JURNAL ILMU LINGKUNGAN
Volume 19 Issue 2 (2021) : 347-353 *ISSN 1829-8907*

Clustering Residents' Intention to Engage in Water Conservation Initiative: Evidence from the Upstream of West Java, Indonesia

Prasetyo Nugroho[1*], Apriliyanti Dwi Rahayu[3], Rany Juliani[2], Indarto[3], Alfian Dwi Cahyo[3], Nida Ankhoviyya[3], Edwin Gumilar[1], Denni Susanto[1], Adi Nugroho[1]

[1]Department of Bioresources Technology and Veterinary, Vocational College, Universitas Gadjah Mada.
[2]PT. Tirta Investama Plant Subang
[3]Yayasan Javlec Indonesia, Yogyakarta

ABSTRAK
Kawasan hulu daerah aliran sungai telah lama dianggap memainkan peran strategis dalam konservasi air pada lanskap yang kompleks dan dinamis. Sementara banyak studi telah meneliti pentingnya upaya konservasi air, studi yang berfokus pada pengelompokan niat penduduk untuk terlibat dalam inisiatif konservasi air di hulu daerah aliran sungai masih belum banyak dipelajari. Untuk memahami bagaimana warga mengelompok, kami mengklasifikasikan warga di dua desa (Cibeusi dan Sanca) berdasarkan pendapat mereka yang khas terhadap variabel *Theory of Planned Behavior* (TPB), yaitu sikap, norma subjektif, kontrol perilaku yang dipersepsikan, niat perilaku, dan perilaku terhadap inisiatif konservasi air. Secara total, 200 kuesioner yang dapat digunakan dalam analisis telah diambil. Hasil penelitian menemukan bahwa warga dapat dikelompokkan menjadi dua kluster yaitu "pendukung konservasi air" dan "pendukung pasif". Pendukung konservasi air dicirikan dengan kesepakatan yang tinggi pada semua variabel TPB, sedangkan pendukung pasif adalah sebaliknya. Temuan ini menegaskan bahwa persepsi masyarakat tidak homogen, tetapi merupakan kelompok individu yang memiliki pemikiran berbeda. Lebih lanjut, studi saat ini berimplikasi bahwa pengelola sumber daya air harus menyadari fakta bahwa masyarakat dapat dikelompokkan ke dalam kelompok yang berbeda berdasar pendapat dan kepentingannya masing-masing. Rancangan kebijakan, strategi, dan intervensi yang efektif harus dirancang sesuai dengan kelompok yang berbeda tersebut.

Kata kunci: Theory of planned behavior, konservasi air, kluster analisis, Subang

ABSTRACT
Upstream areas have long been considered to play strategic roles in the water conservation of complex and dynamic landscapes. While earlier studies have examined the importance of water conservation efforts, studies that focused on clustering residents' intention to engage in water conservation initiatives in the upstream areas remain understudied. To understand how residents are clustered, we classify residents in two villages (Cibeusi and Sanca) based on their distinctive opinions of the Theory of Planned Behavior (TPB) variables, i.e., attitudes, subjective norms, perceived behavioral control, behavioral intention, and behavior toward water conservation initiatives. In total, 200 usable questionnaires were retrieved. The study finds that residents are clustered into two clusters named *water conservation supporters* and *passive supporters*. Water conservation supporters are characterized by high agreement on all the TPB variables, while passive supporters are the opposite. These findings confirm that communities are not homogenous but constitute a distinctive group of like-minded individuals. Furthermore, the current study implies that water resource managers should be aware of the fact that residents are clustered into distinct groups with their own opinions and interests. The design of effective policies, strategies, and interventions must be arranged according to those different groups.

***Keywords*:** *Theory of planned behavior, water conservation, clustering analysis, Subang*

***Citation**:* Nugroho, P., Rahayu, A.D., Juliani, R., Indarto, I., Cahyo, A.D., Ankhoviyya, N., Gumilar, E., Susanto, D., Nugroho, A. (2021). Clustering Residents' Intention to Engage in Water Conservation Initiative: Evidence from the Upstream of West Java, Indonesia. *Jurnal ilmu Lingkungan*, 19(2),347-353, doi: 10.14710/jil.19.2.347-353

1. Introduction

Water availability and its conservation are among today's top global concerns (Křeček & Haigh, 2019; Li et al., 2021), and upstream areas play strategic roles in the water conservation of complex and dynamic landscapes (Booij et al., 2019; di Matteo et al., 2017; Křeček et al., 2021; Marhaento et al., 2018). Upstream areas consider playing a pivotal role in recharging groundwater (Irawan et al., 2009; Zheng et al., 2019), mitigating flood occurrences while maintaining river discharge persistence (Marhaento et al., 2018; Nugroho et al., 2013; Suryatmojo, 2015), and providing multiple ecosystem services for locals (e.g., Nugroho et al., 2020). Consequently, policymakers and resource

* Corresponding author: prasetyonugroho@ugm.ac.id

managers seek to manage upstream areas for the essential services they provide.

