https://iopscience.iop.org/journal/1755-1315

NOTICE: There are currently some performance issues with IOPscience, which may also cause error messages to appear. Apologies for the inconvenience..

IOPscience Journals Books Publishing Support Login

IOP Conference Series: Earth and Environmental Science

The open access *IOP Conference Series: Earth and Environmental Science (EES)* provides a fast, versatile and cost-effective proceedings publication service.

Sign up for new issue notifications

Latest published conferences

Vol 1031 Go

Conference archive

2022 Go

View forthcoming volumes accepted for publication.

JOURNAL LINKS

- Journal home
- Journal scope
- Information for organizers
- Information for authors
- Contact us
- Reprint services from Curran Associates

If you would like more information regarding *IOP Conference Series: Earth and Environmental Science* please visit conferenceseries.iop.org, and if you are interested in publishing a proceedings with IOP Conference Series please visit our page for conference organizers.

Conference organizers can use our online form and we will get in touch with a quote and further details.

PAPER • OPEN ACCESS

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

A Hardanto[1], Ardiansyah[1], A Mustofa[1] and A Taryana[2]

IOP Conference Series: Earth and Environmental Science, Volume 757, International Conference on Sustainable Agriculture and Biosystem, 25th of November 2020, West Sumatera, Indonesia

Citation A Hardanto *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **757** 012044

hardanto.unsoed@gmail.com

[1] Faculty of Agriculture, Jenderal Soedirman University, Jl. Dr. Soeparno No. 63, Purwokerto 53122, Banyumas, Indonesia

[2] Faculty of Engineering, Jenderal Soedirman University, Jl. Mayjen Sungkono KM. 5 Blater 53371, Purbalingga, Indonesia

https://doi.org/10.1088/1755-1315/757/1/012044

Abstract

Serayu watershed, the largest watershed in Central Java Province of Indonesia, have various condition in the catchment area. Drawback of environmental services occurred in Banjarnegara, Wonosobo and Purbalingga regency due to intensive agriculture activities in the catchment area. However, suitable protected catchment area performed in Banyumas regency as part of Serayu watershed. Nature landscape and water quality (e.g., river and spring) are potential for tourism and domestic water resource. Nowadays, population growth and economical reason may threaten environmental services especially in catchment area. The research aim to identify waterfall potential as ecotourism development in Banyumas regency. Ecotourism Environmental Protection (EEP) approach already implemented in Asian mainland and appropriate tool for describing environmental protect measurement and its effect. EEP modified variables with Analytical Hierarchy Process (AHP) analysis were applied with focusing on water resource and conservation especially on waterfall ecotourism development. Identification of waterfall and survey of local communities, natural community, and government were conducted. We explore 109-waterfall in 17 districts of Banyumas regency with less than 20% manage by local or regional government. Third sector intervention (such local-or regional government and private sector) is indispensable for improving waterfall value as ecotourism attraction. In attractive waterfall destination, local people including local organisation receive economic benefit and might improve their welfare. Ecotourism of waterfall in Banyumas regency is promising strategy for water conservation in catchment area.

Who do you want to contact

Conference Series

David McDade

SENIOR PUBLISHER - CONFERENCE SERIES

Anete Ashton

CONFERENCE SERIES OPERATIONS MANAGER

Rosalind Barrett

COMMISSIONING EDITOR - CONFERENCE SERIES

Lorna Wroe

COMMISSIONING EDITOR - CONFERENCE SERIES

Feichi Gao

CONFERENCE SERIES COORDINATOR

Kayleigh Parsons

CONFERENCE SERIES COORDINATOR

Reyes Velazquez

Table of contents

Volume 757

2021

Previous issue Next issue

International Conference on Sustainable Agriculture and Biosystem, 25th of November 2020, West Sumatera, Indonesia

Accepted papers received: 19 April 2021
Published online: 21 May 2021

Open all abstracts

Preface

Precision Farming

Socio Economic Value Chains in Agricultural System

E Rahmi and D Yuzaria

+ Open abstract View article PDF

OPEN ACCESS 012006

Morphological characterization of Colchicine-induced Mutants in *Stevia rebaudiana*

N I Azizan, A Shamsiah, N A Hasan and S Hussein

+ Open abstract View article PDF

OPEN ACCESS 012007

Induced Mutations Using Gamma Ray and Multiplication of Plantlet through Micro Cross Section Culture of Banana (*Musa acuminata* cv. Berangan)

A A Hasim, A Shamsiah and S Hussein

+ Open abstract View article PDF

OPEN ACCESS 012008

The Analysis of Ergonomic Risk Factors Effecting Health Problem on Workers from Harvesting Activity in Oil Palm Plantation

R Rozadi and K Fatin

+ Open abstract View article PDF

OPEN ACCESS 012009

Supply Response Analysis on the Impact of Climate Change on Oil Palm Production in Malaysia

W N W M Noor, N M Nawi, K W K Seng and M Buda

+ Open abstract View article PDF

OPEN ACCESS 012010

Competitiveness and Effect of Government Policies on Laying Hens Farming Business in West Pasaman Regency, West Sumatra Province. Indonesia

D Yuzaria, A R Wahyuni and M Fajrin

+ Open abstract View article PDF

OPEN ACCESS 012011

Developing the Competitiveness and Sustainability of Agricultural Cluster Areas Based on Micro, Small and Medium Enterprise by Means of Community Entrepreneurship

Silfia, Helmi, M Noer and Henmaidi

+ Open abstract View article PDF

OPEN ACCESS 012012

An Assessment of Comparative Advantage of Pineapple Production (*Ananas comosus*) among Smallholders in Johor, Malaysia

N H Suhaimi and F A Fatah

+ Open abstract View article PDF

OPEN ACCESS 012013

Determinants of Technical Efficiency Among Coconut Smallholder Production in Johor, Malaysia: A Cobb Douglas Stochastic Frontier Production Approach

Z Omar and F A Fatah

+ Open abstract View article PDF

OPEN ACCESS 012014

Increasing the Competitiveness of Micro, Small and Medium Enterprises of Skin Crackers in Padang City West Sumatra Province Indonesia

D Yuzaria, E Rahmi and M I Rias

+ Open abstract View article PDF

OPEN ACCESS 012015

Public Concern for the Use of Backyard to Maintain the Environment and Food Security of the COVID-19 Pandemic in the City of Padang

N R Yanti and I Putri

+ Open abstract View article PDF

OPEN ACCESS 012016

Importance Performance Analysis of Dairy Processing Cooperatives for Recommendations on Capacity Building for Small and Medium Enterprises and Cooperatives in the Regional Innovation System of Padang Panjang City, West Sumatra

A Suresti, R Wati, A Agustar and A Hasan

+ Open abstract View article PDF

Smart Technologies in Agriculture System

OPEN ACCESS 012017

Design of Micro-Climate Data Monitoring System for Tropical Greenhouse based on Arduino UNO and Raspberry Pi

I Ardiansah, N Bafdal, E Suryadi and A Bono

+ Open abstract View article PDF

OPEN ACCESS 012018

Effects of Seed PEG Immersion And Hydration-Dehydration on Rice Physiological Quality

N Rozen, M Kasim and A Anwar

+ Open abstract View article PDF

OPEN ACCESS 012019

Biocontrol of *Meloidogyne* sp. on Tomato Plants by Selected *Bacillus* spp

T Habazar, Winarto, Obel, Y Yanti, MR Dani and D Monica

+ Open abstract View article PDF

OPEN ACCESS 012020

The Design of the Divider Door for the Orange Grading Machine Based on the Diameter and Color Uses Image Processing

Ifmalinda and Andasuryani

+ Open abstract View article PDF

OPEN ACCESS 012021

Effect of Acoustic Waves on the Growth and Productivity of Sawi Plants (*Brassica Juncea* L.)

