and development of current topics to visitors. The integration of mission conservation with actual issues supposed to visitor be aware, understand and directly contribute to turtle conservation.

Based on the Meru Betiri National Park report, the park should collaborate and work with the community yet, the participation of the community in the management is minimal. Currently, the appointed guide is from the surrounding community, but the number needs to be increased to support the growing number of visitors. Knowledge about conservation and guiding skills also need to be improved. Many information can be explained to visitors especially about the effects of climate change, natural predators, the sex ratio of turtle, etc. Additional resources in the form of website content, leaflets, booklets and interpretation boards must be available to support the communication process. In addition to turtle watching, other activities can be promoted to visitors such as trekking, birdwatching and cruising around the mangrove sites.

Regarding visitors' feedback, they wrote about their comments and experiences on the Tripadvisor site. They expected environmental interpretation programs to be implemented for the visitors' awareness about the park issues. Nevertheless, the park has not been able to provide a quick response related to this matter. First, the park needs to monitor and evaluate visitor feedback to improve services in the future. Existing facilities must be

improved; hence, as a priority for visitors to watch the turtles at night and take the hatchlings in the morning. With appropriate facilities, a variety of programs and activities will offer them the opportunity to stay in Sukamade longer (Figure 8).

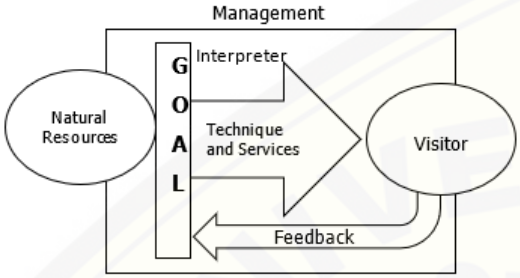


Figure 8 | Visitor feedback process in Meru Betiri National Park

Due to the increasing urgency of natural and environmental loss, the wider resource management field requires participation from all stakeholders. Through the synthesis of current interpretive practices and visitor feedback, we seek to create an alternative interpretation model applicable to turtle conservation which incorporates stakeholders' participation. Based on interpretation planning (Veverka, 1998), at first, park should include visitor feedback, and involve community stakeholders in management planning, implementation and evaluation of national park (Figure 9).

Second, the park should create a welcoming, inclusive environment that provides opportunities for the visitor to observe activities, connect people to the sites and provide information that helps visitors appreciate its significance. Third, the park interpreter characteristics (i.e., knowledge, training, service attitude, communication competence and emotional intelligence) must be enhanced, as emphasized in the research about wildlife tourists and their interest in conservation issues (Roy Ballantyne, Packer, & Hughes, 2009).

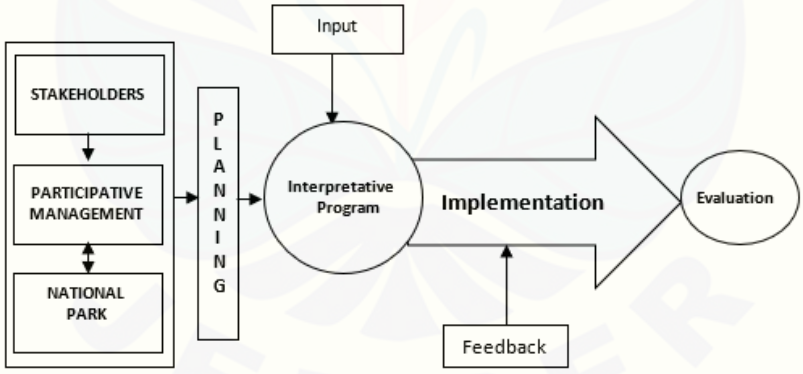


Figure 9 | Interpretation Model for Meru Betiri National Park

The 'Who' element consists of visitor profiles based on their demographics, motivations, and perceptions. While the 'How/When/Where' elements consist of the current program, technical, and media interpretation. Element Implementation and Operations consist of the arrangements, time, and resources required for implementation of the interpretation program. The 'What' element consists of recommendations for model development and interpretation media. Draft Interpretation Model will be presented and discussed together with the manager to obtain inputs. Subsequent revisions and draft improvements are made for the final Model Interpretation at Sukamade Beach.

However, the interpretation programs have limits and becomes an obstacle due to the limited budget and number of personnel. Participa-

tion from the community is needed, through the provision of products and services and collaboration with tourism agencies, non-profit organizations, and schools in designing interpretation services and quality image promotions. The critical goals towards sustainable ecological protected areas need to be realized and it is suggested that interpretation program must be implemented.

6. Acknowledgment

This research was supported under the Unit Research of the University of Jember - Ministry of Research, Technology, and Higher Education, Indonesia Projects funding scheme. The authors would like to thank the manager and ranger at the Meru Betiri National Park, Ministry of Forestry - Indonesia for their overall assistance in the conduct of this study, including those who helped during the interview namely: Dodit Ari, Puji, and Junaedi.

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