It is widely believed that managing biophysical properties is prominent in conserving water resources. For instance, existing literature has explained that biophysical changes (e.g., land cover, forest cover) will eventually lead to changes in water availability and quality (Marhaento et al., 2018; Nugroho et al., 2013; Suryatmojo, 2015). Although those earlier studies provide insights into managing water resources, there has been growing recognition that incorporating social dimension (e.g., residents' opinions) as the supplement of water conservation strategies is paramount (Floress et al., 2017; Koop et al., 2019; Kumar et al., 2020; Valizadeh et al., 2020; Yazdanpanah et al., 2016). This possibly because residents are salient stakeholders who are directly exposed to many effects of changes in their socio environment (Valizadeh et al., 2020). Accordingly, obtaining their opinions would be beneficial in evaluating and improving water conservation strategies. More importantly, understanding the psychological processes of water use in society would be useful to urge policy to generate more conservation behavior (Russell & Knoeri, 2020).

Residents reflect heterogeneous groups of individuals that may have different interests. Their interest in the specific issues might be varied based on their knowledge, attitude, norm, and their perceived behavioral control (Aprile & Fiorillo, 2017; Perren & Yang, 2015; Russell & Knoeri, 2020; Yazdanpanah et al., 2016). Moreover, residents' living circumstances may determine their attitudes and behavior, subsequently affect their intention to engage in the conservation programs (Valizadeh et al., 2020; Yazdanpanah et al., 2014; Zhang et al., 2019). For instance, experiencing water scarcity influences residents' attitudes to engage in conserving water intention (Yazdanpanah et al., 2014). They also emphasize that interwoven normative aspects (e.g., attitude, subjective norm, moral norm, and self-identity) significantly influence residents' intention and water conservation behavior. However, while understanding residents' diverse intentions may be complicated, identifying groups of residents by placing them into selected clusters is beneficial in producing a better understanding of the structure of the community's reactions toward specific issues (Fredline & Faulkner, 2000). More essentially, although studies on psychosocial and behavioral by clustering residents' opinions are ubiquitous, i.e., in tourism (del Chiappa et al., 2018; Roca et al., 2009) and aquaculture (Skallerud & Armbrecht, 2020), the study by using a cluster analysis approach in the context of resident intention to engage in water conservation initiatives in the upstream areas remains underexplored.

Using the case of two villages (i.e., Cibeusi and Sanca) located upstream of West Java, Indonesia, the current study attempts to assess the heterogeneity of resident intention to engage in water conservation initiatives. Hence, the purpose of this study is to classify residents in two villages based on their intention to engage in water conservation initiatives. The main objective of the cluster analysis is to segregate the different groups within the targeted sample to scrutinize their common features and subsequently divide them into meaningful groups (Andriotis & Vaughan, 2003; Sinclair-Maragh et al., 2015). We hypothesized that residents were clustered based on their distinctive attitudes, subjective norms, perceived behavioral control, behavioral intention, and behavior. The findings of this study will serve a better picture of the community's structure in the field, which eventually offers insights to improve strategies and policies that enable coping with water conservation issues in upstream areas. To explain that, our research uses the theory of planned behavior (TPB) (Ajzen, 1991) as the theoretical framework. TPB has been intensively studied in conservation studies (e.g., Perren & Yang, 2015; Russell & Knoeri, 2020; Yazdanpanah et al., 2014) and is widely used in research that focuses on psychosocial and behavioral studies.

2. Research methods

2.1. Study site

Cibeusi and Sanca villages are situated the upstream of Cipunagara basin (see Figure 1), and administratively located in Subang regency, West Java Province, Indonesia. Cibeusi cover 363 ha and inhibited by 2,864 people, while Sanca has 634 ha witha a total of 4,727 residents.

