Journal for Nature Conservation 73 (2023) 126411

Contents lists available at ScienceDirect

Journal for Nature Conservation

journal homepage: www.elsevier.com/locate/jnc

Wetland restoration challenges and eco-volunteerism

Adams Osman [a,*], Isaac Boateng [b], Kow Ansah-Mensah [a], Alex Barimah Owusu [c]

[a] Department of Geography Education, Faculty of Social Sciences Education, University of Education, Winneba, Ghana
[b] Department of Construction, Akenten Appiah-Menkah University of Skills Training and Entrepreneurial Development, Kumasi, Ghana
[c] Department of Geography and Resource Development, Faculty of Social Sciences, University of Ghana, Legon, Ghana

ARTICLE INFO

Keywords:
Eco-volunteerism
Challenges
Eco-restoration
Expectancy theory
Muni-Pomadze
Wetland

ABSTRACT

Depending on planned behaviour theory most studies have assumed a direct effect between socio-demographics and biophilia attitudes on eco-volunteerism without considering prior eco-restoration challenges. Using the expectancy motivation theory, this study assessed the challenges eco-volunteers faced during an eco-restoration exercise within the Muni-Pomadze Ramsar Site (Ghana) and its effects on future eco-volunteerism. The study collected data from eco-volunteers and analysed it using a paired-sampled *t*-test and generalised linear modelling. Per the results, eco-volunteers face challenges including transportation difficulties, limited refreshment, inadequate equipment, and interpersonal conflict with other eco-volunteers. Ecological reasons superseded social reasons as a motivating factor for eco-volunteerism. Expectancy motivation theory influence of valence played out when the combined effect of transportation difficulties, limited refreshment, inadequate equipment, and interpersonal conflicts on social reasons negatively affected future eco-volunteerism. The study recommends that organisers of eco-restoration exercises should be more sensitive to the needs of eco-volunteers and address these challenges to help encourage future eco-volunteerism.

1. Introduction

Over 50–87% of the world's wetland habitats have been destroyed by changing land uses (agricultural, residential, commercial, recreational, and industrial) and climate change (Li et al., 2018; Davidson, 2014). This has weakened the provisioning [fish and crab food, water supply], regulating [carbon sequestration, flood control, groundwater recharge], supporting [beach protection, mangrove development, bird habitats, fish spawning] and cultural [tourist, education] services of wetlands (Jamion et al., 2022; Oja et al., 2021; Robertson et al., 2019). Current rates of wetland loss and impacts necessitate assistance for wetlands via restoration services to rejuvenate, stimulate, and promote regrowth. Wetland restoration has favourable effects on biodiversity enclaves, carbon sequestration, pollination, food production, water purification, soil stabilisation, landscape aesthetics, and recreation opportunities (Mould et al., 2020). However, budgetary restrictions, limited ecologists/foresters, knowledge, and commitments affect significantly eco-restoration activities (Canning et al., 2021; Grant & Langer, 2021). Eco-volunteers (persons who dedicate their time and resources to the protection/conservation of nature) provide free services, a considerable degree of money, time, commitment, and skills to supplement the efforts of ecologists and foresters (Osman et al., 2022; Kim et al., 2021; Rahman & Abdul Rahman, 2021).

Actions of eco-volunteers include planting, trimming, watering, dredging and species monitoring. Others include warding off encroachers, coordinating activities, outreach, fundraising, and providing education and awareness creation (Jacobsen et al., 2019; Pérez et al., 2019). Following a tree-planting exercise, soil organic carbon levels increased by 20%, soil permeability by 27%, and plant-available phosphorus decreased by 23% in Wairarapa Moana Wetland [New Zealand] (Tomscha et al., 2021). Benson et al. (2018) discovered that after a private–public sector restoration effort [creating ponded areas, berms, and ditch-plugging] four new fish species [Pumpkinseed (Lepomis gibbosus), Brook Stickleback (Culaea inconstans), Central Mudminnow (Umbra limi), and Fathead Minnow (Pimephales promelas)] emerged at St. Lawrence Valley Wetlands. Night patrols and monitoring by eco-volunteers along the beaches of Tortuguero [Costa Rica] in 2012 stimulated turtle hatching success by 73.5% (Prieto et al., 2013). Beyond the ecological reasons, eco-volunteerism promotes a sense of accomplishment, learning and acquiring new skills. Eco-volunteerism fosters community spirit by encouraging collaboration and cooperation (Wong, Lim, & Bidin, 2020). Also, it helps people reconnect with nature and/or

* Corresponding author.
E-mail address: aosman@uew.edu.gh (A. Osman).

https://doi.org/10.1016/j.jnc.2023.126411
Received 8 November 2022; Received in revised form 17 February 2023; Accepted 19 April 2023
Available online 25 April 2023

find spiritual fulfilment (Clewell & Aronson, 2013), improves mental health, tranquillity, expressiveness, reduce stress and mental tiredness (O'Brien et al., 2010). In the end, some eco-volunteers find new homes and new families outside their native communities and countries.

General factors known to influence eco-volunteerism are economic growth, pandemics, social demographic backgrounds, ecological and socio-psychological motivations (Patrick et al., 2022; Damian, 2019; Pereira et al., 2019). But in providing unselfish services to the environment, eco-volunteers face the challenge of availability of time for eco-restoration operations and limited managerial skills (McAteer & Flannery, 2022; Yee et al., 2021; Vanson et al., 2019). Furthermore, the cost of transportation, the distance travelled, and the opportunity costs of paid occupations all impact eco-volunteers (Yee et al., 2021; Mould et al., 2020).Tensions and conflict among eco-volunteers can undermine the social and psychological advantages of eco-volunteering. Also, eco-volunteers are discouraged by less involvement in restoration project planning (Hustinx, 2010). Concerns of "community capture" and local political dynamics limit eco-volunteers' interest and retention (Mould et al., 2020).