F Arlius, R E Putri, N S Putri and I Putri

+ Open abstract View article PDF

OPEN ACCESS 012022

Performance Analysis of Fuzzy Logic Controller Applied on Portable Roaster

Radi, E P Saragih, B Pratama and W K Fitri

+ Open abstract View article PDF

OPEN ACCESS 012023

Effect of High Inlet Temperature of Spray Dryer on Viability of Microencapsulated *Trichoderma asperellum* Conidia

A A Ishak, F R A Zulkepli, N F M Hayin, N H Md Zain and Z Sapak

+ Open abstract View article PDF

OPEN ACCESS 012024

Breeding Efforts on Wild Honey Bee *Apis cerana* Fabr. within Coconut Plantations in Padang Pariaman, West Sumatra

Jasmi, D P Putra, Syarifuddin, H Herwina and M N Janra

+ Open abstract View article PDF

OPEN ACCESS 012025

The Application of a Data Acquisition System and Airflow Control System in an Air Dehumidified Drying Machine

B Susilo, M B Hermanto, R Damayanti and A I A Putra

+ Open abstract View article PDF

OPEN ACCESS 012026

Vernonia Amygdalina Chlorophyll Content Prediction by Feature Texture Analysis of Leaf Color

R Damayanti, D F A Riza, A W Putranto and R J Nainggolan

+ Open abstract View article PDF

Biosystem and Bioprocess

OPEN ACCESS 012027

Hybrid Dryer of Cassava Chips

W Warji and T Tamrin

+ Open abstract View article PDF

OPEN ACCESS 012028

Moisture Sorption Isotherm and Isosteric Heat of Butterfly-pea Flowers *(Clitoria ternatea)*

L C Hawa, M Efendi, Ubaidillah, A A Razak and Y Wibisono

+ Open abstract View article PDF

OPEN ACCESS 012029

The Effects of Pyrolysis Temperature on Chemical Properties of Empty Fruit Bunch and Palm Kernel Shell Biochars

A R A Hadi and A S Norazlina

+ Open abstract View article PDF

OPEN ACCESS 012030

Preliminary Assessment of Grain Losses for Paddy Combine Harvester in Koperasi Felcra Seberang Perak, Malaysia

M N Z Sharifuddin and S Mustaffha

+ Open abstract View article PDF

OPEN ACCESS 012031

Design and Fabrication of Small-Scale Potato Peeling Machine with Lye Method

Sandra, R Damayanti, I Y Prayogi and A S Basukesti

+ Open abstract View article PDF

OPEN ACCESS 012032

Development of Artificial Neural Network Model for Soil Nitrate Prediction

F Rohman, D Setiawan, Y D Prasetyatama and L Sutiarso

+ Open abstract View article PDF

Land and Water Resources

OPEN ACCESS 012033

Usage of Fenton Reagent in Local Tannery Wastewater Bioremediation

N A Fitriyanto, A K Sari, R A Prasetyo and N Kurniawati

+ Open abstract View article PDF

OPEN ACCESS 012034

An Estimation Method for Oil Palm Replanting Potential in Kampar Regency, Province of Riau

Erwinda, D P Hati, A Mulyani and E S Nugroho

+ Open abstract View article PDF

OPEN ACCESS 012035

Spatial Identification of Black Soils in Indonesia

Y Sulaeman, D Cahyana, Husnain and D Nursyamsi

+ Open abstract View article PDF

OPEN ACCESS 012036

Leaching Treatment of Acid Sulphate Soil and Crop Adaptation Test under Micro Scale Condition

M S Imanudin, J P Satria, D Budianta and C Charli

+ Open abstract View article PDF

OPEN ACCESS 012037

Surface temperature Across Land-use Change Phenomena in Padang, Indonesia

E G Ekaputra, E Stiyanto and N A I Hasanah

+ Open abstract View article PDF

OPEN ACCESS 012038

Economic Value of Water Yields on Critical Land Conservation in Kuranji Watershed

E G Ekaputra, Yonariza and D Wardiman

+ Open abstract View article PDF

OPEN ACCESS 012039

Design of Drip Irrigation for Cayenne Pepper

A Asmuti and R Awalina

+ Open abstract View article PDF

OPEN ACCESS 012040

Developing and Testing Soil Correlation Matrix to Assess the Spatial Variation of Soil Resource in Indonesia

D Cahyana, Y Sulaeman, M Anda, D O Saparina and D Subardja

+ Open abstract View article PDF

OPEN ACCESS 012041

Potential Evapotranspiration uses Thornthwaite Method to the Water Balance in Padang City

R Rusnam and N R Yanti

+ Open abstract View article PDF

OPEN ACCESS 012042

Improving Volcanic Soil Chemistry After the Eruption of Mt. Sinabung, North Sumatera in 2020

S L Rajmi, G Gusnidar, R L Lubis, F I Ginting, F R Hidayat, H Zulhakim, A N Armer, N Yulanda, I F Syukri and D Fiantis

+ Open abstract View article PDF

OPEN ACCESS 012043

Chemical Properties of Volcanic Soil After 10 Years of the Eruption of Mt. Sinabung (North Sumatera, Indonesia)

R L Lubis, Juniarti, S L Rajmi, A N Armer, F R Hidayat, H Zulhakim, N Yulanda, I F Syukri and D Fiantis

+ Open abstract View article PDF

OPEN ACCESS 012044

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

A Hardanto, Ardiansyah, A Mustofa and A Taryana

+ Open abstract View article PDF

OPEN ACCESS 012045

Numerical Model for Quantifying the Function of Soil Erosion and Sediment Transport Controls at Slope Agricultural Lands

Apip

+ Open abstract View article PDF

OPEN ACCESS 012046

Organic Matter Sequestration Under Coffee Plantation Based on Slope and Crop Age in Sibarasok Maninjau, West Sumatra Indonesia

S Yasin, L Maira and Yulnafatmawita

+ Open abstract View article PDF

OPEN ACCESS 012047

Case Study: Water Resources, Knowledge and Safety Practices of Pesticides Among Farmers Around Lake Diatas of West Sumatera

T Edwin, V S Bachtiar, D Helard, P S Komala and R N Kusuma

+ Open abstract View article PDF

OPEN ACCESS 012048

The Potential of Palm Oil Mill Effluent for Improving the Water Infiltration Rate in Lateritic Soil

N F A Rashid, N Zulkifli, A Yaacob, S K Yong and J Kassim

+ Open abstract View article PDF

OPEN ACCESS 012049

The Operation Management Model of Intermittent Irrigation in Cihea Irrigation Area In Cianjur Regency

D Yanti, T Mandang, M Y J Purwanto and M Solahudin

+ Open abstract View article PDF

OPEN ACCESS 012050

The Effect of Different Rate of Biofertilizer on the Growth Performance and Yield of Rice

M R Noraida and M R A Hisyamuddin

+ Open abstract View article PDF

Food Technology

OPEN ACCESS 012051

IOP Conference Series: Earth and Environmental Science

COUNTRY

United Kingdom

Universities and research institutions in United Kingdom

SUBJECT AREA AND CATEGORY

Earth and Planetary Sciences
Earth and Planetary Sciences (miscellaneous)

Environmental Science
Environmental Science (miscellaneous)

Physics and Astronomy
Physics and Astronomy (miscellaneous)

PUBLISHER

IOP Publishing Ltd.

H-INDEX

34

PUBLICATION TYPE

Conferences and Proceedings

ISSN

17551307, 17551315

COVERAGE

2010-2021

INFORMATION

Homepage

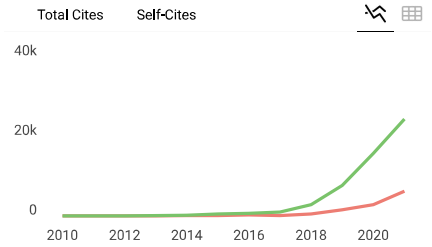
How to publish in this journal

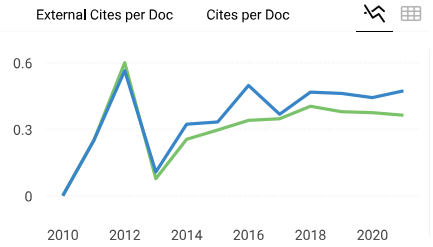
ees@ioppublishing.org

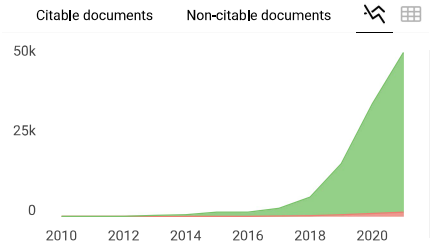
SCOPE

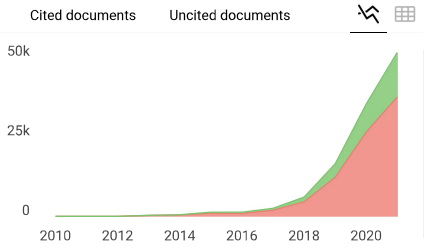
The open access IOP Conference Series: Earth and Environmental Science (EES) provides a fast, versatile and cost-effective proceedings publication service.

Join the conversation about this journal









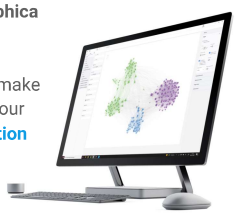
← Show this widget in your own website

Just copy the code below and paste within your html code:

<a href="https://www.scimag

SCImago Graphica

Explore, visually communicate and make sense of data with our **new data visualization tool**.