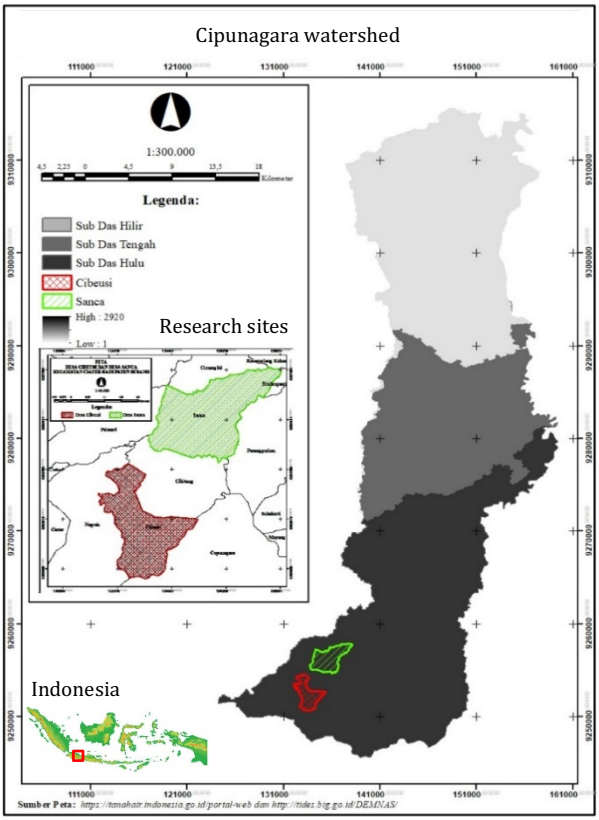

Figure 1 Research sites and map of Cipunagara watershed

Most of the residents are working in farming-related activities and laborers, while a small fraction of them works as entrepreneurs, staff, and government officers (Anonim, 2019).

Those two rural communities in the upstream area (i.e., Cibeusi and Sanca) were specifically selected for the research because they have long been received water conservation programs from the local government and private sectors. Over the years, residents of Cibeusi and Sanca have been trained to conduct various water conservation efforts such as establishing soil and water conservation techniques (e.g., terrace, biopore, infiltration-well, ditches) and community empowerment in managing the landscape.

2.2. Questionnaire design

A structured questionnaire was developed to investigate determinants of resident intention to engage in water conservation initiatives based on the TPB framework (Ajzen, 1991). Ajzen argued that people's behavior is a function of their behavioral intention. People's positive attitudes, strong perceived subjective norms, and high perceived behavioral control contribute to their intention to adopt the specific behavior (behavioral intention), and subsequently encourage them to take an action (behavior). Attitude toward behavior (ATB) represents the degree to which a person has positive or negative feelings about a particular behavior (Ajzen, 1991). It also requires a consideration of the expected outcomes of undertaking a behavior. Subjective norms (SN) are defined as the person's perception of how much people are engaged in and support for the behavior (Ajzen, 1991). Perceived behavioral control (PBC) indicates an individual's control over the behavior (Ajzen, 1991). It involves evaluation of how difficult or easy a particular behavior would be. Given these scenarios, the questionnaire consisted of two sections.

The first section consisted of five latent variables of the TPB framework (Ajzen, 1991). The five selected latent variables were adopted from the TPB framework. Totally, 17 measurement variables or question items were adopted and adapted from existing literature devoted to attitudes toward behavior (ATB), subjective norm (SN), perceived behavioral control (PBC), behavioral intention (BI), and behavior (B) (Ajzen, 2002; Chaudhary et al., 2017; Chien et al., 2012; Mihanyar et al., 2016; Warner, 2021; Warner et al., 2018; Yazdanpanah et al., 2014). Responses were on a five-point Likert scale, with 1 was "strongly disagree," and 5 was "strongly agree." The final part of the questionnaire inquired about the resident's sociodemographic profiles.

2.3. Sampling and survey procedures

Targeted villages and respondents were determined by using non-probability sampling with purposive sampling. This allowed us to select sampling based on the research purpose or specific issue, subjective judgment, and availability of the subject (Guo & Hussey, 2004). This method is also worthwhile to test the theoretical frameworks and locate the phenomena of a broader population (Etikan et al., 2016; Rivera, 2019). To satisfy the study objectives, targeted villages should be located at the upstream area, involved in water conservation programs, and accessible. A series of field observations and discussions with project managers were conducted to obtain the data and candidates of the sampling village. Finally, the two villages, i.e., Cibeusi and Sanca, were selected as survey sites. Data were collected in October 2020.

The questionnaires were administered face-to-face to obtain a high response rate (Heerwegh & Loosveldt, 2008). Three interviewers were trained to intercept respondents, perform interviews, and administer the questionnaire. Limited resources (i.e., time and finances) were considered the constraints in targeting the respondents. Given these circumstances, a convenience sampling method was employed to assign targeted respondents based on their availability, accessibility, and willingness to engage in the survey. Only residents aged 18 or over were inquired to participate in the survey. The intercepted residents were asked their willingness to take part in the survey. Once intercepted resident agreed, they were asked to complete the question items on site.