It is critical to understand the challenges eco-volunteers face in this era of rapid ecological degradation and difficulties in volunteer recruitment and retention (Canning et al., 2021; Grant & Langer, 2021; Shinbrot et al., 2021). This study sought to assess the effects of the challenges experienced by eco-volunteers on their future eco-volunteerism at the Muni Pomadze Ramsar Site in Ghana. The specific aims of the study were:

i. *Assess the factors which motivated participation in the eco-restoration exercise of the Muni-Podmaze Ramsar Site.*
ii. *Explore the challenges eco-volunteers experienced during the eco-restoration exercise of the Muni-Podmaze Ramsar Site.*
iii. *Assess the effect of the challenges experienced by eco-volunteers at the Muni-Podmaze Ramsar Site on their future eco-volunteerism.*

The significance of this study was to appreciate the challenges experienced by eco-volunteers, and to motivate them, boost their interest, and urge them to maintain their volunteer spirit. In addition, the knowledge about eco-volunteer challenges can help organisers of eco-restoration exercises to improve volunteers' experiences and provide the necessary support.

2. Literature

2.1. Vroom's expectancy theory of motivation

Most academics explain volunteerism using planned behaviour theory, which states that behaviour is preceded by intentions, which are impacted by attitudes, subjective norms, and perceived behavioural control (Zboja et al., 2020). The omission of the reward and cost components of motivation, which are central to Vrooms' expectancy theory of motivation, is a drawback of planned behaviour theory (Zboja et al., 2020). Expectancy motivation theory explains that the individual evaluates choices and makes decisions based on the choice with the most desirable personal outcome to optimise pleasure and minimise pain. Thus volunteers believe their effort leads to performance [expectancy], with performance leading to rewards [instrumentality] and the rewards outweigh the associated cost of volunteering [valence] (Purvis et al., 2015). The advantages of expectancy motivation theory are that it prioritises individual interest, emphasises rewards, and maximises pleasure with the least amount of discomfort (Barba-Sánchez & Atienza-Sahuquillo, 2017; Parijat & Bagga, 2014). While its limitation is individual differences in the assignment of reward and cost; reward is not always correlated with effort but other parameters such as position, responsibility, institutional structure and time (Wilson & Gilbert, 2005). Lastly, there is a challenge with explicitness in defining the interactions between expectancy, instrumentality, and valence (Kiatkawsin & Han, 2017). The traditional models focus on motivation influencing expectancy, instrumentality and valence while the causal chain model treats valence influencing instrumentality, expectancy and motivation (Zboja et al., 2020).

2.2. Reasons and benefits of eco-volunteerism

Eco-volunteerism is the dedication of time, resources and actions/behaviour to protect and conserve nature (Pon et al., 2022; Wong, Lim, & Bidin, 2020). Eco-volunteerism involves practical activities such as tree planting, species conservation, policing, activism, and campaigns, and education. Diverse reasons influence eco-volunteerism ranging from individual to communal, ecological to social, direct and indirect. Ecological reasons for volunteerism are to preserve endangered species or habitats (Carballo-Cárdenas & Tobi, 2016; Solinas et al., 2008) and promote the resilience of ecosystems to disasters (Shaw, 2006). Also, it restores a damaged and unresponsive landscape to its "original" state with enhanced ecosystem services (Pon et al., 2022; Liu et al., 2021; Battaglia et al., 2014). Social benefits include an avenue for eco-volunteers to learn about nature, share knowledge, techniques and learn new skills from other participants. It builds a community spirit by promoting collaboration and cooperation between participants, improving social networks, and strengthening oneness (Wong, Lim, & Bidin, 2020). It helps improve mental health as participants feel more satisfied, calm, expressive, experience less stress and mental fatigue, improve alertness, and fitness (DiEnno & Thompson, 2013; O'Brien et al., 2010). Eco-volunteerism offers time for leisure, improves social standings with social rewards (Wong, Lim, & Bidin, 2020; Stebbins, 2013). For institutions (universities, sports clubs, political clubs, and cultural organisations), organised volunteer programmes are ways to project a positive eco-friendly image (Rahman & Abdul Rahman, 2021).

2.3. Challenges of eco-volunteerism

Participants of eco-restoration activities encounter off-site and onsite constraints that can affect future participation and project outcome. The cost of transportation, distance of travel, and opportunity costs tend to discourage volunteerism (Yee et al., 2021; Mould et al., 2020). The top-down management approach adopted by most organisers of eco-restoration demotivates volunteers because it limits eco-volunteers contribution and importance (Mould et al., 2020; Bremer et al. 2018; Hustinx, 2010). Additionally, eco-volunteers lament over the inadequate support systems in the provision of free services (Mould et al., 2020). Sometimes behaviour and actions of other volunteers may affect volunteer satisfaction, commitment, and retention (Grube & Piliavin, 2000). Furthermore, access routes to eco-restoration areas are often poor and overgrown with vegetation limiting access (Gordon et al., 2000). While individually people shy away from the organised community and government activities because of local political dynamics (Mould et al., 2020).

3. Methods

3.1. Study area

Muni-Pomadze wetland is located within the bounding coordinates 5^0 27′ 5′'N and 0^0 36′ 32′'to the Northeast and 5^0 19′ 4′'N and 0^0 43′ 2′'W to the Southwest. (Fig. 1). Its spatial extent is about 9500 ha extending from the coast [Effutu-Winneba-Central Region of Ghana] to about 15 km inland [Gomoa-Pomadze] (Attuquayefio & Ryan, 2006; Gordon et al., 2000).