Metrics based on Scopus® data as of April 2022

N **NAJI** 1 month ago

Hello Dear

I participated as a corresponding author in IOP conf .series: Earth and Environment Science 877(2021)012046

I want do this IOP still in Scopus ???

kind regards

reply

Source details

IOP Conference Series: Earth and Environmental Science

Scopus coverage years: from 2010 to Present

Publisher: Institute of Physics Publishing

ISSN: 1755-1307 E-ISSN: 1755-1315

Subject area: Earth and Planetary Sciences: General Earth and Planetary Sciences

Environmental Science: General Environmental Science

Source type: Conference Proceeding

CiteScore 2021
0.6

SJR 2021
0.202

SNIP 2021
0.409

View all documents > | Set document alert | Save to source list | Source Homepage

CiteScore | CiteScore rank & trend | Scopus content coverage

¡ Improved CiteScore methodology

CiteScore 2021 counts the citations received in 2018-2021 to articles, reviews, conference papers, book chapters and data papers published in 2018-2021, and divides this by the number of publications published in 2018-2021. Learn more >

CiteScore 2021

$$0.6 = \frac{45{,}063 \text{ Citations 2018 - 2021}}{74{,}324 \text{ Documents 2018 - 2021}}$$

CiteScoreTracker 2022

$$0.6 = \frac{40{,}750 \text{ Citations to date}}{69{,}023 \text{ Documents to date}}$$

Calculated on 05 May, 2022

Last updated on 05 July, 2022 • Updated monthly

CiteScore rank 2021

Category	Rank	Percentile
Earth and Planetary Sciences └ General Earth and Planetary Sciences	#153/191	20th
Environmental Science └ General Environmental	#191/228	16th

View CiteScore methodology > CiteScore FAQ > Add CiteScore to your site

About Scopus

What is Scopus

Content coverage

Scopus blog

Scopus API

Privacy matters

Language

日本語版を表示する

查看简体中文版本

查看繁體中文版本

Просмотр версии на русском языке

Customer Service

Help

Tutorials

Contact us

ELSEVIER

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

A Hardanto[1], Ardiansyah[1], A Mustofa[1], A Taryana[2]

[1] Faculty of Agriculture, Jenderal Soedirman University, Jl. Dr. Soeparno No. 63, Purwokerto 53122, Banyumas, Indonesia
[2] Faculty of Engineering, Jenderal Soedirman University, Jl. Mayjen Sungkono KM. 5 Blater 53371, Purbalingga, Indonesia

Corresponding author's email address: hardanto.unsoed@gmail.com

Abstract. Serayu watershed, the largest watershed in Central Java Province of Indonesia, have various condition in the catchment area. Drawback of environmental services occurred in Banjarnegara, Wonosobo and Purbalingga regency due to intensive agriculture activities in the catchment area. However, suitable protected catchment area performed in Banyumas regency as part of Serayu watershed. Nature landscape and water quality (e.g., river and spring) are potential for tourism and domestic water resource. Nowadays, population growth and economical reason may threaten environmental services especially in catchment area. The research aim to identify waterfall potential as ecotourism development in Banyumas regency. Ecotourism Environmental Protection (EEP) approach already implemented in Asian mainland and appropriate tool for describing environmental protect measurement and its effect. EEP modified variables with Analytical Hierarchy Process (AHP) analysis were applied with focusing on water resource and conservation especially on waterfall ecotourism development. Identification of waterfall and survey of local communities, natural community, and government were conducted. We explore 109-waterfall in 17 districts of Banyumas regency with less than 20% manage by local or regional government. Third sector intervention (such local- or regional government and private sector) is indispensable for improving waterfall value as ecotourism attraction. In attractive waterfall destination, local people including local organisation receive economic benefit and might improve their welfare. Ecotourism of waterfall in Banyumas regency is promising strategy for water conservation in catchment area,
Keywords: catchment area, eco-tourism, environmental services, waterfall, water conservation

1. Introduction

Nowadays, services sector such tourism is growing significantly followed by economic growth, however, potential threat on ecological services cannot be ignored. Banyumas regency (Central Java province of Indonesia) with topography and water resource perform potential values on (eco-) tourism development. Drawback of ecological function due to human activities surrounding water resources protected area reported in some region [1, 2, 3]. Human motivation such economic benefit influence on environmental reduction [4]. Alteration of economic source from natural exploitation to services sector such ecotourism could be an alternative solution between environmental protection and local people welfare [5].

Ecotourism environmental approach already applied in mainland Asia which analytical hierarchy process procedure for deciding between environmental measures and effects [6]. Correlation between measures and effect was reported, however the effectiveness showed spatial variability. Socio-economic influence on ecotourism sustainability, especially for local community or individually [7]. For example, some research reported that humans should be considered on integrated system of ecosystem development, including ecotourism [8, 9]. However, spatial variability and complexity on water resource ecotourism strategy was provided.

Deciding potential natural landscape on ecotourism strategy was reported in some protected area by Analytical Hierarchy Process (AHP). Integrated AHP and Strengths, Weakness, Opportunity and Threats (SWOT) analysis were applied in natural park [10]. AHP and spatial analysis applied for measurement and effect on ecotourism development in mainland Asia [6]. In Indonesia, AHP method was applied to evaluate ecotourism suitability [11]. Its analysis involve expertise in categories each level structure and value of pair wise interaction. We applied AHP on ecotourism environmental perspective of water resource protection. Thus, these research aim to investigated potential waterfall ecotourism in Banyumas regency and variable influence on ecotourism development for supporting water resource protection.

2. Materials and Method

2.1. Location

The research was conducted in the four sub watershed (i.e. Tajum, Logawa, Klawing, and Serayu hilir) of Serayu watershed hydrological system which located in Banyumas regency (Central Java Province, Indonesia), administratively (Figure 1). Mountainous topography dominated in the north region where around 80% waterfall identified. Regional precipitation is over 2000 mm, annually [12]. Banyumas regency consist of 27 District and we explored 109 waterfall placed in 17 District (Table 1). Mainly, the waterfall located in Baturaden District (43,1%) and 90 waterfall are unmanaged by any institution (82,6%).

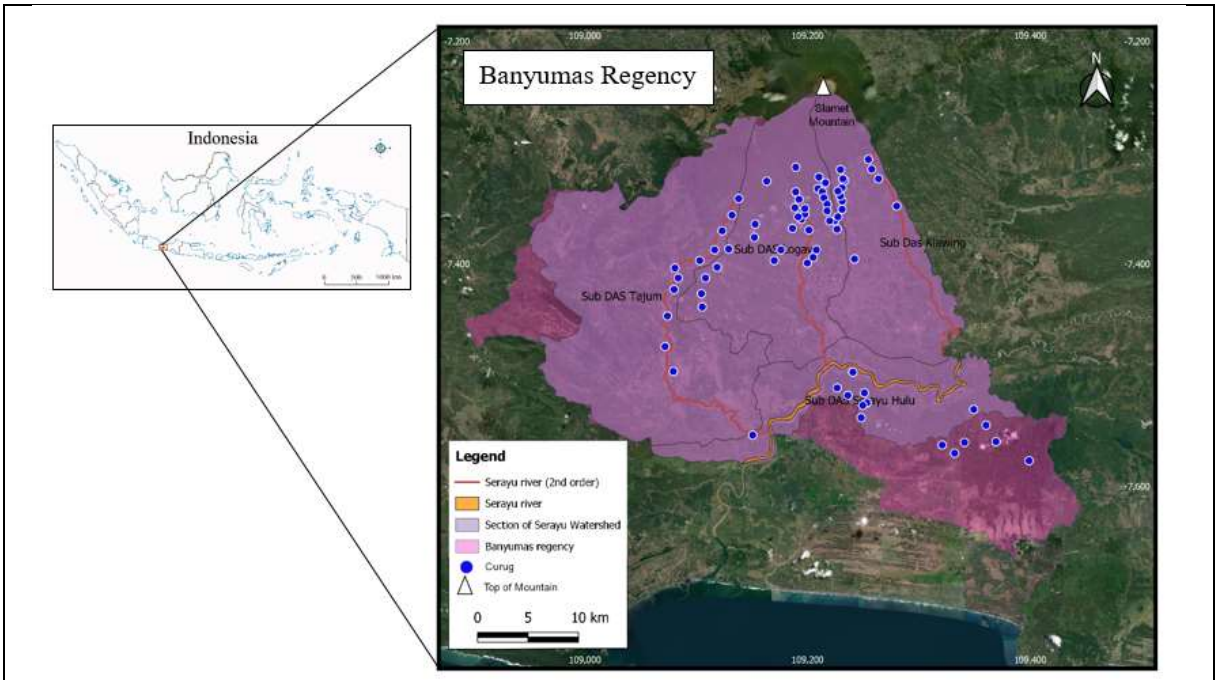


Figure 1. Waterfall destination in Banyumas regency (Central Java province, Indonesia) which three sub watershed of Serayu (i.e. Tajum, Logawa, Klawing, and Serayu hilir).