2.4. Data analysis

First, data screening was conducted to ensure suitability and applicability prior to the cluster analysis. Completed questionnaires were used for subsequent analyses. *Next*, Cronbach's alpha (α) coefficient was used to examine internal consistency, that is, how closely related a set of question items are as a group under designated latent variable (Adamson & Prion, 2013; Cortina, 1993). The α coefficient > 0.6 demonstrating a high level of reliability (Hair et al., 1998), and the average value of the question items of the latent construct was used in clustering analysis. *Third*, a non-hierarchical clustering analysis (i.e., k-means) was employed to generate the clusters. This was used to classify the residents' opinions according to the factors derived from the TPB framework. The K-means method allows users to determine the optimum number of central clusters (k). In this study, we used the silhouette method to obtain the optimum number of k. This procedure seeks for k-centers within the predetermined data set that minimizes the total sum of the squared distances between each sample and its nearest center. Once the optimum number of clusters was determined, the k-means analysis was run. Identified clusters generated by the k-means analysis were then validated by using an independent sample t-test. T-test was employed to compare the different groups by examining the statistically significant difference between them. Ultimately, descriptive statistics by using cross-tabulation were used to outline respondent demographic characteristics. Indeed, scholars used this method to demonstrate the

cluster to the demographic profiles of its members (e.g., Andriotis & Vaughan, 2003; Sinclair-Maragh et al., 2015). Descriptive statistics and k-means clustering analysis were performed in this study by using the stats and ggplot2 packages in R Studio ver 1.1.463 (RStudio Team, 2015).

3. Result and discussion

3.1. Respondent profiles

In total, 200 usable questionnaires were retrieved. Table 1 shows respondents' demographic profiles. The majority of the respondents were male (64.5%), and most of them were between 20 – 50 years old (75%). Of the respondents, 4% were illiterate, 81.5% had completed primary and secondary education (i.e., elementary, junior, and high school), and 14.5% of them had enrolled in university. Finally, 55.5% of the respondents had earned personal monthly income of < IDR 1,000,000 (US$69.54), and only 14% of > IDR 2,500,000 (US$173.8) (1 US$ =14,380.2 IDR as of March 12, 2021).

Table 1. Respondents' demographic profiles

Characteristics	Frequency	Percentage (%)
Gender		
Male	129	64.5
Female	71	35.5
Age (years)		
≤ 20	12	6.0
> 20 - ≤30	47	23.5
> 30 - ≤40	57	28.5
> 40 - ≤50	46	23.0
> 50 - ≤60	26	13.0
> 60	12	6.0
Formal education attainment		
No formal education	8	4.0
Elementary school	42	21.0
Junior high school	54	27.0
High school	67	33.5
University	29	14.5
Personal monthly income (IDR)		
< 1,000,000	110	55.0
≥1,000,000 – 2,500,000	62	31.0
≥2,500,000 – 4,000,000	22	11.0
>4,000,000	6	3.0

3.2. Cluster analysis

Table 2 describes the overall value of the latent variables of the study. The standard deviation (SD) of attitude toward behavior (ATB), subjective norm (SN), perceived behavioral control (PBC), behavioral intention (BI), and behavior (B) were 4.5, 3.76, 3.73, 3.88, and 3.9, respectively. Likewise, Cronbach's alpha value for attitude toward behavior, subjective norm, perceived behavioral control, and behavioral intention was 0.79, 0.87, 0.79, and 0.73, respectively. These values indicated a high level of reliability (Cortina, 1993; Hair et al., 1998). Therefore, the average values of question items under the latent variables were used in the cluster analysis.

In the current study, a non-hierarchical analysis by using the k-means method was utilized to finalize by using a priori optimum number of clusters examined by the silhouette method. Figure 2 illustrates that the optimum number of clusters was two clusters. Accordingly, from the non-hierarchical procedure using 200 observations, two clusters were derived. Figure 3 demonstrates the cluster plot for resident intention to engage in water conservation initiatives based on the TPB framework. Cluster 2 (N=143), being the largest members, represented 71.5% of the respondents. However, Cluster 1 (N=57) represented 28.5% of the respondents. Table 4 shows that all the five latent variables employed for cluster validation were statistically significant. This result testified that there were statistical differences between the two generated clusters in the study. The generated clusters were eventually named corresponding to their agreement toward question items to delineate the cluster's identities distinctively.

Cross-tabulation was utilized to identify the demographic profiles of the cluster members based on their gender, age, formal educational attainment, and personal monthly income. Table 3 shows the demographic profiles of the respondents. Our findings indicated that most of the respondents in Cluster 1 were male, between 20 and 40 years old, attained high school education, and earned less than IDR 1.000.000 per month. Additionally, Cluster 2 was dominated by male, between 30 and 40 years old, had graduated from junior and high school, earned less than IDR 1.000.000 per month.