Muni-Pomadze gained international recognition through its designation as a Ramsar Site in 1992 under the Global Environment Facility and the Ghana Coastal Wetlands Management Project (CWMP) to help preserve the wetland (Gordon et al., 2000). Rocha-Ghana (2020) estimated that about 23,000 water birds are within the wetland, consisting

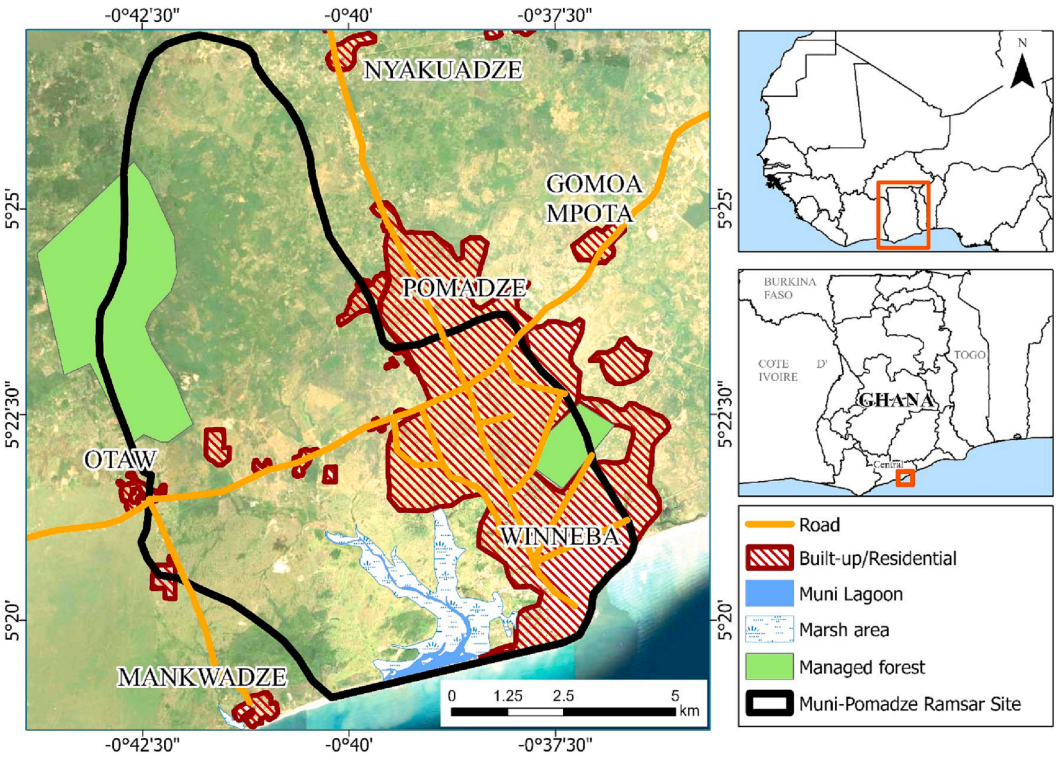

Fig. 1. Map of Muni-Pomadze Ramsar Site.

of about 29 species of waders, 8 terns, 7 herons and egrets, 2 gulls, and 1 duck. Muni-Pomadze Ramsar Site is a spawning ground for the turtles such as the Chelonia mydas, Lepidochelys olivacea and the Dermochelys coriacea (Rocha-Ghana, 2020). Culturally, the Muni-Pomadze Ramsar Site serve as a hunting ground for the Effutu people during the Aboakyire Festival, where young adult groups engage in competitive deer hunting exercises. Recently, the urbanisation of Winneba and Pomadze, farming and illegal logging have placed ecological stress on the wetland (Boanu et al., 2022; Rocha-Ghana, 2020; Tiakor, 2015; Attuquayefio & Ryan, 2006).

3.2. Data collection

The study collected data from eco-volunteers (students of the University of Education Winneba) of the eco-restoration exercise (tree planting) organised by the Department of Geography and the Forestry Commission of the Muni-Pomadze Ramsar Site on the 11th of June 2021. Most studies in the area concentrate on communities' restoration exercises (Davies-Vellum & West, 2015; Egyir et al., 2015) without the contribution of students and the academic community, hence the focus on students. An electronic questionnaire was deployed on the eco-volunteer's social media platform to solicit their responses. A total of 229 respondents out of about 360 participants of the restoration exercise, filled out the electronic questionnaire within one week after the eco-restoration exercise. The questionnaire had three sections: Section A looked at the socio-demographic profile of respondents. Section B focused on the reasons for participation in the restoration exercise and individual assessment of their contributions to the restoration of the wetland. The scale for reasons for participation asked questions about ecological and social reasons with 24 items on a 3-point Likert Scale [Low, moderate and High] (Appendix 1). While Section C focused on challenges participants faced during restoration exercises and their willingness to participate in future restoration exercises, with 18 items on a 3-point Liker Scale [Less likely, moderately likely and highly likely] (Appendix 1).

3.3. Data processing and analysis

Data processing activities included downloading responses (items) from the electronic database. The items were checked for completeness, normality, validity and reliability. Validity and reliability were assessed through exploratory factor analysis to identify significant items, and their relationships, and assist in categorising them, whereas confirmatory analysis was used to generate the best parameter estimates and data-model fits. Specifically, an exploratory factor analysis using the maximum likelihood method and an Eigenvalue of greater than 1 to identify factors which explain more variance in the factors. The rotation method was the Promax to generate the structure of the items with a significant factor coefficient above 0.50 [indicates an item is important] (Boermans & Kattenberg, 2011). In relation to reasons for participation scale, the exploratory statistics generated a Kaiser-Meyer-Olkin Measure of Sample Adequacy [KMO] = 0.75, Bartlett's Test of Sphericity X^2 (231) = 2396.18, p = 0.00 signifying a good model as explained by Hair et al. (2010). Six components thus provisioning, regulating, supporting, socialising, learning, and promoting social image were derived with a cumulative variance of 64.49% (Appendix 1). Internal consistency for the components had provisioning (α = 0.80), regulating (α = 0.83), supporting (α = 0.67), socialising (α = 0.75), learning (α = 0.74) and social image (α = 0.88) above the modest acceptable level of 0.6 (Boermans & Kattenberg, 2011).