Table 1. Description of waterfall place in 17 District of Banyumas regency

No	District	Quantity	Percentage (%)	Management Responsibility			
				PM	LG	RG	NM
1	Cilongok	2	1,8	-	-	1	1
2	Karanglewas	4	3,7	-	-	-	4
3	Pekuncen	12	11,0	-	1	-	11
4	Rawalo	1	0,9	-	-	-	1
5	Lumbir	2	1,8	-	-	-	2
6	Ajibarang	1	0,9	-	-	-	1
7	Gumelar	3	2,8	-	-	-	3
8	Baturaden	47	43,1	1	6	3	37
9	Kedung banteng	10	9,2	-	2	1	7
10	Kembaran	1	0,9	-	-	-	1
11	Somagede	1	0,9	-	-	-	1
12	Sumbang	10	9,2	1	3		6
13	Kebasen	6	5,5	-	-	-	6
14	Sumpiuh	3	2,8	-	-	-	3
15	Tambak	2	1,8	-	-	-	2
16	Banyumas	1	0,9	-	-	-	1
17	Kemranjen	3	2,8	-	-	-	3
Total		109	100	2	12	5	90

PM= private management; LG= local government (e.g. village, civil organisation); G= government (regency); NM= no management responsibility

2.2. Data collection and analysis

Analytical Hierarchy Process (AHP) applied ecotourism development of waterfall potential in Banyumas regency. To understand waterfall potential in Banyumas regency, criteria and alternative variable decided by expert and practitioners who concern with water conservation and tourism such as researcher, ecologist, government, civil organisation, nature community (Table 2 and 3). Data collection and analysis followed Saaty's procedure (Figure 2; [13]). Based on AHP structures, we collected questioners from 55 respondents of natural community member as waterfall visitors regularly. In assessment process, each alternative scored by Likert scale, i.e. 1 to 7 as poor to very good value then calculate.

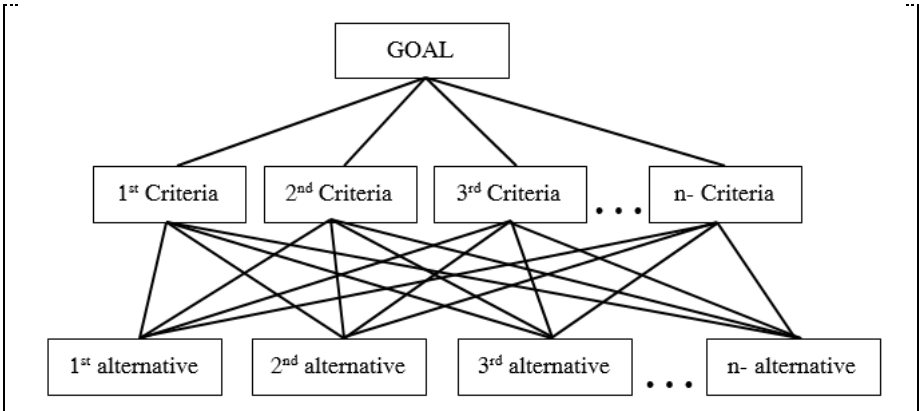


Figure 2. Analytical Hyracrti Process (AHP) structure

3. Results and Discussion

Ecology and environmental aspect should be considered on waterfall development, followed by economy function, infrastructure, operational management, and naturalness (Table 2). Ecology and environmental services should be compromised with economic benefit such as local people community.

Mainly waterfall located in rural region as its community received simple economic reward, however they contribute on conservation with sophisticated social-ecological relation [14, 15]. In regional development, including ecotourism destination, human bring significant influence on ecological function [16, 17]. For example, drawback due to lack of people education was reported weakness significantly in National Park Serbia [18]. Ecotourism can increase human capability on their ecosystem protection awareness [19].

Table 2. Pair wise comparison matrix, criteria's weight and validity

Criteria	C1	C2	C3	C4	C5	Sum	Weight	Consistency
Ecology & environmental (C1)	1,00	4,40	0,88	1,00	3,87	1,72	0,32	5,21
Economic benefit (C2)	0,23	1,00	4,40	1,97	1,29	1,21	0,23	5,07
Landscape/Naturalness (C3)	1,14	0,20	1,00	0,77	0,38	0,58	0,11	5,71
Infrastructure (C4)	1,00	0,51	1,29	1,00	1,00	0,92	0,17	4,52
Operation Management (C5)	0,26	0,77	2,65	1,00	1,00	0,88	0,17	4,52
Total	3,62	6,88	10,22	5,74	7,54		CI=	0,0010
							RI=	1,12
							CR=	0,0009

Based on alternative result, water resources and benefit for local people are the most important on waterfall ecotourism developing strategies. Increasing economic benefit can be addressed by intensification and diversification strategy [20] however should be considered not only on economic but also water resources conservation. Biodiversity and landscape surrounding waterfall location are the attractiveness for tourism, nonetheless improving management such public services and facilities are more valued factor (Table 3). Tourism development level was indicated by the development of public service quality [21]. All alternative strategies should be concern to ecological factor due to increasing tourism followed by economic growth but decrease ecological quality [22].

Table 3. Criteria and alternative's weight

Criteria	Alternatives	C1	C2	C3	C4	C5	Weight
Ecology & environmental (C1)	Biodiversity protection	0.10	0.09	0.08	0.06	0.06	0.08
	Water quality and quantity	0.15	0.13	0.11	0.09	0.09	0.12
Economic benefit (C2)	Income (local people/community)	0.13	0.13	0.10	0.08	0.09	0.11
	Income (government)	0.05	0.13	0.11	0.03	0.09	0.08
Landscape/naturalness (C3)	Scenery/Naturalness	0.12	0.06	0.16	0.07	0.12	0.10
	Culture/local attraction	0.08	0.09	0.14	0.08	0.17	0.10
Infrastructure (C4)	Public facilities	0.12	0.09	0.07	0.11	0.14	0.11
	Accessibility	0.11	0.05	0.04	0.13	0.07	0.09
Operation & management (C5)	Management (system & organization)	0.10	0.11	0.07	0.14	0.08	0.10
	Services	0.03	0.12	0.11	0.20	0.11	0.10

Water resources in 109 identified water-fall show moderate potential of waterfall attraction on ecotourism environmental perspective (Table 4). Water quality perform good quality year-round, either the rainy or dry season. Stream water quality correlate to temporal effect such seasonality [23, 24]. Waterfall attraction in Banyumas regency stash natural potential such landscape, local people hospitality and biodiversity. Conversely, lack of public facilities, management and accessibility are identified. Government and local people receive less and moderate benefit income from these attraction, respectively. In waterfall ecotourism development, government role (e.g. regulation and facilities construction) is required, while private and local sector can assist on management and services [7, 25, 26].

Table 4. Scoring potential waterfall attraction in Banyumas regency regarding to ecotourism water protection

District	Alternative (weight, %)										Score
	A1 (12,1)	**A2** (11,3)	**A3** (10,9)	**A4** (10,3)	**A5** (10,3)	**A6** (10,3)	**A7** (10,2)	**A8** (8,6)	**A9** (8,2)	**A10** (7,9)	
Cilongok	6.50	5.00	3.00	4.00	5.00	6.50	3.00	3.00	6.00	3.00	4.56
Karanglewas	5.75	4.00	3.00	5.25	4.50	5.75	3.00	2.50	6.00	2.75	4.30
Pekuncen	5.83	4.17	3.17	5.75	3.42	6.00	3.67	2.58	5.58	2.08	4.30
Rawalo	5.00	3.00	3.00	5.00	5.00	6.00	3.00	3.00	6.00	2.00	4.13
Lumbir	6.00	3.00	3.00	6.00	3.00	6.00	3.00	2.00	6.00	2.00	4.06
Ajibarang	6.00	3.00	3.00	6.00	3.00	6.00	3.00	2.00	6.00	1.00	3.98
Gumelar	6.00	5.00	3.00	6.00	3.00	5.33	3.00	1.67	5.67	2.33	4.19
Baturaden	6.25	4.77	3.44	5.29	3.85	5.83	3.54	3.19	5.69	2.81	4.53
Kedungbanteng	6.00	4.33	3.00	6.00	3.00	5.67	3.00	2.67	5.33	2.33	4.21
Kembaran	6.00	5.00	3.00	6.00	3.00	5.00	3.00	3.00	6.00	3.00	4.35
Somagede	5.00	5.00	3.00	6.00	3.00	5.00	3.00	3.00	6.00	3.00	4.23
Sumbang	6.40	4.10	3.60	5.20	4.10	5.70	3.50	2.90	5.80	3.00	4.49
Kebasen	5.50	4.00	3.00	5.83	3.00	5.33	3.33	2.33	5.50	2.17	4.06
Sumpiuh	5.00	3.67	3.00	5.67	3.67	5.33	3.00	3.00	5.67	2.33	4.07
Tambak	6.00	3.00	3.00	6.00	3.00	5.00	3.00	2.00	6.00	2.00	3.96
Banyumas	6.00	5.00	3.00	6.00	3.00	6.00	3.00	2.00	6.00	2.00	4.29
Kemranjen	5.67	4.33	3.00	6.00	3.67	5.33	3.00	3.00	6.00	2.33	4.28
Average	5.82	4.14	3.07	5.65	3.54	5.63	3.12	2.58	5.84	2.36	4.23