Table 2 Overall value of latent variables of the questionnaire

Latent variables	Overall value		
	Avg	SD	Cronbach's alpha
Attitude toward behavior (*n=5*)	4.25	0.60	0.79
Subjective norm (*n=3*)	3.76	0.65	0.87
Perceived behavioral control (*n=4*)	3.73	0.69	0.79
Behavioral intention (*n=4*)	3.88	0.58	0.73
Behavior (*n=1*)	3.89	0.67	

Avg=average, SD=standard deviation, n= number of questions

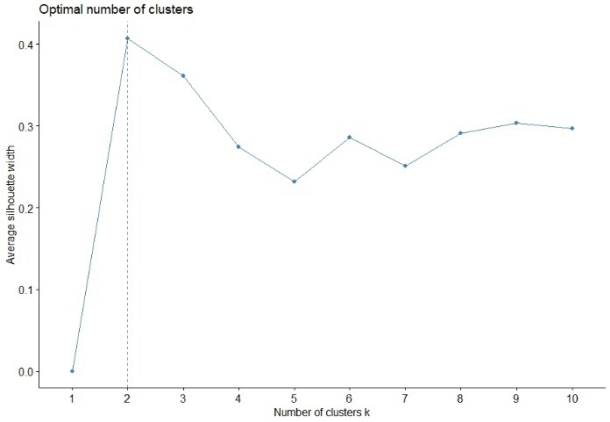

Figure 2 Optimal number of clusters

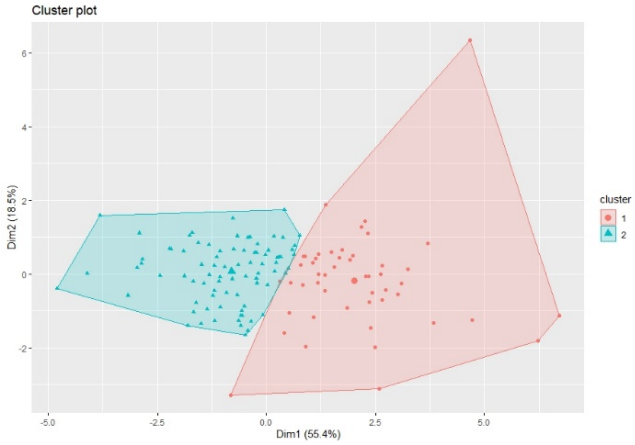

Figure 3 Cluster plot for resident intention to engage in water conservation initiatives based on TPB framework.

Table 4 demonstrates clustering variable profiles on water intention to engage in water conservation initiatives. As indicated in Table 4, Cluster 2 members hold high agreement in all the given latent variables of the TPB framework. They have higher agreement about the importance of engaging in water conservation initiatives in their village. This may be because they believed that water conservation efforts were the wise initiatives, important, beneficial, and essential to prevent water scarcity in the future. In addition, they strongly believed that their decision to engage in water conservation initiatives was supported by their surrounding people. Our findings were corroborated by earlier studies that have indeed been emphasized that residents' attitudes were a strong determinant of their intention to engage in the water conservation efforts (Russell & Knoeri, 2020; Yazdanpanah et al., 2014). Attitudes directly, positively, significantly influenced residents' behavioral intention and support for water conservation activities (Perren & Yang, 2015; Yazdanpanah et al., 2014). Similarly, earlier studies argued that those who feel a personal responsibility to conserve water might be more likely to practice water conservation by themselves (Chaudhary et al., 2017; Floress et al., 2017). Given those circumstances, Cluster 2 was eventually labeled as "*water conservation supporters*." Nevertheless, respondents' agreement toward PBC was the lowest variable compared to other latent variables in Cluster 2. As the TPB tenets, the PBC reflects an individual's control over the behavior (Ajzen, 1991). In other words, this may also reflect personal barriers to executing particular behavior (Perren & Yang, 2015). Given those circumstances, members of Cluster 2 may have limitations, as well as difficulties, to conduct water conservation efforts by themselves. This might be the reason why community assistance on water conservation in those two villages remain the priority for government and private sectors. Furthermore, Perren & Yang (2015) indicated that providing sufficient information and meaningful intervention may help remove barriers to water conservation practices in the community.