An assessment of the challenges faced by the participants during the restoration exercise had a model fit of Kaiser-Meyer-Olkin Measure of Sample Adequacy [KMO] = 0.76 and Bartlett's Test of Sphericity X^2 (136) = 1697.79, p = 0.00. Four components thus limited refreshment, transportation difficulties, inadequate equipment, and interpersonal conflicts were derived with a cumulative variance of 59.05%. Internal consistency for the challenges were limited refreshment (α = 0.71), transport difficulties (α = 0.88), inadequate equipment (α = 0.34) and interpersonal conflicts (α = 0.77). Using confirmatory factor analysis, the construct validity was measured for the two scales, which had a good model fit. Reasons for participation in the eco-restoration exercise had a minimum discrepancy X^2/df = 1.86, comparative fit index [CFI] = 0.95,

root mean square error of approximation [RMSEA] = 0.06. The composite reliability (CR) was greater than 0.7, the average variance extracted (AVE) was greater than 0.5, and discriminatory validity with the maximum shared variance (MSV) of less than AVE (Appendix 3). While the scale for challenges had X^2 /df = 1.94, CFI = 0.92, RMSEA = 0.06 and CR, AVE and MSV (Appendix 4). Both the exploratory and confirmatory factor analysis generated parameters within statistically acceptable limits as recommended by Hair et al. (2010). Hence, the study employed paired sampled t-tests to assess the generated factors (reasons for participation) while the generalised linear equation was used to model the effect of the challenges on future eco-volunteerism. The adaptation of parametric tools to analyse Likert-scale responses is statistically appropriate without any significant effect on expected results (Willits et al., 2016; Sullivan & Artino, 2013).

4. Results

4.1. Reason for participating in ecological restoration exercise

The basic statistics from the data had sex (Male = 72%, Female = 28%), mean age (23 years), ethnicity (Akan = 60%, Ewe = 10%, Guan = 12%, Mole Dagbani = 18%), religion (No = 19%, Catholic = 18%, Pentecostal = 48%, Muslim = 11%, Traditional = 4%) and average monthly income/stipend (average = 50USD), willingness to participate in future restoration exercise (Less likely = 28%, Moderately likely = 20% and Highly likely = 52%) and individual assessment of contribution to the restoration of the wetland (expectancy-Low = 15.2%, moderate = 29.3% and High = 55.5%). Eco-volunteers of the Muni Ramsar Site restoration exercise participated mainly for ecological reasons [M = 2.40, SD = 0.39] and social reasons [M = 2.27, SD = 0.44] (Table 1). Ecological reasons that motivated participation were; to help improve the regulating, provisioning, and supporting services of the wetland. Socially, participants were motivated to undertake the exercise to boost their social image, learn about nature and socialise with other participants.

The motivations with the highest values were to learn (M = 2.58, SD = 0.58) and improve regulating services (M = 2.53, SD = 0.62). The least motivation for participation was to socialise (M = 1.87, SD = 0.52). The mean composite of ecological reasons (M = 2.40, SD = 0.39) was statistically significantly higher (MD = 0.13, t (228) = 4.54, p = 0.00) than social reasons (M = 2.27, SD = 0.44) as a motivator for eco-volunteerism in the Muni-Pomadze restoration exercise.

4.2. Challenges faced by participants of an organised tree planting exercise in Muni Ramsar Site

The challenges faced by participants were transportation difficulties (M = 1.88, SD = 0.52), limited refreshment (M = 2.4, SD = 0.51), inadequate equipment (M = 2.0, SD = 0.44) and interpersonal conflicts (M = 1.63, SD = 0.57) (Table 2). Limited refreshment given to eco-volunteers was statistically significantly higher than transport difficulties (MD = 0.55, t (228) = -11.70, p = 0.00), inadequate equipment (MD = 0.43, t = 0.21, p = 0.00) and interpersonal (M = 0.80, t (228) = 17.72, p = 0.00).

The least challenge experienced by participants was interpersonal conflict with other participants, as it was statistically significantly lower than transportation difficulties, limited refreshment, and inadequate equipment.

4.3. Effect of the challenges experienced during Muni-Pomadze eco-restoration on future eco-volunteerism

A generalised linear model analysis indicated that the ecological and social reasons for participation in tree planting exercises influenced future participation. The model had goodness of fit deviance X^2/df = 0.24, and the Omnibus test of likelihood ratio X^2 (7) = 28.91 and p = 0.00 (Table 3). Ecological reasons (β = 0.53, p = 0.00) had a positive effect on participation in future restoration exercises in the Muni Ramsar Site, while on the contrary, social reasons did not show any effect.

For the challenges, transport difficulties (β = 0.21, p = 0.03) had a direct positive effect on future restoration exercise participation but

Table 1
Reasons for participation of Muni Ramsar Site restoration.

Reasons for participation	Mean	Std. Deviation	Skewness	Kurtosis
Ecological reasons				
Regulating	2.53	0.62	−1.23	0.46
Provisioning	2.41	0.58	−0.65	−0.30
Supporting	2.25	0.49	−0.30	−0.09
Mean	*2.40*	*0.39*	*−0.39*	*−0.57*
Social reasons				
Social Image	2.36	0.70	−0.63	−0.92
Learn	2.58	0.58	−1.29	0.83
Socialise	1.87	0.52	0.26	−0.37
Mean	*2.27*	*0.44*	*−0.72*	*0.22*

Table 2
Challenges faced by participants during the restoration of Muni Ramsar Site.

Challenges	MD	S.E	95% Confidence Interval of the Difference		t	*p*
			Lower	Upper		
Transportation difficulties-Limited refreshment	−0.55	0.05	−0.65	−0.46	−11.70	0.00
Transportation difficulties-Interpersonal conflicts	0.25	0.05	0.16	0.34	5.33	0.00
Transportation difficulties-Inadequate equipment	−0.12	0.04	−0.19	−0.04	−3.16	0.00
Limited refreshment-Interpersonal conflicts	0.80	0.05	0.71	0.89	17.72	0.00
Limited refreshment-Inadequate equipment	0.43	0.04	0.35	0.52	10.21	0.00
Interpersonal conflicts-Inadequate equipment	−0.37	0.05	−0.46	−0.28	−7.97	0.00

M = Mean, MD = Mean Difference, S.E = Standard error, t = T-value, p = significant value.

Table 3
Direct effect of factors influencing motivation for future eco-volunteerism.