A1= Water quality and quantity; A2= Benefit (local people/community); A3= Public facilities; A4= Services; A5= Management (system & organization); A6= Scenery/Naturalness; A7= Culture/local attraction; A8= Accessibility; A9= Biodiversity; A10= Income (government)

4. Conclusion

Based on 109-waterfall identification in three sub-watershed (i,e, Logawa, Tajum, and Serayu hilir sub-watershed) and ecotourism assessment on ecosystem perspective, mainly waterfall attraction perform potential value on tourist attractiveness. Further, contribution of government, local people and private sector needs to be included especially on public services, hospitality, and accessibility. In attractive waterfall destination, local people including local organisation receive economic benefit and might improve their welfare. It might impact on decreasing natural source exploitation when service sector provided. Ecotourism of waterfall in Banyumas regency is promising strategy for water conservation in the catchment area.

Acknowledgement

We thank to Public work services of Banyumas Regency for data information. This research funded by BLU UNSOED No. 3716/UN23.14/PN.01.00/2018. Thank deliver to Erina for the waterfall map and discussion.

Reference

[1] Wang Y-J, Qin D-H. Influence of climate change and human activity on water resources in arid region of Northwest China: An overview. Advances in Climate Change Research. 2017; 8(4):268–78.

[2] Liu Y, Chen Y. Impact of population growth and land-use change on water resources and ecosystems of the arid Tarim River Basin in Western China. International Journal of Sustainable Development & World Ecology. 2006; 13(4):295–305.
[3] Ashton P, Patrick M, MacKay H, Weaver A. Integrating biodiversity concepts with good governance to support water resources management in South Africa. WSA. 2006; 31(4):449–56.
[4] Rees WE. Economic development and environmental protection: an ecological economics perspective. Environ Monit Assess. 2003; 86:29–45.
[5] Das D, Hussain I. Does ecotourism affect economic welfare? Evidence from Kaziranga National Park, India. Journal of Ecotourism. 2016; 15(3):241–60.
[6] Wang L, Zhong L, Zhang Y, Zhou B. Ecotourism environmental protection measures and their effects on protected areas in China. Sustainability. 2014; 6(10):6781–98.
[7] Tsaur S-H, Lin Y-C, Lin J-H. Evaluating ecotourism sustainability from the integrated perspective of resource, community and tourism. Tourism Management. 2006; 27(4):640–53.
[8] Lochner P, Weaver A, Gelderblom C, Peart R, Sandwith T, Fowkes S. Aligning the diverse: the development of a biodiversity conservation strategy for the Cape Floristic Region. Biological Conservation. 2003; 112(1–2):29–43.
[9] Young OR, Lambin EF, Alcock F, Haberl H, Karlsson SI, McConnell WJ, et al. A Portfolio approach to analyzing complex human-environment interactions: institutions and land change. Ecology and Society. 2006; 11(2).
[10] Çelik D. Determination of the most suitable ecotourism activities with the analytic hierarchy process: a case study of Balamba natural park, Turkey. Appl Ecol Env Res. 2018; 16(4):4329–55.
[11] Adigana M, Sih Setyono J. Ecotourism site suitability using GIS and AHP: A case study of Ngargoyoso District in Karanganyar Regency. KnE Engineering. 2019. Available from: https://knepublishing.com/index.php/KnE-Engineering/article/view/5839
[12] Suwarno, Sutomo, Aditam. The analysis of the landslide vulnerability sub watersheds Arus in Banyumas Regency. Geographia Technica. 2019; 14(2):112–9.
[13] Saaty TL. Decision making with the analytic hierarchy process. IJSSCI. 2008; 1(1):83.
[14] Berkes F. Rethinking community-based conservation. Conservation Biology. 2004; 18(3):621–30.
[15] García-Frapolli E, Toledo VM, Martinez-Alier J. Adaptations of a Yucatec Maya multiple-use ecological management strategy to ecotourism. Ecology and Society. 2008; 13(2).
[16] Isbell F, Gonzalez A, Loreau M, Cowles J, Díaz S, Hector A, et al. Linking the influence and dependence of people on biodiversity across scales. Nature. 2017; 546(7656):65–72.
[17] Sushchenko O, Prokopishyna O, Kozubova N. Eco-friendly behavior of local population, tourists and companies as a factor of sustainable tourism development. IJET. 2018; 7(4.3):514.
[18] Ristić D, Vukoičić D, Milinčić M. Tourism and sustainable development of rural settlements in protected areas - example NP Nopaonik (Serbia). Land Use Policy. 2019; 89:104231.
[19] Kimmel JR. Ecotourism as environmental learning. The Journal of Environmental Education. 1999; 30(2):40–4.
[20] Arlym L, Hermon D. Strategy of ecotourism development in Pariaman City. IOP Conf Ser: Earth Environ Sci. 2019; 314:012039.
[21] Tang Y. Research on optimizing public goods supply system of tourism destinations in Liaoning from the perspective of rural revitalization. In: Proceedings of the 2019 International Conference on Management Science and Industrial Economy (MSIE 2019). Guangzhou, China: Atlantis Press; 2020. Available from: https://www.atlantis-press.com/article/125933256
[22] Danish, Wang Z. Dynamic relationship between tourism, economic growth, and environmental quality. Journal of Sustainable Tourism. 2018; 26(11):1928–43.
[23] Rodrigues V, Estrany J, Ranzini M, de Cicco V, Martín-Benito JMT, Hedo J, et al. Effects of land use and seasonality on stream water quality in a small tropical catchment: The headwater of Córrego Água Limpa, São Paulo (Brazil). Science of The Total Environment. 2018; 622–623:1553–61.

[24] Pratt B, Chang H. Effects of land cover, topography, and built structure on seasonal water quality at multiple spatial scales. Journal of Hazardous Materials. 2012; 209–210:48–58.
[25] Lee J, Choi HO. Stakeholders' views on reducing financial support in government-led ecotourism areas. Ocean & Coastal Management. 2017; 144:7–15.
[26] Wight P. Sustainable ecotourism: balancing economic, environmental and social goals within an ethical framework. Tourism Recreation Research. 1995; 20(1):5–13.

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

by Ardiansyah Ardiansyah

Submission date: 10-Jul-2022 08:29AM (UTC+0700)
Submission ID: 1868479167
File name: Hardanto_2021_IOP_Conf._Ser.__Earth_Environ._Sci._757_012044.pdf (553.28K)
Word count: 3313
Character count: 17475

PAPER · OPEN ACCESS

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

To cite this article: A Hardanto *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **757** 012044

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

A Hardanto[1], Ardiansyah[1], A Mustofa[1], A Taryana[2]

[1] Faculty of Agriculture, Jenderal Soedirman University, Jl. Dr. Soeparno No. 63, Purwokerto 53122, Banyumas, Indonesia
[2] Faculty of Engineering, Jenderal Soedirman University, Jl. Mayjen Sungkono KM. 5 Blater 53371, Purbalingga, Indonesia

Corresponding author's email address: hardanto.unsoed@gmail.com

Abstract. Serayu watershed, the largest watershed in Central Java Province of Indonesia, have various condition in the catchment area. Drawback of environmental services occurred in Banjarnegara, Wonosobo and Purbalingga regency due to intensive agriculture activities in the catchment area. However, suitable protected catchment area performed in Banyumas regency as part of Serayu watershed. Nature landscape and water quality (e.g., river and spring) are potential for tourism and domestic water resource. Nowadays, population growth and economical reason may threaten environmental services especially in catchment area. The research aim to identify waterfall potential as ecotourism development in Banyumas regency. Ecotourism Environmental Protection (EEP) approach already implemented in Asian mainland and appropriate tool for describing environmental protect measurement and its effect. EEP modified variables with Analytical Hierarchy Process (AHP) analysis were applied with focusing on water resource and conservation especially on waterfall ecotourism development. Identification of waterfall and survey of local communities, natural community, and government were conducted. We explore 109-waterfall in 17 districts of Banyumas regency with less than 20% manage by local or regional government. Third sector intervention (such local- or regional government and private sector) is indispensable for improving waterfall value as ecotourism attraction. In attractive waterfall destination, local people including local organisation receive economic benefit and might improve their welfare. Ecotourism of waterfall in Banyumas regency is promising strategy for water conservation in catchment area,

Keywords: catchment area, eco-tourism, environmental services, waterfall, water conservation

1. Introduction

Nowadays, services sector such tourism is growing significantly followed by economic growth, however, potential threat on ecological services cannot be ignored. Banyumas regency (Central Java province of Indonesia) with topography and water resource perform potential values on (eco-) tourism development. Drawback of ecological function due to human activities surrounding water resources protected area reported in some region [1, 2, 3]. Human motivation such economic benefit influence on environmental reduction [4]. Alteration of economic source from natural exploitation to services sector such ecotourism could be an alternative solution between environmental protection and local people welfare [5].