Table 3 Demographic profiles (*N = 200*)

Characteristics	Cluster 1 (*N=57*)		Cluster 2 (*N=143*)	
	Freq	%	Freq	%
Gender				
Male	33	57.89	96	67.13
Female	24	42.11	47	32.87
Age (years)				
≤ 20	9	15.79	3	2.10
> 20 - ≤30	15	26.32	32	22.38
> 30 - ≤40	12	21.05	45	31.47
> 40 - ≤50	14	24.56	32	22.38
> 50 - ≤60	4	7.02	22	15.38
> 60	3	5.26	9	6.29
Formal education attainment				
No formal education	3	5.26	5	3.50
Elementary school	13	22.81	29	20.28
Junior high school	9	15.79	45	31.47
High school	25	43.86	42	29.37
University	7	12.28	22	15.38
Personal monthly income (IDR)				
< 1,000,000	38	66.67	72	50.35
>1,000,000 – ≤2,000,000,-	13	22.81	38	26.57
>2,000,000 – ≤3,000,000,-	2	3.51	22	15.38
>3,000,000 – ≤4,000,000,-	3	5.26	6	4.20
> 4.000.000,-	1	1.75	5	3.50

N= number of members

Table 4 Clustering variable profiles on water intention to engage in water conservation initiatives.

Latent variables	Cluster center		t-value	*p-value*	sig
	C-1	C-2			
ATB	4.02	4.34	-4.87	0.000	***
SN	3.16	3.99	-11.925	0.000	***
PBC	3.16	3.95	-13.062	0.000	***
BI	3.51	4.03	-9.59	0.000	***
Behavior	3.26	4.13	-7.47	0.000	***

*ATB=Attitude toward behavior, SN= Subjective norms, BI= Behavioral Intention, PBC= Perceived behavioral control, C-1 = Cluster 1, C-2= Cluster 2. ***p<0.001*

Cluster 1 is primarily characterized by those who hold low agreement in their subjective norms, perceived behavioral control, intention, and behavior of water conservation initiatives. Notwithstanding, they agreed that water conservation initiatives were notable and beneficial to prevent water scarcity issues. In addition, the high agreement on attitudes toward water conservation initiatives may indicate their awareness

of the importance of water conservation practices. Therefore, this cluster was subsequently named "*passive supporters*" to reflect their opinions toward water conservation initiatives.

4.Conclusion and implications

This study concludes that residents in Cibeusi and Sanca villages are clustered into two clusters, namely *water conservation supporters* and *passive supporters.* This work provides empirical findings that residents hold distinctive attitudes, subjective norms, perceived behavioral control, behavioral intention, and behavior on water conservation initiatives in their villages. Accordingly, the study contributes to the knowledge of psychosocial and behavioral studies based on the TPB framework, particularly in testifying that communities are not homogenous but constitutes a distinctive group of like-minded individuals.

However, although empirically proven, the study has practical implications for water resources managers. While noticeable, it is substantial to note that water resource managers should be aware of the fact that residents are clustered into distinct groups with their own opinions and interests. Accordingly, managers should be considered that there is no "*one-size-fits-all*" in implementing water conservation strategies. The design of effective policies, strategies, and interventions must be designed according to those different groups.

DAFTAR PUSTAKA

Adamson, K. A., & Prion, S. (2013). Reliability: Measuring Internal Consistency Using Cronbach's α. *Clinical Simulation in Nursing*, *9*(5). https://doi.org/10.1016/j.ecns.2012.12.001

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211.

Ajzen, I. (2002). *Constructing a TPB Questionnaire: Conceptual and Methodological Considerations.* https://people.umass.edu/aizen/pdf/tpb.measurement.pdf

Andriotis, K., & Vaughan, R. D. (2003). Urban Residents' Attitudes toward Tourism Development: The Case of Crete. *Journal of Travel Research*, *42*(2), 172–185. https://doi.org/10.1177/0047287503257488

Anonim. (2019). *Kecamatan Ciater Dalam Angka 2019*. https://subangkab.bps.go.id/publication/2019/09/26/f53a8ac114b8ab97149b2f2c/kecamatan-ciater-dalam-angka-2019

Aprile, M. C., & Fiorillo, D. (2017). Water conservation behavior and environmental concerns: Evidence from a representative sample of Italian individuals. *Journal of Cleaner Production*, *159*, 119–129. https://doi.org/10.1016/j.jclepro.2017.05.036

Booij, M. J., Schipper, T. C., & Marhaento, H. (2019). Attributing changes in streamflow to land use and climate change for 472 catchments in australia and the United States. *Water (Switzerland)*, *11*(5). https://doi.org/10.3390/w11051059

Chaudhary, A. K., Warner, L., Lamm, A., Israel, G., Rumble, J., & Cantrell, R. (2017). Using the Theory of Planned Behavior to Encourage Water Conservation among Extension Clients. *Journal of Agricultural Education*, *58*(3), 185–202. https://doi.org/10.5032/jae.2017.03185

Chien, G. C. L., Yen, I. Y., & Hoang, P. Q. (2012). Combination of Theory of Planned Behavior and Motivation: An Exploratory Study of Potential Beach-based Resorts in Vietnam. *Asia Pacific Journal of Tourism Research*, *17*(5), 489–508. https://doi.org/10.1080/10941665.2011.627352