Independent Variables	β	S.E	*p*	95% Wald Confidence Interval	
				Lower	Upper
Intercept	0.09	0.42	0.83	−0.74	0.91
Ecological reason	0.53	0.14	0.00	0.26	0.80
Social reason	−0.17	0.13	0.20	−0.43	0.09
Transportation difficulties	0.21	0.09	0.03	0.03	0.39
Limited refreshment	−0.06	0.11	0.59	−0.28	0.16
Interpersonal conflicts	−0.01	0.08	0.87	−0.17	0.14
Inadequate equipment	−0.21	0.11	0.05	−0.43	0.00
Goodness of Fit					
Deviance X^2 (222) = 55.72					
Pearson Chi-Square	0.24				
Log-Likelihood	−330.18				
Omnibus Test					
Likelihood Ratio X^2 (6) = 28.91p = 0.00					

β = coefficient, S.E = Standard error, p = Significance value, df = degree of freedom.

inadequate equipment (β = -0.21, p = 0.05) had a negative effect on future restoration exercise participation. Interactional analysis between the challenges faced by participants and reasons for eco-volunteering on future eco-volunteering activities had goodness of fit with deviance value of (value/df) = 0.42, log-likelihood of 210.33 and Omnibus test X^2 (30) = 161.61, p = 0.00 (Table 4). The interaction of ecological and social reasons (β = 0.82, p = 0.00) influenced respondents' likelihood to participate in future eco-volunteering exercises.

There was a positive interactional effect between ecological reasons, transportation difficulties and limited refreshments (β = 2.97, p = 0.09) as respondents were more likely to partake in future eco-volunteering exercises. While transportation difficulties and inadequate equipment negatively detracted from the positive effect of ecological reasons (β = -2.76, p = 0.07) on future eco-volunteering. Also, the transportation difficulties and limited refreshments negatively affected social reasons for participation in the tree planting exercise.

5. Discussion

Eco-volunteers contribute their time, resources, and expertise to support the work of foresters to improve the ecological health of natural areas. Eco-volunteers experience numerous challenges in providing these support services that can impact their future ecological volunteering intent. With the help of Vroom's expectancy motivation theory, the study sought to assess the challenges encountered by eco-volunteers who participated in the ecological restoration exercise organised by the Department of Geography and the Forestry Commission of the Muni-Pomadze Ramsar Site on the 11th of June 2021. The primary method of gathering data was an electronic questionnaire with items to measure the reasons for participating in eco-volunteerism and the challenges encountered. Data processing methods included exploratory and confirmatory factor analysis which generated 3 ecological (provisional, regulatory, supporting) and 3 social (socialise, social image, learn) reasons for eco-volunteering and 4 main challenges (limited refreshment, transportation difficulties, interpersonal conflict, and inadequate equipment) encountered during the eco-restoration exercise. The model statistics for the generated factors were within statistically acceptable value thresholds. The factors were analysed per the objectives of the study using descriptive statistics, pair-sample t-tests, and generalised linear equation modelling.

The study identified ecological and social reasons as factors which influenced participation in the Muni-Pomadze Ramser Site eco-restoration activity. This was in line with those of Carballo-Cárdenas & Tobi, (2016); Wong, Lim, & Bidin, (2020), who discovered that social and ecological factors were the primary drivers of eco-volunteering. The severe degradation of Muni-Pomadze (Rocha-Ghana, 2020; Tiakor, 2015) could have inspired the ecological reason for the participation in the eco-restoration exercise. The ecological instrumentality will not become apparent until the planted trees have completely grown to offer services to Muni-Pomadze, supporting Vrooms' theory that some efforts take time to manifest (Wilson & Gilbert, 2005). The social expectancy for eco-volunteering could be tied to the benefit of acquiring knowledge because participants were mainly students. Affirming Wong, Lim, & Bidin, (2020) assertion, eco-volunteerism provides an avenue for students to learn about nature, exchange information, foster creativity, and gain new skills. Also, the student's participation in the eco-restoration improves the Department of Geography Education and the University of Education Winneba community services and eco-friendly reputation.

According to the study, the valence for volunteering was transportation difficulties, inadequate equipment, limited refreshments, and interpersonal conflicts in line with findings by Yee et al. (2021) and Vanson et al. (2019). The most significant challenge was limited refreshments as eco-volunteers claimed they were not provided with enough food/snacks/drinks by the organisers of the eco-restoration exercise. Eco-volunteers might have envisaged this as a cost when the limited refreshment is compared with the length of time worked and, the

Table 4
Moderating effect of challenges between reasons and future eco-volunteerism.