Ecotourism environmental approach already applied in mainland Asia which analytical hierarchy process procedure for deciding between environmental measures and effects [6]. Correlation between measures and effect was reported, however the effectiveness showed spatial variability. Socio-economic influence on ecotourism sustainability, especially for local community or individually [7]. For example, some research reported that humans should be considered on integrated system of ecosystem development, including ecotourism [8, 9]. However, spatial variability and complexity on water resource ecotourism strategy was provided.

Deciding potential natural landscape on ecotourism strategy was reported in some protected area by Analytical Hierarchy Process (AHP). Integrated AHP and Strengths, Weakness, Opportunity and Threats (SWOT) analysis were applied in natural park [10]. AHP and spatial analysis applied for measurement and effect on ecotourism development in mainland Asia [6]. In Indonesia, AHP method was applied to evaluate ecotourism suitability [11]. Its analysis involve expertise in categories each level structure and value of pair wise interaction. We applied AHP on ecotourism environmental perspective of water resource protection. Thus, these research aim to investigated potential waterfall ecotourism in Banyumas regency and variable influence on ecotourism development for supporting water resource protection.

2. Materials and Method

2.1. Location

The research was conducted in the four sub watershed (i.e. Tajum, Logawa, Klawing, and Serayu hilir) of Serayu watershed hydrological system which located in Banyumas regency (Central Java Province, Indonesia), administratively (Figure 1). Mountainous topography dominated in the north region where around 80% waterfall identified. Regional precipitation is over 2000 mm, annually [12]. Banyumas regency consist of 27 District and we explored 109 waterfall placed in 17 District (Table 1). Mainly, the waterfall located in Baturaden District (43,1%) and 90 waterfall are unmanaged by any institution (82,6%).

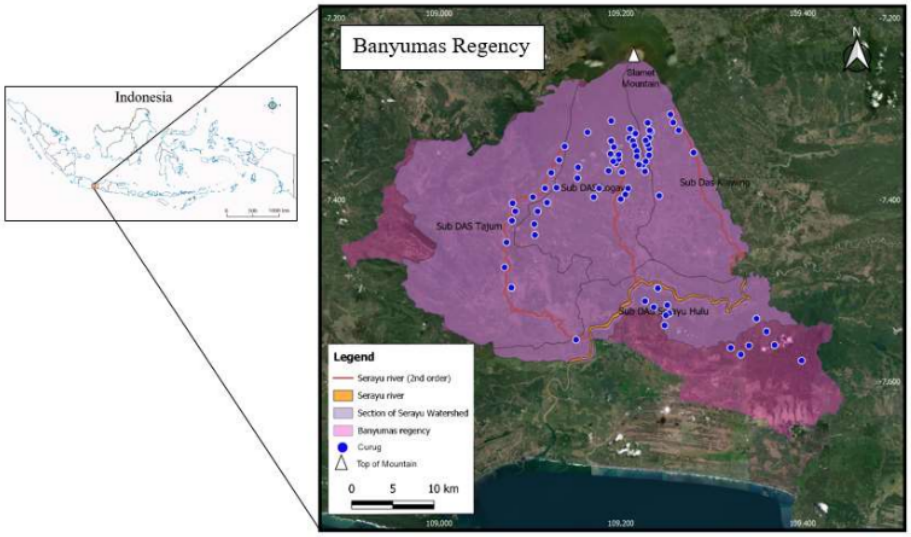


Figure 1. Waterfall destination in Banyumas regency (Central Java province, Indonesia) which three sub watershed of Serayu (i.e. Tajum, Logawa, Klawing, and Serayu hilir).

Table 1. Description of waterfall place in 17 District of Banyumas regency

No	District	Quantity	Percentage (%)	Management Responsibility			
				PM	LG	RG	NM
1	Cilongok	2	1,8	-	-	1	1
2	Karanglewas	4	3,7	-	-	-	4
3	Pekuncen	12	11,0	-	1	-	11
4	Rawalo	1	0,9	-	-	-	1
5	Lumbir	2	1,8	-	-	-	2
6	Ajibarang	1	0,9	-	-	-	1
7	Gumelar	3	2,8	-	-	-	3
8	Baturaden	47	43,1	1	6	3	37
9	Kedung banteng	10	9,2	-	2	1	7
10	Kembaran	1	0,9	-	-	-	1
11	Somagede	1	0,9	-	-	-	1
12	Sumbang	10	9,2	1	3		6
13	Kebasen	6	5,5	-	-	-	6
14	Sumpiuh	3	2,8	-	-	-	3
15	Tambak	2	1,8	-	-	-	2
16	Banyumas	1	0,9	-	-	-	1
17	Kemranjen	3	2,8	-	-	-	3
Total		109	100	2	12	5	90

PM= private management; LG= local government (e.g. village, civil organisation); G= government (regency); NM= no management responsibility

2.2. Data collection and analysis

Analytical Hierarchy Process (AHP) applied ecotourism development of waterfall potential in Banyumas regency. To understand waterfall potential in Banyumas regency, criteria and alternative variable decided by expert and practitioners who concern with water conservation and tourism such as researcher, ecologist, government, civil organisation, nature community (Table 2 and 3). Data collection and analysis followed Saaty's procedure (Figure 2; [13]). Based on AHP structures, we collected questioners from 55 respondents of natural community member as waterfall visitors regularly. In assessment process, each alternative scored by Likert scale, i.e. 1 to 7 as poor to very good value then calculate.

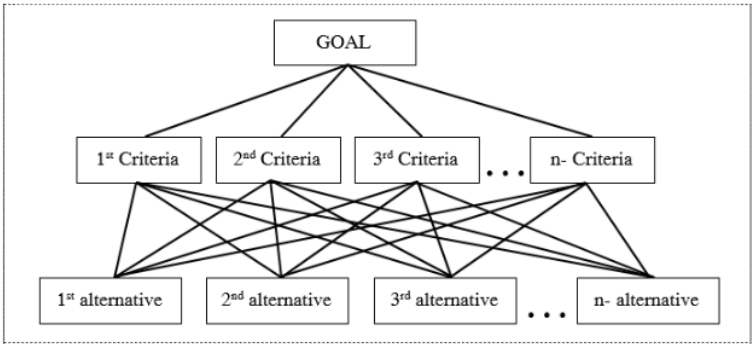


Figure 2. Analytical Hyracrti Process (AHP) structure

3. Results and Discussion

Ecology and environmental aspect should be considered on waterfall development, followed by economy function, infrastructure, operational management, and naturalness (Table 2). Ecology and environmental services should be compromised with economic benefit such as local people community.

Mainly waterfall located in rural region as its community received simple economic reward, however they contribute on conservation with sophisticated social-ecological relation [14, 15]. In regional development, including ecotourism destination, human bring significant influence on ecological function [16, 17]. For example, drawback due to lack of people education was reported weakness significantly in National Park Serbia [18]. Ecotourism can increase human capability on their ecosystem protection awareness [19].

Table 2. Pair wise comparison matrix, criteria's weight and validity

Criteria	C1	C2	C3	C4	C5	Sum	Weight	Consistency
Ecology & environmental (C1)	1,00	4,40	0,88	1,00	3,87	1,72	0,32	5,21
Economic benefit (C2)	0,23	1,00	4,40	1,97	1,29	1,21	0,23	5,07
Landscape/Naturalness (C3)	1,14	0,20	1,00	0,77	0,38	0,58	0,11	5,71
Infrastructure (C4)	1,00	0,51	1,29	1,00	1,00	0,92	0,17	4,52
Operation Management (C5)	0,26	0,77	2,65	1,00	1,00	0,88	0,17	4,52
Total	3,62	6,88	10,22	5,74	7,54		CI=	0,0010
							RI=	1,12
							CR=	0,0009

Based on alternative result, water resources and benefit for local people are the most important on waterfall ecotourism developing strategies. Increasing economic benefit can be addressed by intensification and diversification strategy [20] however should be considered not only on economic but also water resources conservation. Biodiversity and landscape surrounding waterfall location are the attractiveness for tourism, nonetheless improving management such public services and facilities are more valued factor (Table 3). Tourism development level was indicated by the development of public service quality [21]. All alternative strategies should be concern to ecological factor due to increasing tourism followed by economic growth but decrease ecological quality [22].