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, *78*(1), 98–104. https://doi.org/10.1037/0021-9010.78.1.98

del Chiappa, G., Lorenzo-Romero, C., & Gallarza, M. (2018). Host community perceptions of cruise tourism in a homeport: A cluster analysis. *Journal of Destination Marketing and Management*, *7*(June 2015), 170–181. https://doi.org/10.1016/j.jdmm.2016.08.011

di Matteo, L., Dragoni, W., Piacentini, S. M., & Maccari, D. (2017). Climate change, water supply and environmental problems of headwaters: The paradigmatic case of the Tiber, Savio and Marecchia rivers (Central Italy). *Science of the Total Environment*, *598*, 733–748. https://doi.org/10.1016/j.scitotenv.2017.04.153

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1), 1. https://doi.org/10.11648/j.ajtas.20160501.11

Floress, K., García de Jalón, S., Church, S. P., Babin, N., Ulrich-Schad, J. D., & Prokopy, L. S. (2017). Toward a theory of farmer conservation attitudes: Dual interests and willingness to take action to protect water quality. *Journal of Environmental Psychology*, *53*, 73–80. https://doi.org/10.1016/j.jenvp.2017.06.009

Fredline, E., & Faulkner, B. (2000). Host community reactions: A cluster analysis. *Annals of Tourism Research*, *27*(3), 763–784. https://doi.org/10.1016/S0160-7383(99)00103-6

Guo, S., & Hussey, D. L. (2004). Nonprobability Sampling in Social Work Research. *Journal of Social Service Research*, *30*(3), 1–18. https://doi.org/10.1300/J079v30n03_01

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis with readings (5nd ed.). In *Prentice-Hall, Upper Saddle River*.

Heerwegh, D., & Loosveldt, G. (2008). Face-to-Face versus Web Surveying in a High-Internet-Coverage Population: Differences in Response Quality. *Public Opinion Quarterly*, *72*(5), 836–846. https://doi.org/https://doi.org/10.1093/poq/nfn045

Irawan, D. E., Puradimaja, D. J., Notosiswoyo, S., & Soemintadiredja, P. (2009). Hydrogeochemistry of volcanic hydrogeology based on cluster analysis of Mount Ciremai, West Java, Indonesia. *Journal of Hydrology*, *376*(1–2), 221–234. https://doi.org/10.1016/j.jhydrol.2009.07.033

Koop, S. H. A., van Dorssen, A. J., & Brouwer, S. (2019). Enhancing domestic water conservation behaviour: A

review of empirical studies on influencing tactics. In *Journal of Environmental Management* (Vol. 247, pp. 867–876). Academic Press. https://doi.org/10.1016/j.jenvman.2019.06.126

Křeček, J., & Haigh, M. (2019). Land use policy in headwater catchments. *Land Use Policy*, *80*, 410–414. https://doi.org/10.1016/j.landusepol.2018.03.043

Křeček, J., Nováková, J., Palán, L., Pažourková, E., & Stuchlík, E. (2021). Role of forests in headwater control with changing environment and society. *International Soil and Water Conservation Research*, *9*(1), 143–157. https://doi.org/10.1016/j.iswcr.2020.11.002

Kumar, P., Avtar, R., Dasgupta, R., Johnson, B. A., Mukherjee, A., Ahsan, Md. N., Nguyen, D. C. H., Nguyen, H. Q., Shaw, R., & Mishra, B. K. (2020). Socio-hydrology: A key approach for adaptation to water scarcity and achieving human well-being in large riverine islands. *Progress in Disaster Science*, *8*, 100134. https://doi.org/10.1016/j.pdisas.2020.100134

Li, M., Peng, C., Zhang, K., Xu, L., Wang, J., Yang, Y., Li, P., Liu, Z., & He, N. (2021). Headwater stream ecosystem: an important source of greenhouse gases to the atmosphere. *Water Research*, *190*. https://doi.org/10.1016/j.watres.2020.116738

Marhaento, H., Booij, M. J., & Hoekstra, A. Y. (2018). Hydrological response to future land-use change and climate change in a tropical catchment. *Hydrological Sciences Journal*, *63*(9), 1368–1385. https://doi.org/10.1080/02626667.2018.1511054

Mihanyar, P., Rahman, S. A., & Aminudin, N. (2016). Investigating the Effect of National Park Sustainability on National Park Behavioral Intention: Kinabalu National Park. *Procedia Economics and Finance*, *37*, 284–291. https://doi.org/10.1016/s2212-5671(16)30126-5