Parameter	β	S.E	p	95% Wald Confidence Interval	
				Lower	Upper
Intercept	4.60	1.12	0.00	2.41	6.78
Ecological reason	−10.39	13.03	0.43	−35.92	15.14
Social reason	6.68	14.41	0.64	−21.56	34.92
Ecological reason * Social reason	0.82	0.22	0.00	0.40	1.25
Ecological reason * Transportation difficulties	−0.44	4.02	0.91	−8.32	7.45
Ecological reason * Limited refreshment	−1.14	4.85	0.81	−10.66	8.37
Ecological reason * Interpersonal conflicts	−3.36	8.19	0.68	−19.41	12.69
Ecological reason * Inadequate equipment	10.18	8.34	0.22	−6.17	26.54
Social reason * Transportation difficulties	2.04	4.81	0.67	−7.40	11.48
Social reason * Limited refreshment	2.44	5.33	0.65	−8.00	12.88
Social reason * Interpersonal conflicts	4.08	8.91	0.65	−13.39	21.55
Social reason * Inadequate equipment	−11.23	9.02	0.21	−28.91	6.45
Ecological reason * Transportation difficulties* Limited refreshment	2.97	1.75	0.09	−0.45	6.40
Ecological reason * Transportation difficulties * Interpersonal conflicts	2.72	2.80	0.33	−2.76	8.20
Ecological reason * Transportation difficulties * Inadequate equipment	−2.76	1.50	0.07	−5.70	0.18
Ecological reason * Limited refreshment * Interpersonal	4.31	3.73	0.25	−2.99	11.61
Ecological reason * Limited refreshment * Inadequate equipment	−1.94	2.92	0.51	−7.67	3.79
Ecological reason * Interpersonal conflicts * Inadequate equipment	−0.59	4.80	0.90	−9.99	8.81
Social reason * Transportation difficulties * Refreshment	−4.06	2.04	0.05	−8.06	−0.06
Social reason * Transportation difficulties * Interpersonal	−3.31	3.03	0.28	−9.25	2.64
Social reason * Transportation difficulties * Equipment	2.87	1.73	0.10	−0.52	6.26
Social reason * Limited refreshment * Interpersonal conflicts	−5.06	4.03	0.21	−12.96	2.85
Social reason * Limited refreshment * Inadequate equipment	1.81	3.19	0.57	−4.43	8.06
Social reason * Interpersonal conflicts * Inadequate equipment	0.61	5.19	0.91	−9.56	10.78
Ecological reason * Transportation difficulties * Refreshment * Interpersonal	−2.86	1.66	0.08	−6.11	0.39
Ecological reason * Limited refreshment * Interpersonal conflicts * Inadequate equipment	−0.97	1.96	0.62	−4.82	2.88
Ecological reason * Transportation difficulties * Limited refreshment * Interpersonal conflicts * Inadequate equipment	0.69	0.40	0.08	−0.09	1.47
Social reason * Transportation difficulties * Limited refreshment * Interpersonal conflicts	3.34	1.74	0.06	−0.07	6.75

(*continued on next page*)

Table 4 (*continued*)

Parameter	β	S.E	*p*	95% Wald Confidence Interval	
				Lower	Upper
Social reason * Transportation difficulties * Refreshment * Inadequate equipment	0.20	0.28	0.48	−0.36	0.75
Social reason * Limited refreshment * Interpersonal conflicts * Inadequate equipment	1.18	2.13	0.58	−3.00	5.35
Social reason * Transportation difficulties * Limited refreshment * Interpersonal conflicts * Inadequate equipment	−0.80	0.40	0.05	−1.58	−0.02
Goodness of Fit-Test					
	Value	df		Value/df	
Deviance	84.09	198		0.42	
Log-Likelihood	−210.23				
Akaike's Information Criterion (AIC)	484.45				
Omnibus Test					
Likelihood Ratio Chi-Square	df	Sig.			
161.61	30	0.00			

β = Coefficient, S.E = Standard error, *p* = Significant value.

exhaustive nature of the eco-restoration activity. Another critical challenge was inadequate equipment which can reduce productivity and increase idleness. Hustinx (2010) noted that when eco-volunteers labour below their capability, they get dissatisfied, develop poor commitment, and are less likely to volunteer in the future. When compared to other activities that eco-volunteers abandoned to take part in the eco-restoration exercise, being unable to work because of inadequate equipment can be considered as valence. Another challenge encountered throughout the exercise was interpersonal conflicts among the eco-volunteers. Eco-volunteers need empathy to accommodate other volunteers according to Wong, Lim, & Bidin, (2020), a quality required for future leadership roles. On the other hand, if such interpersonal conflicts are not appropriately handled, eco-volunteers may become stressed and resentful (DiEnno & Thompson, 2013).

The valence and expectancies influenced participants' future eco-volunteerism. For participants highly motivated by social reasons of eco-volunteerism, they were less likely to engage in future ecological activities because of transportation difficulties and limited refreshment. At this point, Zboja et al. (2020) causal chain effect of expectancy theory is at play as the influence of the valence is greater than the expected reward. While for persons motivated by ecological reasons, Kiatkawsin and Han (2017) traditional model of expectancy theory manifested as instrumentality superseded valence. The findings present critical information for organisers of eco-volunteer exercises to address the challenges of eco-volunteers to help improve retention (Canning et al., 2021).

6. Conclusions

Per the data collection and analysis, the study makes the following conclusion. Participation in the Muni Ramsar Pomadze Site eco-restoration exercise organised by the Department of Geography Education [UEW] was based on ecological and social reasons. However, the ecological reason was the principal reason for participation in the restoration exercise. In the bid to provide restoration exercise eco-volunteers were faced with challenges such as transportation difficulties, inadequate equipment, limited refreshments and interpersonal conflicts. The greatest challenge experienced by eco-volunteers was limited refreshments thus quantity/amount of food and drinks provided by the organisers of the exercise. Motivated by ecological reasons eco-volunteers were more likely to participate in future ecological restoration exercises even with the combined effect of transportation difficulties, limited refreshment, inadequate equipment, and interpersonal conflicts. On the contrary, eco-volunteers motivated by social reasons were less likely to participate in future eco-volunteer exercises. For this group, prior challenges experienced were more likely to heighten their unwillingness to participate in future ecological restoration activities.

7. Recommendations

The study recommends that organisers of eco-restoration exercises should adopt a bottom-up approach in the planning of future exercises to meet and dialogue with potential eco-volunteers on their needs and challenges. Furthermore, organisers should be able to anticipate the number of participants to provide the required number of equipment. On the participants' side, they can complement the organisers' refreshments by coming with their food and drinks. Above all, volunteerism is a personal sacrifice arising from a deep-seated inner desire to do good, hence doing it for the ecology presents a greater motivation which must be imbibed and sustained.

8. Limitations

The spatial scope of this research was confined to a wetland restoration activity which might be difficult to generalise for other ecosystems. Furthermore, the wetland is located within the urban landscape hence the challenges experienced are likely to be lower compared to wetlands located within rural landscapes. Participants were students and the results could have changed if other categories of society were sampled.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgement

The study acknowledges the cooperation of the Department of Geography Education (Students and Staffs especially Dr Yaw Asamoah, Dr Bernard Arko, Mr Emmanuel Yeboah Okyere) of the University of Education Winneba and the Forestry Commission in charge of the Muni-Pomadze Ramsar Site.