Table 3. Criteria and alternative's weight

Criteria	Alternatives	C1	C2	C3	C4	C5	Weight
Ecology & environmental (C1)	Biodiversity protection	0.10	0.09	0.08	0.06	0.06	0.08
	Water quality and quantity	0.15	0.13	0.11	0.09	0.09	0.12
Economic benefit (C2)	Income (local people/community)	0.13	0.13	0.10	0.08	0.09	0.11
	Income (government)	0.05	0.13	0.11	0.03	0.09	0.08
Landscape/naturalness (C3)	Scenery/Naturalness	0.12	0.06	0.16	0.07	0.12	0.10
	Culture/local attraction	0.08	0.09	0.14	0.08	0.17	0.10
Infrastructure (C4)	Public facilities	0.12	0.09	0.07	0.11	0.14	0.11
	Accessibility	0.11	0.05	0.04	0.13	0.07	0.09
Operation & management (C5)	Management (system & organization)	0.10	0.11	0.07	0.14	0.08	0.10
	Services	0.03	0.12	0.11	0.20	0.11	0.10

Water resources in 109 identified water-fall show moderate potential of waterfall attraction on ecotourism environmental perspective (Table 4). Water quality perform good quality year-round, either the rainy or dry season. Stream water quality correlate to temporal effect such seasonality [23, 24]. Waterfall attraction in Banyumas regency stash natural potential such landscape, local people hospitality and biodiversity. Conversely, lack of public facilities, management and accessibility are identified. Government and local people receive less and moderate benefit income from these attraction, respectively. In waterfall ecotourism development, government role (e.g. regulation and facilities construction) is required, while private and local sector can assist on management and services [7, 25, 26].

Table 4. Scoring potential waterfall attraction in Banyumas regency regarding to ecotourism water protection

District	Alternative (weight, %)										Score
	A1 (12,1)	**A2** (11,3)	**A3** (10,9)	**A4** (10,3)	**A5** (10,3)	**A6** (10,3)	**A7** (10,2)	**A8** (8,6)	**A9** (8,2)	**A10** (7,9)	
Cilongok	6.50	5.00	3.00	4.00	5.00	6.50	3.00	3.00	6.00	3.00	4.56
Karanglewas	5.75	4.00	3.00	5.25	4.50	5.75	3.00	2.50	6.00	2.75	4.30
Pekuncen	5.83	4.17	3.17	5.75	3.42	6.00	3.67	2.58	5.58	2.08	4.30
Rawalo	5.00	3.00	3.00	5.00	5.00	6.00	3.00	3.00	6.00	2.00	4.13
Lumbir	6.00	3.00	3.00	6.00	3.00	6.00	3.00	2.00	6.00	2.00	4.06
Ajibarang	6.00	3.00	3.00	6.00	3.00	6.00	3.00	2.00	6.00	1.00	3.98
Gumelar	6.00	5.00	3.00	6.00	3.00	5.33	3.00	1.67	5.67	2.33	4.19
Baturaden	6.25	4.77	3.44	5.29	3.85	5.83	3.54	3.19	5.69	2.81	4.53
Kedungbanteng	6.00	4.33	3.00	6.00	3.00	5.67	3.00	2.67	5.33	2.33	4.21
Kembaran	6.00	5.00	3.00	6.00	3.00	5.00	3.00	3.00	6.00	3.00	4.35
Somagede	5.00	5.00	3.00	6.00	3.00	5.00	3.00	3.00	6.00	3.00	4.23
Sumbang	6.40	4.10	3.60	5.20	4.10	5.70	3.50	2.90	5.80	3.00	4.49
Kebasen	5.50	4.00	3.00	5.83	3.00	5.33	3.33	2.33	5.50	2.17	4.06
Sumpiuh	5.00	3.67	3.00	5.67	3.67	5.33	3.00	3.00	5.67	2.33	4.07
Tambak	6.00	3.00	3.00	6.00	3.00	5.00	3.00	2.00	6.00	2.00	3.96
Banyumas	6.00	5.00	3.00	6.00	3.00	6.00	3.00	2.00	6.00	2.00	4.29
Kemranjen	5.67	4.33	3.00	6.00	3.67	5.33	3.00	3.00	6.00	2.33	4.28
Average	5.82	4.14	3.07	5.65	3.54	5.63	3.12	2.58	5.84	2.36	4.23

A1= Water quality and quantity; A2= Benefit (local people/community); A3= Public facilities; A4= Services; A5= Management (system & organization); A6= Scenery/Naturalness; A7= Culture/local attraction; A8= Accessibility; A9= Biodiversity; A10= Income (government)

4. Conclusion

Based on 109-waterfall identification in three sub-watershed (i,e, Logawa, Tajum, and Serayu hilir sub-watershed) and ecotourism assessment on ecosystem perspective, mainly waterfall attraction perform potential value on tourist attractiveness. Further, contribution of government, local people and private sector needs to be included especially on public services, hospitality, and accessibility. In attractive waterfall destination, local people including local organisation receive economic benefit and might improve their welfare. It might impact on decreasing natural source exploitation when service sector provided. Ecotourism of waterfall in Banyumas regency is promising strategy for water conservation in the catchment area.

Acknowledgement

We thank to Public work services of Banyumas Regency for data information. This research funded by BLU UNSOED No. 3716/UN23.14/PN.01.00/2018. Thank deliver to Erina for the waterfall map and discussion.

Reference

[1] Wang Y-J, Qin D-H. Influence of climate change and human activity on water resources in arid region of Northwest China: An overview. Advances in Climate Change Research. 2017; 8(4):268–78.

[2] Liu Y, Chen Y. Impact of population growth and land-use change on water resources and ecosystems of the arid Tarim River Basin in Western China. International Journal of Sustainable Development & World Ecology. 2006; 13(4):295–305.
[3] Ashton P, Patrick M, MacKay H, Weaver A. Integrating biodiversity concepts with good governance to support water resources management in South Africa. WSA. 2006; 31(4):449–56.
[4] Rees WE. Economic development and environmental protection: an ecological economics perspective. Environ Monit Assess. 2003; 86:29–45.
[5] Das D, Hussain I. Does ecotourism affect economic welfare? Evidence from Kaziranga National Park, India. Journal of Ecotourism. 2016; 15(3):241–60.
[6] Wang L, Zhong L, Zhang Y, Zhou B. Ecotourism environmental protection measures and their effects on protected areas in China. Sustainability. 2014; 6(10):6781–98.
[7] Tsaur S-H, Lin Y-C, Lin J-H. Evaluating ecotourism sustainability from the integrated perspective of resource, community and tourism. Tourism Management. 2006; 27(4):640–53.
[8] Lochner P, Weaver A, Gelderblom C, Peart R, Sandwith T, Fowkes S. Aligning the diverse: the development of a biodiversity conservation strategy for the Cape Floristic Region. Biological Conservation. 2003; 112(1–2):29–43.
[9] Young OR, Lambin EF, Alcock F, Haberl H, Karlsson SI, McConnell WJ, et al. A Portfolio approach to analyzing complex human-environment interactions: institutions and land change. Ecology and Society. 2006; 11(2).
[10] Çelik D. Determination of the most suitable ecotourism activities with the analytic hierarchy process: a case study of Balamba natural park, Turkey. Appl Ecol Env Res. 2018; 16(4):4329–55.
[11] Adigana M, Sih Setyono J. Ecotourism site suitability using GIS and AHP: A case study of Ngargoyoso District in Karanganyar Regency. KnE Engineering. 2019. Available from: https://knepublishing.com/index.php/KnE-Engineering/article/view/5839
[12] Suwarno, Sutomo, Aditam. The analysis of the landslide vulnerability sub watersheds Arus in Banyumas Regency. Geographia Technica. 2019; 14(2):112–9.
[13] Saaty TL. Decision making with the analytic hierarchy process. IJSSCI. 2008; 1(1):83.
[14] Berkes F. Rethinking community-based conservation. Conservation Biology. 2004; 18(3):621–30.
[15] García-Frapolli E, Toledo VM, Martinez-Alier J. Adaptations of a Yucatec Maya multiple-use ecological management strategy to ecotourism. Ecology and Society. 2008; 13(2).
[16] Isbell F, Gonzalez A, Loreau M, Cowles J, Díaz S, Hector A, et al. Linking the influence and dependence of people on biodiversity across scales. Nature. 2017; 546(7656):65–72.
[17] Sushchenko O, Prokopishyna O, Kozubova N. Eco-friendly behavior of local population, tourists and companies as a factor of sustainable tourism development. IJET. 2018; 7(4.3):514.
[18] Ristić D, Vukoičić D, Milinčić M. Tourism and sustainable development of rural settlements in protected areas - example NP Nopaonik (Serbia). Land Use Policy. 2019; 89:104231.
[19] Kimmel JR. Ecotourism as environmental learning. The Journal of Environmental Education. 1999; 30(2):40–4.
[20] Arlym L, Hermon D. Strategy of ecotourism development in Pariaman City. IOP Conf Ser: Earth Environ Sci. 2019; 314:012039.
[21] Tang Y. Research on optimizing public goods supply system of tourism destinations in Liaoning from the perspective of rural revitalization. In: Proceedings of the 2019 International Conference on Management Science and Industrial Economy (MSIE 2019). Guangzhou, China: Atlantis Press; 2020. Available from: https://www.atlantis-press.com/article/125933256
[22] Danish, Wang Z. Dynamic relationship between tourism, economic growth, and environmental quality. Journal of Sustainable Tourism. 2018; 26(11):1928–43.
[23] Rodrigues V, Estrany J, Ranzini M, de Cicco V, Martín-Benito JMT, Hedo J, et al. Effects of land use and seasonality on stream water quality in a small tropical catchment: The headwater of Córrego Água Limpa, São Paulo (Brazil). Science of The Total Environment. 2018; 622–623:1553–61.