Nugroho, P., Marsono, D., Sudira, P., & Suryatmojo, H. (2013). Impact of Land-use Changes on Water Balance. *Procedia Environmental Sciences*, *17*, 256–262. https://doi.org/10.1016/j.proenv.2013.02.036

Nugroho, P., Numata, S., & Abdi Aprilianto, N. (2020). Perceived Forest-based Ecosystem Services and Attitudes Toward Forest Rehabilitation: A Case Study in the Upstream of Central Java, Indonesia. *Jurnal Ilmu Kehutanan*, *14*(2), 185–197. https://jurnal.ugm.ac.id/jikkt

Perren, K., & Yang, L. (2015). Psychosocial and behavioural factors associated with intention to save water around the home: A Greek case study. *Procedia Engineering*, *119*(1), 1447–1454. https://doi.org/10.1016/j.proeng.2015.08.1005

Rivera, J. D. (2019). When attaining the best sample is out of reach: Nonprobability alternatives when engaging in public administration research. *Journal of Public Affairs Education*, *25*(3), 314–342. https://doi.org/10.1080/15236803.2018.1429821

Roca, E., Villares, M., & Ortego, M. I. (2009). Assessing public perceptions on beach quality according to beach users' profile: A case study in the Costa Brava (Spain). *Tourism Management*, *30*(4), 598–607. https://doi.org/10.1016/j.tourman.2008.10.015

RStudio Team, -. (2015). RStudio: Integrated Development for R. *[Online] RStudio, Inc., Boston, MA URL Http://Www. Rstudio. Com*. https://doi.org/10.1007/978-81-322-2340-5

Russell, S. v., & Knoeri, C. (2020). Exploring the psychosocial and behavioural determinants of household water conservation and intention. *International Journal of Water Resources Development*, *36*(6), 940–955. https://doi.org/10.1080/07900627.2019.1638230

Sinclair-Maragh, G., Gursoy, D., & Vieregge, M. (2015). Residents' perceptions toward tourism development: A factor-cluster approach. *Journal of Destination Marketing and Management*, *4*(1), 36–45. https://doi.org/10.1016/j.jdmm.2014.10.001

Skallerud, K., & Armbrecht, J. (2020). A segmentation of residents' attitudes towards mariculture development in Sweden. *Aquaculture*, *521*. https://doi.org/10.1016/j.aquaculture.2020.735040

Suryatmojo, H. (2015). Rainfall-runoff Investigation of Pine Forest Plantation in the Upstream Area of Gajah Mungkur Reservoir. *Procedia Environmental Sciences*, *28*(SustaiN 2014), 307–314. https://doi.org/10.1016/j.proenv.2015.07.039

Valizadeh, N., Bijani, M., Karimi, H., Naeimi, A., Hayati, D., & Azadi, H. (2020). The effects of farmers' place attachment and identity on water conservation moral norms and intention. *Water Research*, *185*. https://doi.org/10.1016/j.watres.2020.116131

Warner, L. A. (2021). Who conserves and who approves? Predicting water conservation intentions in urban landscapes with referent groups beyond the traditional 'important others.' *Urban Forestry & Urban Greening*, *60*, 127070. https://doi.org/10.1016/j.ufug.2021.127070

Warner, L. A., Lamm, A. J., & Kumar Chaudhary, A. (2018). Florida residents' perceived role in protecting water quantity and quality through landscape practices. *Landscape and Urban Planning*, *171*, 1–6. https://doi.org/10.1016/j.landurbplan.2017.11.007

Yazdanpanah, M., Forouzani, M., Abdeshahi, A., & Jafari, A. (2016). Investigating the effect of moral norm and self-identity on the intention toward water conservation among Iranian young adults. *Water Policy*, *18*(1), 73–90. https://doi.org/10.2166/wp.2015.031

Yazdanpanah, M., Hayati, D., Hochrainer-Stigler, S., & Zamani, G. H. (2014). Understanding farmers' intention and behavior regarding water conservation in the Middle-East and North Africa: A case study in Iran. *Journal of Environmental Management*, *135*, 63–72. https://doi.org/10.1016/j.jenvman.2014.01.016

Zhang, B., Fu, Z., Wang, J., & Zhang, L. (2019). Farmers' adoption of water-saving irrigation technology alleviates water scarcity in metropolis suburbs: A case study of Beijing, China. *Agricultural Water Management*, *212*, 349–357. https://doi.org/10.1016/j.agwat.2018.09.021

Zheng, W., Wang, S., Sprenger, M., Liu, B., & Cao, J. (2019). Response of soil water movement and groundwater recharge to extreme precipitation in a headwater catchment in the North China Plain. *Journal of Hydrology*, *576*, 466–477. https://doi.org/10.1016/j.jhydrol.2019.06.071