References

Attuquayefio, D. K., & Ryan, J. M. (2006). Taxonomic report on small mammals from two coastal wetland (Ramsar) sites in Ghana. *West African Journal of Applied Ecology, 10* (1).

Barba-Sánchez, V., & Atienza-Sahuquillo, C. (2017). Entrepreneurial motivation and self-employment: Evidence from expectancy theory. *International Entrepreneurship and Management Journal, 13*(4), 1097–1115.

Battaglia, M., Buckley, G. L., Galvin, M., & Grove, M. (2014). It's not easy going green: Obstacles to tree-planting programs in East Baltimore. *Cities and the Environment, 7* (2), 1–19.

Benson, C. E., Carberry, B., & Langen, T. A. (2018). Public–private partnership wetland restoration programs benefit species of greatest conservation need and other wetland-associated wildlife. *Wetlands Ecology and Management, 26*, 195–211.

Boanu, N. Y., Dadson, I. Y., Adu-Boahen, K., & Yeboah, E. O. (2022). Assessment of the Physico-chemical Properties in the Muni-Pomadze Ramsar Site and its Catchment in Winneba. *Ghana. Environmental Protection Research*, 95–111.

Boermans, M. A., & Kattenberg, M. (2011). *Estimating reliability coefficients with heterogeneous item weightings using Stata: A factor based approach*. Koopmans Research Institute Discussion Paper: Tjalling C.

Bremer, L. L., Brahman, K. A., Nelson, S., Prado, K. M., Wilburn, E., & Fiorina, A. C. O. (2018). Relational values in evaluations of upstream social outcomes of watershed payment for ecosystem services: A review. *Current Opinion in Environmental Sustainability, 35*, 116–123.

Canning, A. D., Jarvis, D., Costanza, R., Hasan, S., Smart, J. C., Finisterre, J., … Waltham, N. J. (2021). Financial incentives for large-scale wetland restoration: Beyond markets to common asset trusts. *One Earth, 4*(7), 937–950.

Carballo-Cárdenas, E. C., & Tobi, H. (2016). Citizen science regarding invasive lionfish in Dutch Caribbean MPAs: Drivers and barriers to participation. *Ocean & Coastal Management, 133*, 114–127.

Clewell, A., & Aronson, J. (2013). The SER primer and climate change. *Ecological Management & Restoration, 14*(3), 182–186.

Davidson, N. C. (2014). How much wetland has the world lost? Long-term and recent trends in global wetland area. *Marine Freshwater Resource, 65*, 934–941.

Damian, E. (2019). Formal volunteering in Europe: Evidence across nations and time. *Cross-Cultural Research, 53*(4), 385–409.

Davies-Vellum, K. S., & West, M. (2015). Shoreline change and sea level rise at the Muni-Pomadze coastal wetland (Ramsar site). *Ghana. Journal of Coastal Conservation, 19*(4), 515–525.

DiEnno, C. M., & Thompson, J. L. (2013). For the love of the land: How emotions motivate volunteerism in ecological restoration. *Emotion, Space and Society, 6*, 63–72.

Egyir, I. S., Ofori, K., Antwi, G., & Ntiamoa-Baidu, Y. (2015). Adaptive capacity and coping strategies in the face of climate change: A comparative study of communities around two protected areas in the coastal savanna and transitional zones of Ghana. *Journal of Sustainable Development, 8*(1), 1.

Gordon, C., Ntiamoa-Baidu, Y., & Ryan, J. M. (2000). The Muni-Pomadze Ramsar site. *Biodiversity & Conservation, 9*(4), 447–464.

Grant, A., & Langer, E. R. (2021). Wildfire volunteering and community disaster resilience in New Zealand: Institutional change in a dynamic rural social-ecological setting. *Ecology and Society, 26*(3).

Grube, J. A., & Piliavin, J. A. (2000). Role identity, organizational experiences, and volunteer performance. *Personality and Social Psychology Bulletin, 26*(9), 1108–1119.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hustinx, L. (2010). Institutionally individualized volunteering: Towards a late modern re-construction. *Journal of Civil Society, 6*(2), 165–179.

Jacobsen, K. I., Hoffmann, T. C., & Dohrn, C. (2019). In-kind contributions to Orange County marine protected area management. *Ocean & Coastal Management, 178*, Article 104800.

Jamion, N. A., Lee, K. E., Mokhtar, M., Goh, T. L., Simon, N., Goh, C. T., & Bhat, I. U. H. (2022). The integration of nature values and services in the nature-based solution assessment framework of constructed wetlands for carbon–water nexus in carbon sequestration and water security. *Environmental Geochemistry and Health*, 1–30.

Kiatkawsin, K., & Han, H. (2017). Young travelers' intention to behave pro-environmentally: Merging the value-belief-norm theory and the expectancy theory. *Tourism Management, 59*, 76–88.

Kim, J. H., Kim, S. Y., & Yoo, S. H. (2021). South Koreans' willingness to pay for restoration of Gomsoman Tidal Flat. *Ocean & Coastal Management, 199*, Article 105388.

Li, X., Bellerby, R., Craft, C., & Widney, S. E. (2018). Coastal wetland loss, consequences, and challenges for restoration. *Anthropocene Coasts, 1*(1), 1–15.

Liu, Z., Fagherazzi, S., & Cui, B. (2021). Success of coastal wetlands restoration is driven by sediment availability. *Communications Earth & Environment, 2*(1), 1–9.

McAteer, B., & Flannery, W. (2022). Power, knowledge and the transformative potential of marine community science. *Ocean & Coastal Management, 218*, Article 106036.

Mould, S., Fryirs, K., & Howitt, R. (2020). The importance of relational values in river management: Understanding enablers and barriers for effective participation. *Ecology and Society, 25*(2).

O'Brien, L., Townsend, M., & Ebden, M. (2010). 'Doing something positive': Volunteers' experiences of the well-being benefits derived from practical conservation activities in nature. *Voluntas: International Journal of Voluntary and Nonprofit Organizations, 21*(4), 525–545.