[24] Pratt B, Chang H. Effects of land cover, topography, and built structure on seasonal water quality at multiple spatial scales. Journal of Hazardous Materials. 2012; 209–210:48–58.
[25] Lee J, Choi HO. Stakeholders' views on reducing financial support in government-led ecotourism areas. Ocean & Coastal Management. 2017; 144:7–15.
[26] Wight P. Sustainable ecotourism: balancing economic, environmental and social goals within an ethical framework. Tourism Recreation Research. 1995; 20(1):5–13.

Waterfall Exploration in Banyumas Regency Based on Ecotourism Environmental Protection (EEP) Approach for Water Conservation

ORIGINALITY REPORT

14%	10%	13%	10%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Universitas Andalas Student Paper	6%
2	W Budianta, A Ardiana. "Remediation of lead-contaminated soil from artisanal mining site using natural zeolite", IOP Conference Series: Earth and Environmental Science, 2020 Publication	2%
3	D Indiahono. "Shifting waste policy issues at the local level: a case study in Banyumas", IOP Conference Series: Earth and Environmental Science, 2021 Publication	1%
4	A A Nasihuddin, K Pamuji, Supriyanto, S Rosyadi, A A Ahmad. "The Role of Social Capital in Promoting Sustainable Rural Development Area in Banyumas Regency", IOP Conference Series: Earth and Environmental Science, 2020 Publication	1%

5	A Sudarmaji, S Sahirman, Saparso, Y Ramadhani. "Time based automatic system of drip and sprinkler irrigation for horticulture cultivation on coastal area", IOP Conference Series: Earth and Environmental Science, 2019 Publication	1 %
6	jglobal.jst.go.jp Internet Source	1 %
7	A Suresti, R Wati, A Agustar, A Hasan. "Importance Performance Analysis of Dairy Processing Cooperatives for Recommendations on Capacity Building for Small and Medium Enterprises and Cooperatives in the Regional Innovation System of Padang Panjang City, West Sumatra", IOP Conference Series: Earth and Environmental Science, 2021 Publication	1 %
8	Submitted to Aberystwyth University Student Paper	1 %
9	Somen Gope, Buddhadeb Bhattacharjee. "Signature of intermittency in hybrid UrQMD-hydro data at 10 AGeV Au$$+$$Au collisions", The European Physical Journal A, 2021 Publication	<1 %
10	repository.unhas.ac.id Internet Source	<1 %

11	iosrjournals.org Internet Source	<1%
12	Rokhmani, Darsono, Edy Riwidiharso. "Diversity of Trichodina spp. on The Larvae of Freshwater Fish in Banyumas and Surrounding Areas of Central Java", IOP Conference Series: Earth and Environmental Science, 2020 Publication	<1%
13	B Susilo, M B Hermanto, R Damayanti, A I A Putra. "The Application of a Data Acquisition System and Airflow Control System in an Air Dehumidified Drying Machine", IOP Conference Series: Earth and Environmental Science, 2021 Publication	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		

ICSAB 2020

CERTIFICATE OF ACHIEVEMENT

The Certificate is Presented to :

ARDIANSYAH

(as Presenter)

International Conference on Sustainable Agriculture and Biosystem (ICSAB) 2020

Theme : "Emerging New Trends In Sustainable Agriculture and Biosystem Practices"

Padang, 25 November 2020

Dean of Agricultural Technology Faculty
Andalas University

Dr. Ir. Feri Arlius, M.Sc
NIP. 196712251993021001

Chairman ICSAB 2020

Khandra Fahmy, S.TP., MP., Ph.D
NIP. 198104082008121002

INTERNATIONAL CONFERENCE ON SUSTAINABLE AGRICULTURE AND BIOSYSTEM 2020
Faculty of Agricultural Technology – Andalas University
Campus Limau Manis Padang, West Sumatra, Indonesia
Website: http://conference.fateta.unand.ac.id/icsab2020
Email: icsab@ae.unand.ac.id

Dear Afik Hardanto

We are pleased to inform you that the committee has decided that your abstract entitled '**Waterfall exploration in Banyumas regency based on ecotourism environmental protection (EEP) approach for water conservation**' presentation at the International Conference on Sustainable Agriculture and Biosystem 2020, which will be held in Padang, 25-26 November 2020. Congratulations!

Please prepare your full paper in Word Document (.doc) for necessary editing refers to author guidelines in our website: http:/icsab.fateta.unand.ac.id.

Please submit the full paper online before 31 October 2020, and pay registration fees for the conference (15 USD for Develop Countries/ 10 USD for Developing Countries/ 250,000 IDR for Indonesian/ 150,000 IDR for Indonesian Student

Should you need more information, please do not hesitate to contact us to this email addresses: icsab@ae.unand.ac.id

Thank you very much and looking forward to seeing you joint in online conference.

Your sincerelly

Khandra Fahmy, Ph.D
Conference Chairman

INTERNATIONAL CONFERENCE ON SUSTAINABLE AGRICULTURE AND BIOSYSTEM (ICSAB) 2020

Emerging New Trends in Sustainable Agricultural and Biosystem Practices

ICSAB 2020

Faculty of Agricultural Technology
ANDALAS UNIVERSITY
— Padang, Indonesia —

INTERNATIONAL CONFERENCE ON SUSTAINABLE AGRICULTURE AND BIOSYSTEM (ICSAB) 2020

"EMERGING NEW TRENDS IN SUSTAINABLE AGRICULTURAL AND BIOSYSTEM PRACTICES"

November 25, 2020

BOOK OF ABSTRACT

FACULTY OF AGRICULTURAL TECHNOLOGY
ANDALAS UNIVERSITY, PADANG, WEST SUMATERA
INDONESIA
2020

Parallel Room 5.2.

Topic : Land and Water Resources
Chairman : Dr Nur Maizatul Idayu

Time	Paper ID	Title
13.50-14.00	72	Potential Evapotranspiration Uses Thornthwaite Method To The Water Balance In Padang City
14.00-14.10	68	Developing and testing soil correlation matrix to assess the spatial variation of soil resource in Indonesia
14.10-14.20	64	Intermittent Irrigation Operation Management Model In Cihea Irrigation Area, Cianjur Regency
14.20-14.30	88	Improving volcanic soil chemistry after the eruption of Mt. Sinabung, North Sumatera in 2020
14.30-14.40	89	Chemical properties of volcanic soil after 10 years of the eruption of Mt. Sinabung (North Sumatera, Indonesia)
14.40-14.50	90	Waterfall exploration in Banyumas regency based on ecotourism environmental protection (EEP) approach for water conservation
14.50-15.00	107	Numerical model for quantifying the effect of soil erosion and sediment transport controls along a slope agricultural land
15.00-15.10	120	Organic Matter Sequestration under Coffee Plantation based on Slope and Crop Age in Sibarasok Maninjau, West Sumatra Indonesia
15.10-15.20	121	Role of Biochar and Manure on Soil Moisture Content of Ultisol and Growth of Garlic (Alium sativum L.)
15.20-15.30	65	Design Of Drip Irrigation For Cayenne Pepper Plants
15.30-15.40	127	Case Study: Knowledge and Safety Practices of Pesticides Among Farmers Around Lake Diatas of West Sumatera