Oja, E. B., Swartz, L. K., Muths, E., & Hossack, B. R. (2021). Amphibian population responses to mitigation: Relative importance of wetland age and design. *Ecological Indicators, 131*, Article 108123.

Osman, A., Adu-Boahen, K., Arko, B., & Okyere, E. Y. (2022). Analysis of planting practices and post-planting stewardship intention of participants of Arbor Day Tree planting practices and stewardship intention. *Restoration Ecology, 13838*.

Parijat, P., & Bagga, S. (2014). Victor Vroom's expectancy theory of motivation–An evaluation. *International Research Journal of Business and Management, 7*(9), 1–8.

Patrick, R., Henderson-Wilson, C., & Ebden, M. (2022). Exploring the co-benefits of environmental volunteering for human and planetary health promotion. *Health Promotion Journal of Australia, 33*(1), 57–67.

Pérez, D. R., del Mar González, F., Araujo, M. E. R., Paredes, D. A., & Meinardi, E. (2019). Restoration of society-nature relationship based on education: A model and progress in Patagonian drylands. *Ecological Restoration, 37*(3), 182–191.

Pereira, E. J. D. A. L., Ferreira, P. J. S., de Santana Ribeiro, L. C., Carvalho, T. S., & de Barros Pereira, H. B. (2019). Policy in Brazil (2016–2019) threaten conservation of the Amazon rainforest. *Environmental Science & Policy, 100*, 8–12.

Prieto, G. C., Guerrero, D. J., & Harrison, E. (2013). *Report on the 2012 green turtle programm at Tortuguero, Costa Rica*. San Pedro: Sea Turtle Conservancy.

Pon, J. P. S., Becherucci, M. E., Paterlini, C.Á., Adrogué, A. Q., Castano, M. V., Zumpano, F., & García, G. O. (2022). Perception, knowledge and attitudes towards environmental issues and management among coastal users of the most important beach destination in Argentina. *Ocean & Coastal Management, 220*, Article 106070.

Purvis, R. L., Zagenczyk, T. J., & McCray, G. E. (2015). What's in it for me? Using expectancy theory and climate to explain stakeholder participation, its direction and intensity. *International Journal of Project Management, 33*(1), 3–14.

Rahman, A. N., & Abdul Rahman, A. (2021). Extrinsic motivation and perceived benefits of environmental volunteering: Perspectives from students. *Creative Education, 12*, 2792–2805.

Robertson, H. A., Ausseil, A. G., Rance, B., Betts, H., & Pomeroy, E. (2019). Loss of wetlands since 1990 in Southland, New Zealand. *New Zealand Journal of Ecology, 43*(1), 1–9.

Rocha-Ghana (2020). Muni Pomadze Ramsar Site- An interaction between biodiversity and culture. Retrieved on 10th January 2022 from https://ghana.arocha.org/news/muni-pomadze-ramsar-site-an-interaction-between-biodiversity-and-culture/.

Shaw, R. (2006). Indian Ocean tsunami and aftermath: Need for environment-disaster synergy in the reconstruction process. *Disaster Prevention and Management: An International Journal, 15*(1), 5–20.

Shinbrot, X. A., Jones, K. W., Newman, G., & Ramos-Escobedo, M. (2021). Why citizen scientist's volunteer: The influence of motivations, barriers, and perceived project relevancy on volunteer participation and retention from a novel experiment. *Journal of Environmental Planning and Management*, 1–21.

Solinas, M., Clò, S., & Nicosia, M. (2008). Eco-volunteering programs as good practices for nature conservation and sustainable tourism development in protected areas. In *Management for protection and sustainable development. The Fourth International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas Montecatini Terme, Italy* (pp. 14-19).

Stebbins, R. (2013). Unpaid work of love: Defining the work–leisure axis of volunteering. *Leisure Studies, 32*(3), 339–345.

Tiakor, S. (2015). *Impact of farming activities on the water quality of the pratu river and its tributaries in the Muni-Pomadzi wetland*. Un-published document presented to the Department of Department of Nuclear Sciences and Applications, University of Ghana, Legon-Ghana. Retrieved from *http://ugspace.ug.edu.gh/bitstream/handle/123456789/8668/Impact%20of%20Farming%20Activities%20on%20the%20Water%20Quality%20of%20the%20Pratu%20River%20and%20its%20Tributaries%20in%20the%20Muni-Pomadzi%20Wetland%20-%202015.pdf?sequence=1&isAllowed=y*.

Sullivan, G. M., & Artino, A. R., Jr. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of Graduate Medical Education, 5*(4), 541–542.

Tomscha, S. A., Bentley, S., Platzer, E., Jackson, B., de Roiste, M., Hartley, S., … Deslippe, J. R. (2021). Multiple methods confirm wetland restoration improves ecosystem services. *Ecosystems and People, 17*(1), 25–40.

Vanson, T., Gisborne, J., & McCool, S. (2019). *Research to understand environmental volunteering amongst young people*. London: Department for Environment, Food, and Rural Affairs.

Willits, F. K., Theodori, G. L., & Luloff, A. E. (2016). Another look at Likert scales. *Journal of Rural Social Sciences, 31*(3), 126–139.

Wilson, T. D., & Gilbert, D. T. (2005). Affective forecasting: Knowing what to want. *Current Directions in Psychological Science, 14*, 131–134.

Wong, J. L., Lim, L. E., & Bidin, S. (2020). Volunteering in environment conservation program: Gain or loss? *Journal of Environmental Planning and Management, 64*(9), 1536–1554.

Yee, X. T., Wei, C. C., & Ojo, O. A. (2021). Green volunteerism – A new approach to achieve the United Nations' sustainable development goals. *Tourism and Sustainable Development Review Journal (TSDR), 2*, 19–31.

Zboja, J. J., Jackson, R. W., & Grimes-Rose, M. (2020). An expectancy theory perspective of volunteerism: The roles of powerlessness, attitude toward charitable organizations, and attitude toward helping others. *International Review on Public and Nonprofit Marketing, 17*(4), 493–507.